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)

(This attachment must be completed and digitally signed by the legal representative of the proposer)

Please note: The drafting of the project proposal must respect limits indicated for each paragraph with the following characters: Times New Roman font, font size 11, single line spacing.

NAME OF THE INNOVATION ECOSYSTEM: MUSA - Multilayered Urban Sustainability Action

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

NAME OF THE PROPOSER: Università degli Studi di Milano-Bicocca

IMPLEMENTING BODY - HUB:

Parties involved

1. Università degli Studi di Milano-Bicocca
2. Università degli Studi di Milano
3. Università Commerciale Luigi Bocconi
4. Politecnico di Milano
5. Regione Lombardia
6. Comune di Milano
7. Fondazione Cariplo
8. Fondazione Riccagioia 5.0
9. Eni S.P.A.
10. Edison S.P.A.
11. A2A S.p.a.
12. Thales Alenia Space Italia S.P.A.
13. Consiglio Nazionale delle Ricerche

Chosen legal form

Limited liability consortium - Società consortile a responsabilità limitata (S.c.ar.l.)

SPOKE AND AFFILIATE WITH THE SPOKE PERFORMING PARTIES:

1. Università degli Studi di Milano-Bicocca (UNIMIB)
2. Università degli Studi di Milano (UNIMI)
3. Università Commerciale Luigi Bocconi (UNIBOCCONI)
4. Politecnico di Milano (POLIMI)
5. Eni S.P.A. (ENI)
6. Edison S.P.A. (EDISON)
7. A2A S.p.a. (A2A)
8. Thales Alenia Space Italia S.P.A. (THALES)
9. Pirelli &C. S.P.A. (PIRELLI)
10. Novartis Farma SPA (NOVARTIS)
11. Almaviva – The Italian Innovation Company SpA (ALMAVIVA)
12. TIM S.p.A. (TIM)
13. Bio4Dreams SpA (BIO4DREAMS)
14. AstraZeneca S.p.A. (ASTRAZENECA)
15. Bracco spa (BRACCO)
16. Fondazione Politecnico di Milano (FONDAZIONE POLIMI)
17. Officine Innovazione S.r.l. (OI)
18. Camozzi Automation S.p.a. (CAMOZZI)
19. Huawei Technologies Italia S.r.l. (HUAWEI)
20. Infineon Technologies Italia S.r.l. (INFINEON)
21. Humanitas university (HUMANITAS)
22. Fondazione Bruno Kessler (FBK)
23. RCS MediaGroup SpA (RCS)
24. Lumson S.p.A. (LUMSON)

COST OF THE PROGRAM:

129.408.599,00 €

NRRP THEMATIC AREA: *indicate the Theme of the proposal (see Annex A)*

Reference point: Programma Nazionale per la Ricerca 2021-27

- − 5. Clima, energia, mobilità sostenibile (Climate, Energy and Mobility), Primary
- − 4. Digitale, Industria, Aerospazio (Digital, Industry and Space), Secondary
- − 2. Cultura umanistica, Creatività, Trasformazioni Sociali, Società dell'Inclusione (Culture, Creativity and Inclusive Society), Secondary

TERRITORY OF REFERENCE: *indicate the territorial area / territory of reference*
Regione Lombardia

MUSA: Multilayered Urban Sustainability Action

Table of contents

PART A - AREA OF SPECIALIZATION / SCIENTIFIC AND TECHNOLOGICAL FOCUS

A1. Introduction – Presentation of the Ecosystem

MUSA (Multilayered Urban Sustainable Action) is a challenging proposal with the ambition to **turn Milan Metropolitan Area (MMA) into an ecosystem of innovation for urban regeneration**, comprehensive of all levels of intervention, from social to technological, able to scale at the regional and national level and to become a model at the European level. This goal will be pursued by undertaking a set of actions that address various dimensions of an ecosystem of innovation defined as an "*evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors*" (Granstrand and Holgersson, 2020).

The ecosystem intends to grow on the synergy between Academia, Industry, Local Government Entities and Civil Society, in full alignment with the *Quadruple Helix* model fostered by EU: *"Open Innovation involves all stakeholders' needs and creates seamless interaction and mash-up for ideas in innovation ecosystems"*. In the Quadruple Helix Paradigm government, industry, academia and civil participants work together to *co-create the future* and drive structural changes (https://www.openinnovation.eu).

Milan is internationally recognized as a reference model of innovation and with its more than 200,000 students (about 10% of all students enrolled in Higher Education in Italy) it promotes innovative and inclusive training. The leadership builds on several dimensions:

- **Urban Regeneration:** Milan is a flywheel to revive Urban Regeneration and sustainability also being one of the best destinations in the world for real estate investments. The connection with adjacent municipalities and with the *Po Valley* makes the territory an xcellence of production and permanent innovation. Most important projects cross the city borders. This is the case of the ex EXPO site (today MIND), Bovisa reconversion plan, the development of the Falck brownfield in Sesto San Giovanni and the Citta' della Salute along the axis Milan-Monza. The project of Milano Santa Giulia that together with Porta Romana and several other projects will foster the Milano-Cortina Olympic games of 2026 (www.ispionline.it). Milano is also the scenery of the visionary initiative *L'Innesto*, a project which aims at regenerating the Milan Greco-Breda railway yard in the area strictly adjacent to UNIMIB campus (https://innestomilano.it/). The project, the first Social Housing Zero Carbon initiative in Italy, is under development. Synergies between the project and the University are already in place and will develop through a long-term collaboration - e.g., with the newly started UNIMIB initiative Vivaio Bicocca (https://vivaiobicocca.unimib.it/). An iconic example of architectural innovation and urban regeneration is the *Vertical Forest* building (Porta Nuova) that in 2014 won the *International Highrise Award*. Lombardy Region has been the first Region to sign the *Protocol for sustainable development* in 2019, and to make sustainability one of the five priorities of the actions to be carried out by the Regional Government as a "*distinctive feature of the administrative activity and an opportunity to improve the quality of life of the people living in Lombardy. This should be achieved by meeting the needs of productive growth and by involving all local stakeholders: from businesses to citizens, from schools to public administrations*". The Protocol was presented at the United Nations SDGs Summit. Finally, Milan was recently selected as one of the "100 Climate-Neutral and Smart Cities by 2030" targeted by the corresponding Horizon Europe Mission (https://ec.europa.eu/commission/presscorner/detail/en/IP_22_2591).
- **Data revolution and Digitalization:** Milan has accepted early the Data transition, digitalization and digital citizenship challenges with many private companies, Universities and public institutions active in Big Data and data science. Universities (as POLIMI, UNIMI, UNIMIB etc.) have the role of advancing frontier research in Big Data and in the development of advanced AI and ML techniques. The Municipality of Milan and Lombardy Region identify in the *Open Government paradigm* a way to create an open Public Administration that gives vigor to innovation for citizens and businesses and open data represent one of the cornerstones of this strategy.
- **Entrepreneurship, technology and third sector:** Milan has the national leadership for "modern" entrepreneurship (i.e., innovative start-up), Lombardy is first ranked in Italy with a density of 383.8 businesses per 100,000 inhabitants. Milan boasts a density of 675 start-ups per 100,000 registered companies (Sole24Ore 2021).
- **Finance:** Milan is the headquarter of the Italian stock exchange market and after the *Brexit* it is bound to become a *Eurozone hub* for financial services. Its province generates almost 10% of Italy's GDP, while Lombardy alone accounts for 22% of the country's gross domestic product. Milan's GDP per capita amounts to €49,921, twice the national (€ 25,453) and European (€25,652) average. Excluding the UK, Milan has the second largest economy amongst European cities after Paris, and has the largest economy among European

non-capital cities. Among the top ten multinational companies, seven have offices in Milan: Apple, Google, Berkshire Hathaway, Microsoft, ICBC, Novartis and GE all have a presence in the city (http://www.investinlombardyblog.com).

- **Fashion and Design:** Milan is internationally considered one of the most important fashion capitals together with New York, Paris and London. Its leadership in fashion, textiles and design in general is well reflected in events that each year attract thousands of operators and companies from all over the world. Between these the *Milan Fashion Week* and *Il Salone del Mobile*, whith the latter attracting, in 2019, 345.000 visitors with more than 2.000 participating companies, with an average of 70% participants from abroad (in 2021 visitors in presence were 60.000 from 113 countries). Milan was declared in 2009 the "fashion capital of the world" by the Global Language Monitor (GLP)
- **Inclusive social models and services and education:** Milan area and Lombardy Region have historically had a deep attention to the development of social services and assistance to the citizen among the highest concentration of social enterprises and services at national level (ageing, disabilities, youth etc.). The municipality of Milan in the year of the pandemic, strengthened the support for the birth and development of neighborhood businesses, social enterprises and start-ups with over 10 million euros, considered *key realities for the economic, social and inclusive growth and evolution of the outer districts of the city*. Social services as well have been traditionally strongly coordinated at Municipal and Regional levels.

MUSA Hub&Spoke structure will exactly reflect the richness and complexity described above. MUSA aims at addressing several key issues identified by the Lombardy Region S3 strategy 2021-2027 featuring multiple convergences between all the defined 8 innovation ecosystems themes (Nutrition, Healt&Life Science, Connectivity and Information, Smart Mobility and Architecture, Sustainability, Social Development and Advanced Manufacturing, deals with digital transition, sustainable mobility, health, circular economy and the protection of the environment and biodiversity) with all the S3 Specialization Areas (Aerospace, Agrifood, Ecoindustry, Cultural and Creative Industries, Health Industry, Advanced Manufacturing, Sustainable Mobility). Musa is also aligned with the targets of HE Clusters 5, 2 and 4 (see Section A.3).

These are keystone elements to foster a reliable urban transition able to guarantee sustainable development and a higher quality of life. The pillars of this process are Responsible Research and Innovation (RRI) and Open Innovation. In line with the Lombardy Region S3, MUSA focusses primarily on Climate, Energy, Sustainable Mobility, Social Inclusion, Digitalization and Entrepreneurship with specific reference to the problems of resilient cities and communities, which face complex and urgent challenges such as environmental deterioration and natural resource scarcity (e.g. water, energy), outdated infrastructures, traffic congestion, non-scalable healthcare and education systems, social issues. These challenges make Milan an ideal setting that has the potential to move from the status of smart and technological city to a sustainable and greener city, which meets the needs of increasingly aware citizens.

MUSA addresses these challenges by mobilizing resources of one of the major scientific research hubs at European level with the aim of favoring the digital and sustainable transformation of the urban environment and suggesting policy-makers evidence-based actions to deal with social and environmental risk factors, promoting a better quality of life of citizens. The transformation will be driven through a structured alliance among the largest four Milan universities, UNIMIB, UNIMI, POLIMI and UNIBOCCONI that will create environmental, economic and social value through living labs, pilot plants and demonstrators.

MUSA project can have a significant impact on the production industrial chains starting from the services (Third Sector) and on manufacturing activities starting from excellence sectors and aims at exerting a deep impact on Higher Education and specialization. Our vision of the innovation ecosystem encompasses the variety of activities rooted in this territory, along with their environmental and social implications. The complexity of the MMA leads to approach innovation from multiple perspectives: urban transformation towards greater environmental and social sustainability; promotion of social inclusion; design and adoption of more circular production processes in key various industries (including green, design, fashion, luxury and wellness); development of smarter renewable energy solutions, waste and land management systems, and new mobility models; development of digital platforms for biomedical data collection and use to improve citizens' health and wellbeing; incubation and acceleration of innovative ideas; development of new fintech solutions and learning tools to support the decision-making of financial users, improve their financial wellbeing and contribute to social impact.

A2. Elements connecting the Ecosystem specialization area with the scientific and economic vocations of the area / territory of reference

The coherence of the MUSA ecosystem with the S3 regional operational plans and the research and innovation priorities reside in six thematic areas representing the pillars (and the spokes) of the project:

1. **Urban regeneration (City of tomorrow)** dedicated to city redesign and the development of smarter renewable energy solutions, waste and land management systems, and new mobility models [Spoke 1];

2. **Big Data-Open Data in Life Sciences** will develop an innovative digital platform for fast and secure storage and exchange of big data in life sciences, translate basic research into applications aiming to improve nutritional, healing and environmental conditions of citizens, organize data collection and processing with AI techniques [Spoke 2];

3. **Deep Tech: Entrepreneurship & Technology Transfer** will enhance entrepreneurship through the transfer of research and technological innovation and the development of innovative services for local businesses, especially for SMEs. This will be achieved through the implementation of a process of transforming ideas into companies (open innovation), developing industrial research and realizing new joint labs with established firms that will train future industrial researchers and technology entrepreneurs [Spoke 3];

4. **Economic impact and sustainable finance** to develop new fintech solutions and learning tools to support the decision-making of financial users, improve their financial wellbeing and contribute to social impact. Our actions aim at driving the process of "democratization of finance" for the community at large, developing and spreading the culture of data-driven policy-making [Spoke 4];

5. **Sustainable Fashion, Luxury and Design** to drive key sectors of Milan economy towards an ecological and digital transition and contribute to the transformation of the production and distribution processes to reduce environmental impacts [Spoke5];

6. **Innovation for Sustainable and Inclusive Societies** aims at strengthening social inclusiveness by tackling inequalities, promoting public engagement, enforcing social sustainability and strengthening technological tools and innovation for individual and social wellbeing [Spoke 6].

The actions undertaken by the group of universities and their industrial affiliates:

- Propose a vision of the territory that aims at a higher quality of environmental and social life, putting the citizen at the centre, from a global health perspective, and where no one is left behind;

- Develop shared and accessible knowledge and technologies also based on KETs to support the decision-making of researchers, businesses, citizens and public institutions;

- Design innovative evidence-based actions and solutions and fill the gap between R&I and industries thanks to a solid ecosystem, shared and capable of reacting to social, environmental and economic needs and implementing initiatives with high social and economic impact that are sustainable beyond the three-year period and becomes a model for other contexts.

A3. Coherence and synergy of the research and innovation plan with the regional operational plans and the research & innovation priorities at regional or above-regional level (Smart Specialization Strategy)

The MUSA ecosystem directly addresses the European targets of "*making Europe the first digitally-enabled circular, climate-neutral and sustainable economy through the transformation of its mobility, energy, construction and production systems*" (HE strategic Plan). MUSA pursues this objective by promoting a fruitful environment to transfer innovative solutions to the industrial context, thus reducing the time for innovation, amplifying the effects of new processes and products and promoting a shared vision of sustainable development. MUSA interprets many of the topics of the "*Agenda 2030: Sustainable Development Goals*" and the need for action to tackle the worsening of living and sustainability conditions, with a particular focus on the environment, water and waste management cycle and climate mitigation. Through MUSA, the system of research and industry will further develop networks and will acquire KET also to face the goal of Cluster 5 HE (Climate, Energy, Mobility) starting from the demand of innovative strategies to achieve climate neutrality and zero pollution to promotion of resilient cities and communities. The MUSA ecosystem is also synergic with HE Cluster-2-culture, creativity and inclusive society and Cluster-4-digital, industry and space. The characteristics of the Milan Area require the integration of several priorities and sectors for the ecosystem to be impactful on the territory: Digital; Advanced manufacturing; Culture and creativity; Finance; Data for Health and Wellbeing; Social transformations. In line with the S3 Strategy, MUSA looks at the evolution of research and innovation in the MMA area from an Open Innovation perspective. It fosters the collaboration between

Universities and companies within and between the six Spokes Spokes to support the implementation of a systemic integrated model of Tech. Transfer. The project is placed primarily within the *"Sustainability"* ecosystem and is intended to generate significant contributions to the following Ecosystems: *"Health and Life Science"*, *"Culture and Knowledge"*, *"Social development"* and *"Advanced manufacturing"*. The main area of specialization addressed is *"Creative and cultural industries"*. Other relevant areas are *"Eco-industry"* and *"Health Industry"* (Figure 1). The Ecosystem reflects the strengths of the territory and aims at pursuing the identified opportunities to contrast the weaknesses and threats according to the *Regional Territorial Plan* of Lombardy region.

S3 Specialisation Areas	Nutrition	Health and Life Science	Culture and Knowledge	Connectivity and Information	Smart Mobility and Architecture	Sustainability	Social Development	Advanced Manufacturing
Aerospace			✓	✓				
Agrifood	✓	✓						
Ecoindustry						✓		✓
Cultural and Creative Industries			✓			✓	✓	
Health Industry		✓		✓		✓		
Advanced Manufacturing						✓		✓
Sustainable Mobility					✓			

Figure 1. Matrix representing the Lombardy Region S3 and contribution of MUSA.

Table A1. Synthesis of the SWOT analysis of the PTR (Lombardy Regional Territorial Plan) on Metropolitan system, 2021.

Strenghts	**Opportunities**
● Top-level universities and research centres ● Physical and digital infrastructures ● Strong attitude towards entrepreneurship ● Excellence in productive sectors (e.g. fashion and design; cultural industries) ● National financial center	● International leadership in innovation ● Research-driven innovations reducing environmental pressure ● Novel solutions for mobility ● Former industrial areas to be exploited ● Optimized use of resources/shared services ● Multifunctional networks for a Smart City
Weaknesses	**Threats**
● Pollution and traffic ● Obstacles to R&I for SMEs ● Limited understanding of emerging problems ● Low perceived quality of life ● Marginalised areas and social inequalities	● Biodiversity loss/environmental degradation ● Direct European competitors ● Development of new activities limited to selected areas

A4. Exploitation and systematisation of existing initiatives, avoiding duplications and overlaps

MUSA is part of a territorial and national innovation process that arises from a concrete ecological and digital transition need. This requires process and product innovation but above all a high transferability and diffusion of knowledge. MUSA intends to systematize the winning experiences of the four universities to fill the "last mile" in synergy with Industries and Public Institutions. It aims to continuously produce innovation through Joint and Fab Labs, programmes, products and processes, start-ups and spin-offs that will boost the growth of the ecosystem by scaling up the initiatives, strengthening the synergies between the actors representative of the *Quadruple Helix paradigm*. Universities and companies involved have in place several successful initiatives that will be capitalized, but none of these is at such a wide scope and ambition of transforming the Ecosystem in a Game Changer in terms of target impact, number and excellence of actors involved, scalability potential at national and international level. MUSA acts in synergy with the major EU funding programs and strategies and it is synergetic with the structural actions of the NRRP fostered by MITE and MUR ministry for the aspects of environmental, social and economic sustainability, by MISAL for initiatives related to the prevention of multifactorial diseases, territorial medicine and support of frailties and by MEF for initiatives to support SMEs, youth entrepreneurship, etc. Also it is in synergy with regional and national clusters (e.g. ALISEI-Life Sciences) and aligned with vertical initiatives of the Lombardy

Region Open Innovation Platform and Initiatives, the investment gateway for international competitiveness and with Joint initiatives between the regions and the Cariplo Foundation like *Virtuosi Territory Program.*

Lombardy Region and the MMA are facing significant challenges on various grounds, including environmental and social sustainability. The participants in the Ecosystem have substantial experience in various fields related to these problems (see Section B2). MUSA will capitalize on those experiences, integrating cross-disciplinary and cross-sectoral expertise. In this way, the Ecosystem will contribute to the systematization of the existing excellent academic and industrial capabilities of the territory. Some of the key experiences are described below, a full list being beyond the scope of this Section. For all existing and future experiences and activities, all Ecosystem partners, overseen by the Hub management (as detailed in Section C2) will in any case prevent duplication and overlaps and will guarantee avoidance of double funding. With specific reference to other actions of the NRRP Mission 4, Component 2, in which the MUSA partners may or may not be directly involved, the actions taken to avoid duplication are addressed in the relevant part of the proposal (Section D2).

The four universities involved in the MUSA project have undertaken various relevant initiatives in the areas in question. For reasons of space, we focus on only few of those initiatives that, while will definitely not overlap with the MUSA ecosystem, provide a robust background and experience on which the proposed interventions will leverage. Several initiatives are currently active on the themes of sustainability. Two examples are SDA Bocconi School of Management which includes research centers and labs such as "The eSG Lab: excellence in Sustainability and Governance for SMEs" that has the goal of designing a strategic-organizational model especially for Small-Medium Enterprises and the SUR Lab (Sustainable Urban Regeneration Lab) of Bocconi University. The School of Management of Polytechnic of Milan runs advanced tech-transfer programs for social impact-oriented enterprises, such as "Get-It-Twice" in cooperation with Cariplo Foundation. The University of Milano-Bicocca has promoted the first "Behavioral Insights Lab" in the Italian Academic System and the Observatory on Sustainable Finance in collaboration with AIFI and Banca Generali while in the context of urban regeneration it runs the already mentioned Vivaio Bicocca Initiative and BASE (Bicocca Environment Society Economy), an initiative that proposes, plans and implements the University's sustainability plan through management and structural actions, including educational and training activities. Two data science centers are active at the University of Milan-Statale: the CEEDS (Centre of Excellence in Economics and Data Science) and the DSRC (Data Science Research Center) integrates the competences and research activities in computer science and statistics at UniMi, promoting interdisciplinary research activities. All applicant universities contribute to various degrees to science and technology-based entrepreneurship. For example, "PoliHub" collects all the incubation and acceleration activities of the Polytechnic of Milan and is ranked among the world Top5 university incubators in the UBI global ranking. Bicocca can claim a solid experience in entrepreneurial training with the iBicocca and Bicocca University of Crowdfunding programs (BiUniCrowd) and technology transfer with the University for Innovation Foundation (U4I). Also Bocconi for Innovation (B4i) aims at promoting entrepreneurial culture, encouraging and supporting innovative startups, and developing innovation within targeted companies. The University of Milan-Statale promotes and manages Scouting programs (Seed4Innovation), awareness-raising programs for business culture (Student Innovation Lab) and it is one of the anchors of MIND - Milano Innovation District. In the field of fashion, luxury and design, another international excellence of the MMA, POLIMI has organized the "Sustainable Luxury Academy" while UNIMI has opened the MIC Research Center for Fashion Image and Consumer Culture", BOCCONI the LVMH Associate Professorship in Fashion and Luxury Management (UniBocconi), and UNIMI the MaRHE Center, a Luxury Resort dedicated to research and teaching.

Companies and big players involved in the Ecosystem MUSA have a strong commitment and track record in the field of **i)** sustainable and renewable energy production technologies and decarbonization transition (e.g., Eni., Edison. and A2A); **ii)** sustainable mobility and transports (Pirelli &C., Edison and Thales Alenia Space Italia); **iii)** ITC and Telecommunication advanced technologies that constitute the background to foster sustainability, digital and mobility, ITS - Intelligent Transport Systems transition (Almaviva – The Italian Innovation Company, TIM and Huawei Technologies Italia); **iv)** Advanced electronic components and new generation batteries to enable the automation of systems and processes (Infineon Technologies Italia and Camozzi Automation); **v)** Innovation and communication (Fondazione Politecnico di Milano, Officine Innovazione, Fondazione Bruno Kessler and RCS MediaGroup); **vi)** Pharma and life science (Novartis Farma, Bio4Dreams, AstraZeneca, Humanitas university and Bracco); **vii)** Fashion and Design (Lumson).

The 4 Universities already had in the past collaboration with those big companies on the territory mostly on bilateral basis but never at such large "*ecosystemic*" scale that MUSA will require to pursue its objectives as Part B in the appropriate sections of this proposal demonstrates. MUSA is the first experiment that will allow a multilateral collaboration never at such a large scale.

PART B –OBJECTIVES AND SCIENTIFIC QUALITY

B1. Activities, methodologies, and main features of the research and innovation program

Through the research activities conducted by the Spokes, the Multi-layered Urban Sustainable Action ('MUSA Ecosystem') aims to identify innovations capable of improving the environmental and economic sustainability of the urban environment while developing social inclusiveness.

Digital technologies will be the primary driver of innovation, both for collecting and processing data and information and for their systematization and integrated analysis. The identified innovations will be channeled to the target production chains both through the direct participation of some leading companies as Spoke affiliates and through the participation of other companies in the tenders that will be issued to support the transfer of innovation and the creation of start-ups.

Achieving and sustaining durable development outcomes depends on multiple and interconnected actors - universities, civil society, the private sector, and public institutions - to work together effectively. For this reason, the Ecosystem will consist of 6 Spokes, each aimed at a specific thematic area and in line with the specialization trajectories identified by the regional S3 strategy (see Part A). Each comprises universities and private companies (as described in Table 1), which will combine their expertise in different fields of applied research and innovation, public engagement, and training at several levels. The Ecosystem is intended to impact three dimensions of sustainability, as shown in Figure 2, through the involvement of social and digital dimensions, health and mobility through science, technology, humanities, and citizenship. The strong identity of each affiliated partner characterizes the project, sharing responsibilities among the partners and exploiting resources as well as strengths. Furthermore, well-consolidated networks already exist among the Spokes and affiliated entities. The existence of these networks is one of the main strengths of the Milanese territory and, therefore, the Ecosystem will leverage these to ensure the success of the initiative within the expected timeframe.
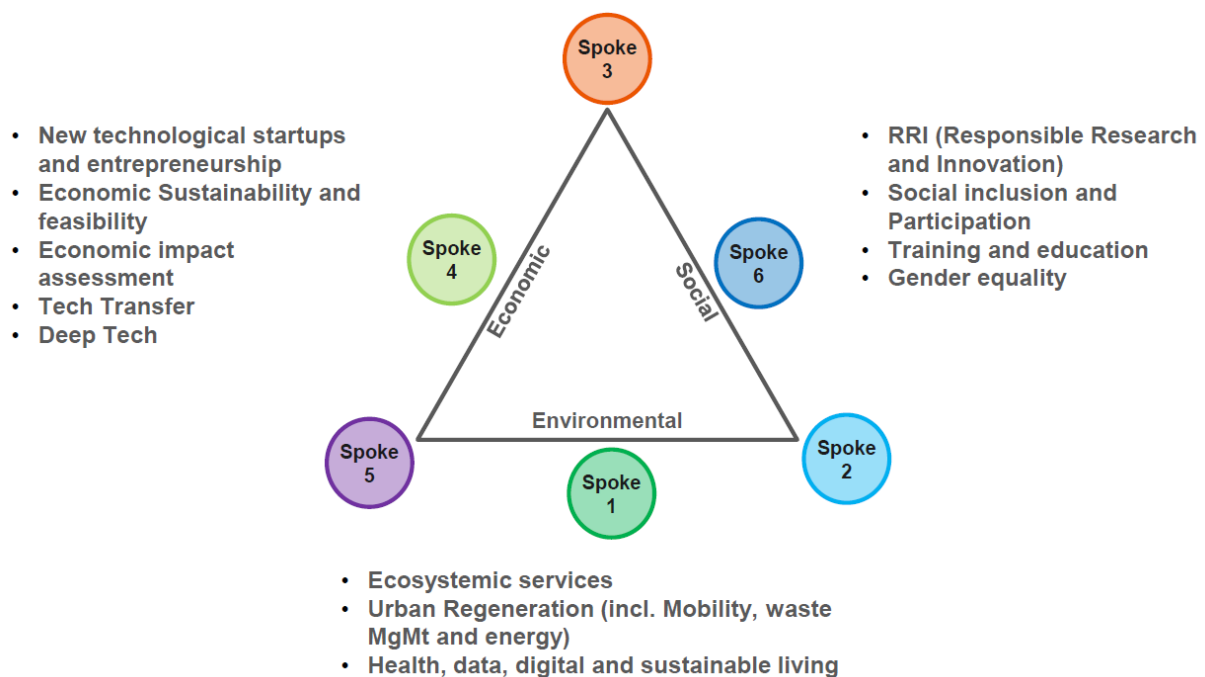
Figure 2. MUSA contributing to the three dimensions of Sustainability.

The allocation of tasks among the partners has been arranged on the basis of the specific skills and specialisations of each. The consistency and complementarity of activities carried out by the different Spokes, each led by one of the participant universities, will be guaranteed by the Hub's supervision (see Part C). Each University will be part of all spokes in order to ensure the coherence of the whole project.

Table B1: Overview of the Spokes and their composition

Spoke	Coordinator	Public Affiliates	Private Affiliates
1. Urban regeneration (City of tomorrow)	**UNIMIB**	POLIMI, UNIMI	UNIBOCCONI, ENI, EDISON, PIRELLI, THALES
2. Big Data-Open Data in Life Sciences	**UNIMI**	POLIMI, UNIMIB	UNIBOCCONI, ALMAVIVA, TIM, NOVARTIS, BIO4DREAMS, ASTRAZENECA, BRACCO
3. Deep Tech: Entrepreneurship & Technology Transfer	**POLIMI**	UNIMI, UNIMIB	UNIBOCCONI, FONDAZIONE POLIMI, OI, CAMOZZI, HUAWEI, INFINEON, A2A, HUMANITAS
4. Economic impact and sustainable finance	**UNIBOCCONI**	POLIMI, UNIMIB, UNIMI	FBK, RCS
5. Sustainable Fashion, Luxury and Design	**POLIMI**	UNIMI, UNIMIB	UNIBOCCONI, LUMSON
6. Innovation for Sustainable and Inclusive Societies	**UNIMIB**	POLIMI, UNIMI	UNIBOCCONI, EDISON, OI, THALES

In particular, Spoke 1 will drive urban regeneration through industrial innovation and sustainable wellbeing, absorbing/integrating data from Spoke 2 to formulate healthy and sustainable lifestyle models. Models of social participation from Spoke 6 will nourish the design of new neighborhoods (RRI approach). The connection with Spoke 3 is key to creating new start-up/spin-off companies that promote the processes and products dedicated to urban regeneration (e.g., new materials, new services, new forms of communications). The connections with Spoke 4 concern the development of financial instruments to provide the urban ecological transition and the enhancement of urban ecosystem services. Lastly, the connections with Spoke 5 involve the aspects of design and enhancement of urban culture as an engine for creativity for urban regeneration.

Spoke 2 will impact citizen wellbeing by transforming lifestyles, structured collections of big data in life science biomedical research in Lombardy, and the development of life science and the pharmaceutical industry. These actions will also be implemented through interaction with Spoke 1 for sustainable lifestyles, Spoke 6 for social inclusion, Spoke 3 and 5 for industrialization of developed solutions and findings, technological transfer, and economic sustainability.

Spoke 3 will contribute to the whole Ecosystem by bridging the gap between academic research and business and opening the ecosystem to external R&I initiatives to ensure impact. Moreover, it will operate in different thematic spheres, interconnected with other Spokes, for example: smart photonic technologies, batteries and energy storage systems, hydrogen, smart advanced materials, building materials and related supply chain - synergy with Spoke 1); technologies for sustainable finance (synergy with Spoke 4); technologies for "made in Italy" (synergies with Spoke 5).

Spoke 4 will provide the Ecosystem actors with the framework and the tools to integrate sustainable finance and economic impact analyses for the Twin Transition actions. Spoke 5 will contribute to the green transition as one of the excellences of the economic system of Milan.

Spoke 6 will facilitate the green and digital transition and will bring the R&I findings of the entire ecosystem to the population. Moreover, it will shape a resilient society ready to support the transformations

The interrelations among the Spokes are graphically represented in Figure 3.
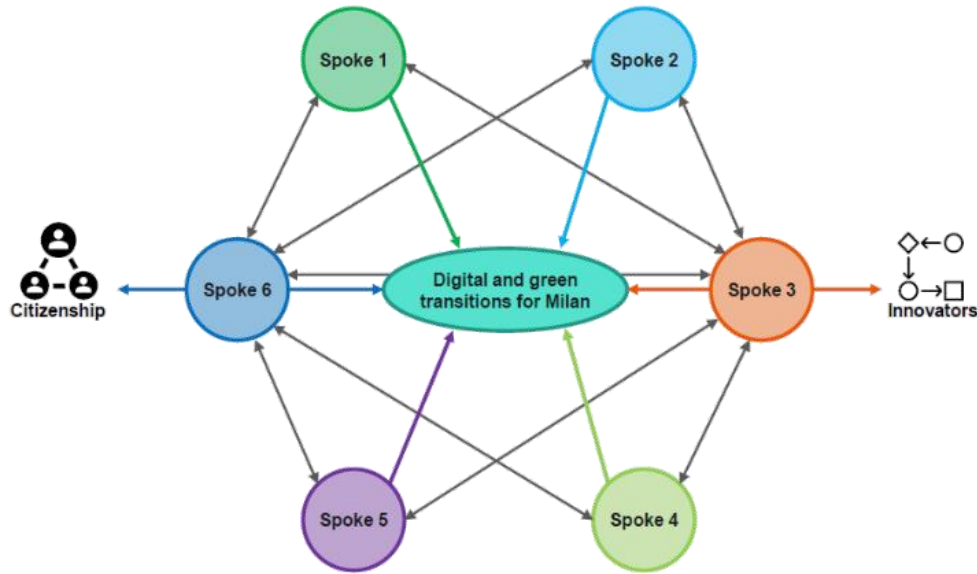
Figure 3. The interaction between the six Spokes of the Innovation Ecosystem.

The methodology that is followed to ensure the project implementation is based on:
  i.   identification, within each Spoke, of work packages describing objectives and key activities;
  ii. identification, within each work package, of tasks to be jointly performed by all the subjects involved in the Spoke.

In what follows, this structure is implemented for each Spoke. Specific qualitative and quantitative descriptors for the activities and their targets are provided in Section C2, in particular see Tables C3 through C13.

Spoke 1 - Urban Regeneration - Cities of Tomorrow

Table B2: Spoke 1, work packages subjects involved and associated tasks

WP	Tasks	Subjects involved
1. Natural, Biological and Human resources for Urban regeneration	1.1 Ecosystem service values	UNIMIB, UNIMI, POLIMI, UNIBOCCONI, EDISON
	1.2 Urban regeneration safety	
	1.3 Digital approach for urban regeneration	
	1.4 Phygital4P 'Public–Private–People partnership' (4P)	
2. Redesigning industrial urban production processes	2.1 Open platform for Recycling and Upcycling urban waste	UNIMIB, UNIBOCCONI, ENI, EDISON, THALES
	2.2 Microbial- and enzymatic-based upcycling of residual biomasses into virgin chemical platforms	
	2.3 TEA and LCA of case studies	
	2.4 Urban circular and regenerative economy	
3: Energy solutions for urban regeneration	3.1 Technical innovations for promoting zero–emission buildings and districts	UNIMIB, POLIMI, UNIBOCCONI, ENI, EDISON
	3.2 Contrasting and mitigating the effects of climate change on indoor and outdoor spaces	
	3.3 Driving urban energy transition	
4: Safe, smart, intermodal, and sustainable mobility	4.1 Analysis and design of sustainable, safe, and inclusive mobility	UNIMIB, UNIBOCCONI, PIRELLI, EDISON
	4.2 Evaluation and validation of innovative solutions and services for sustainable, safe, and inclusive mobility	

WP 1. Natural, Biological and Human resources for Urban regeneration

The goal of WP1 is the development of an integrative approach for urban regeneration planning, able to enhance human wellbeing and to improve urban sustainability (energy, climate, mobility, and logistics). We will develop a phygital (physical + digital) platform that combines the elements of land usage, urban infrastructures, natural resources, and cognitive behaviour to provide a multi-level vision of sustainable urban regeneration considering the needs and characteristics of contemporary urban society.

At the technical level, the platform is conceived as an ecosystem (inter-scalar and multi-disciplinary) enabling the collection of objective environmental data (e.g. derived from sensors, databases, monitoring and environmental sampling), subjective personal data in aggregated form (e.g. from mobile devices, wearables, questionnaires), economic information related to ecosystem services (e.g. impacts on physical and mental health, improvement in urban resilience, etc.), and economic instruments for modeling, simulation and evaluation (e.g. incentive schemes, end-user fees, Payment for Ecosystem Services, carbon pricing, etc.) to foster social sustainability of urban regeneration and public/private/people partnerships (4P). The system will be validated in different urban contexts represented by university campuses (i.e., Città Studi, Bicocca and MIND). Different representations of outcomes, targeted to lay-people and professionals, facilitate a multi-stakeholder interaction. Therefore, this platform acts as a Collaborative Decision Support System, that bridges the Actions and eases the collaborative shaping of sustainable urban regenerations policies and actions with an evidence-based approach to define and evaluate the interventions. WP1 connects to the other WPs as the platform can also integrate information related to urban waste re-use and re-cycle (WP2), energy (WP3), and mobility which are the central topics of the S3 measure selected for the MUSA project.

Task 1.1 Ecosystem services values: Digital and molecular technologies combined with environmental sensors will be used to assess and improve ecosystem support services (e.g., soil regeneration, water, and air purification), regulation (contrasting climate change and pests, improving pollination and seed dispersal), and cultural value (e.g., aesthetic appreciation, recreation improvement) in urban contexts. Data provided will be used to perform an economic valuation of the benefits generated by the ecosystem services at the urban scale, considering specifically the benefits generated by urban regeneration processes. Finally, the analysis and experimentation of economic instruments to improve sustainable impacts of urban regeneration projects will be carried out.

1.2 Urban regeneration safety: The Covid-19 pandemic uncovered the need to develop tools able to rapidly predict risks for human health as well as safe and resilient environments, taking into account indoor contaminants and pathogens (e.g., microbial pathogens in drinking water, air pollutants) as well as those outdoors (e.g., invasive arthropods and other animals, potential vectors or reservoir of diseases, highly allergenic pollens). Predictive models (microbial co-occurrence analysis and machine learning approaches) and remote sensing systems (based on ICT) will be used to i) predict equilibrium perturbation in order to adopt preventive measures and to ii) promote biotechnological exploitation to improve the quality and safety of the urban ecosystem. Data generated will be made available in dedicated repositories following all the applicable best practices for making data FAIR (Findable, Accessible, Interoperable and Reusable), allowing for the implementation of the Phygital Platform.

1.3 Digital approach for urban regeneration: Augmented Reality, Virtual Reality, and media discourse analysis enable the investigation of the psycho-social needs and the impact of urban regeneration processes. The outcomes include emotional and cognitive spatialization of subjective reactions in the target areas (university campuses). The analysis will involve different populations affected by the transformations in a multi-stakeholder approach, including students, professors, university staff, residents and companies located in the area. The analytical tools are integrated with stakeholder participatory processes and judicial tools that maximize their impact, such as collaborative agreements.

1.4 Phygital4P 'Public–Private–People partnership' (4P): Collaborative and Interdisciplinary Phygital Platform for Environmentally and Socially Sustainable Urban Regeneration: analysing, designing, assessing, monitoring, and valuing urban regenerations during all design phases. Through data, simulations, and scenarios and via a two-level (user-friendly and technical) communication layout, the collaborative platform acts as a design and sharing facility for all the actors involved in regeneration processes, from lay-people to professionals (public and private sectors). Data and outcomes from the other WP tasks will be integrated into the platform.

WP2: Redesigning industrial urban production processes

This WP will assess the applicability of the concept of biorefinery integrated in the territory to urban areas, which are hotspots of depauperating resources and generation of waste. Organic waste and residues, directly or indirectly generated by various industrial activities (among which, the food industry), are so-called second-generation biomass, as they are not in competition with the food chain. Their valorisation into novel materials, chemical platforms or

energies has the potential to fully embrace the principles of sustainability and the circular economy. In biorefineries, organic waste is the renewable biomass that can be leveraged into diverse platforms thanks to chemical, physical and/or biological technologies, to generate a wide range of final products. This objective will be developed in a Joint Lab where all the complementary expertise necessary for developing proofs of concept are present and where the potential solutions will be presented to external industrial or institutional stakeholders. This WP will also contribute to redesigning urban services in different sectors (e.g., energy, waste, water) with a circular integrated approach relying on digital solutions. Urban regeneration projects are in fact, opportunities to revise urban services, increasing their digitization, sustainability, and efficiency.

The aims are i) promoting the concept of industrial symbiosis, coupling the flux of side-stream materials with innovative (bio)processes and (bio)materials, prolonging the use of resources, minimizing environmental impacts; ii) generating techno-economic analyses and feasibility studies on the cases studies developed in the Joint Lab to trace resources, their availability over time, their up-cycling and valorization.; iii) increase the efficiency and sustainability of urban services by adopting a circular approach.

Task 2.1 Open platform for Recycling and Upcycling of urban waste: Quantitative and qualitative assessment of organic by-products, including regional/local and seasonal statistics and fluxes. The characterization activities to understand the waste composition (e.g., cellulose, pectin, lignin) and the presence of structures or chemicals that can be valorized. The most appropriate within a panel of diverse methodologies of biomass transformation into chemical platforms or specialty chemicals will be selected for each product, following the cascading principle. A newly instituted Joint Lab will provide the amounts of raw materials for extensive formulation testing to improve final properties as suggested by partners closer to market.

Task 2.2 Microbial- and enzymatic-based upcycling of residual biomasses into virgin chemical platforms: Microbial and enzymatic biodiversity can be exploited under controlled and industrially relevant conditions to transform hydrolysed residual biomasses into virgin chemical platforms or final products. Fermentations and bioconversions in bioreactors will be developed as case studies. As available knowledge and technologies ready to be tested under industrially relevant conditions (TRL 3) there are: microbial fermentation of crude glycerol (or other industrial residues like molasses, sugar beet pulp) into nutraceuticals (long chain omega 3 fatty acids, carotenoids) or into specialty chemicals (plasticisers) or into commodities (bioethanol, biodiesel, organic acids). Synthetic biotechnology and genome engineering for crossing the death valley of microbial-based processes. The laboratory already developed and applied for lab-scale industrially driven processes of production (TRL 3) the following materials and strategies: microbial strains genetically improved for robustness; enzymes selected and already optimised from extremophilic microorganisms; and molecular determinants having a key role in strain robustness and genetic stability.

Task 2.3 TEA and LCA of case studies: The quantitative and qualitative data deriving from the case studies developed in previous tasks will be used for TEA that will assess the feasibility and competitiveness of the proposed processes. These evaluations will be matched with the data deriving from Task 2.1 and completed by LCA to enable decisions regarding the appropriate and profitable location of the biorefinery(ies).

Task 2.4 Urban circular and regenerative economy: Development and analysis of integrated circular solutions at the nexus of different waste sources (e.g., urban biological waste, urban agricultural waste, industrial by-products, wastewater). Assessment of economies of scope and scale and overall benefits associated with integrated circular at the urban level. Development and experiment of innovative circular business models in the project living labs. Development of executive courses to promote sustainable urban regeneration projects, with a specific focus on circular approaches.

WP 3: Energy solutions for urban regeneration

The WP aims at fostering the development of carbon-neutral districts and Positive Energy Districts (PED) through technical innovations (new processes and products) as well as innovative economic schemes and instruments linked to energy efficiency and renewable energy production and management to respond to the needs of the XXI century: reduction of energy and materials throughput as well as land take, protection of communities from warming climates and exacerbation of extreme events.

The WP consists of three actions: i) the development of innovative technical solution for urban renewable energy generation and digital models for optimisation and scaling up of energy solutions; ii) the adaptation of high tech and low tech solutions to enhance the indoor and outdoor comfort (e.g., automated night ventilation, activation of thermal mass, flexibility services based on Model Predictive Controls) to the warming climatic conditions and the higher intensity of extreme events and finally iii) the development/optimisation and assessment of economic instruments (business models, multi-dimensional performance contracts, carbon pricing instruments) to drive sustainable urban regeneration processes as the core for the whole urban green transition.

<u>Task 3.1 Technical innovations for promoting zero–emission buildings and districts</u>: Study and development of processes and products for increasing the use of renewable energy in urban areas, including energy harvesting (photovoltaics) and storage (batteries), geothermal energy and Blue Green infrastructures. The activity will include a joint lab with Eni in order to develop technologies for electrochemical conversion of CO_2 to e-fuels.

<u>Task 3.2 Contrasting and mitigating the effects of climate change on indoor and outdoor spaces</u>: Develop new technological approaches adapted to the warming climatic conditions and the higher intensity of extreme events for increasing the indoor and outdoor comfort in urban spaces and buildings, developing, and testing high tech and low-tech solutions. Implementing pilot/frontline interventions for the adaptation of indoor and outdoor spaces (e.g., buildings, public open spaces, pedestrian alleys). Scaling up of innovative solutions, scaling out and dissemination in other contexts through reply and adaptation and scaling deep: cultural appropriation of the innovation through individual and collective behavioral and organizational change.

<u>Task 3.3 Driving urban energy transition</u>: Enhancing collaborative demand management and renewable energy production and their contribution to the national energy system through the design of innovative business models and economic schemes. Defining and testing innovative carbon pricing instruments for reducing GHG emission at local level by the development of an online simulation and trading platform. Creation of a spin-off to support public and private actors in designing and implementing of innovative and integrated solutions for sustainable urban regeneration.

WP 4: Safe, smart, intermodal, and sustainable mobility

Urban regeneration projects provide the opportunity to plan, develop and test new services and instruments to enhance an integrated sustainable mobility in neighbourhoods. This WP is aimed at developing and enhancing the sustainable, active, and micro mobility at the neighbourhood level through research, educational, technological, and infrastructural interventions, while providing new opportunities for economic development. In particular, the WP objectives are to develop innovative solutions for enhancing pedestrian and cycling friendliness and inclusiveness of the three campuses and to experiment, evaluate and develop innovative wayfinding and MaaS solutions, as well as innovative policy, economic and management measures, for supporting mobility-related behavioral change of young and older generations.

<u>Task 4.1 Analysis and design of sustainable, safe, and inclusive mobility</u>: This task will analyse the local mobility demand and transport supply through local surveys and the adoption of modeling and simulation methods concerning mobility flows, pedestrian dynamics, intersection between vehicles and pedestrians and road accidents. In addition, sensors developed and adapted on the purpose and integrated in the urban fabric and furniture will collect data on individual mobility behaviours and the use of transport infrastructures. On the basis of this analysis, new innovative demonstrators of solutions and services, such as a new MaaS and Wayfinding services, smart urban design, and lighting will be designed and evaluated through simulations, focus groups, and participatory methods aimed at engaging local stakeholders and end users.

<u>Task 4.2 Evaluation and validation of innovative solutions and services for sustainable, safe, and inclusive mobility</u>: This task will propose and validate innovative policy, economic, and management measures (e.g., mobility tradable credit schemes, rewarding schemes) to promote multimodality both on the demand and supply side by means of simulations, experiments, and gamification techniques. Measures will be experimented in connection with urban regeneration projects, also considering the availability of citizens living in new development areas or recently located companies.

Spoke 2 - Big Data-Open Data in Life Sciences

Table B3: Spoke 2, work packages subjects involved and associated tasks

WP	Tasks	Subjects involved
1. A holistic, innovative digital architecture for the storage and safe exchange of life sciences big data	1.1 A novel architecture for big data exchange	UNIMI, TIM
	1.2 Governance, management and regulating the access to services of data in silico	
2. Using Big Data for the development and sharing of new technologies in life sciences and medicine research	2.1 Innovative digital technologies for data collection in the field of life sciences, pre-clinical and clinical pharmacology, and diagnostics	UNIMI, POLIMI, TIM, ALMAVIVA.
	2.2 Artificial Intelligence methods for biomedical data analysis	
	2.3 Digital twins for complex systems	

	2.4 Digital and technology-driven strategies for the development of innovative and sustainable synthesis of active ingredients and crucial intermediates, including antivirals, according to the green chemistry and circular economy principles	
	2.5 Use of digital datasets for the production of artificial organs for surgical planning and training	
	2.6 Creation of virtual clinics for disease management	
3. Big data and innovative approaches to improve global health and wellbeing	3.1 Cardiovascular disease prevention	UNIMIB, POLIMI, UNIMI, ALMAVIVA, ASTRAZENECA, BRACCO, NOVARTIS
	3.2 Eye disease prevention	
	3.3 Sport medicine and population wellbeing	
	3.4 Development of human-mind inspired technological platforms for the study and improvement of workers' safety, personal skills, and wellbeing	
	3.5 Co-production of health: the role of citizens in the collection of Big data	
4. Development of technologies and customisable tools for continuous monitoring, wellbeing, and health	4.1 Use case definition	UNIMIB, POLIMI, ALMAVIVA, BRACCO, ASTRAZENECA, NOVARTIS, BIO4DREAMS
	4.2 Wearable technology to evaluate physiological responses, m-health and smart objects for the prevention of health risks	
	4.3 M-health technologies at the service of a pedagogical vision of learning	
	4.4 Data analysis, feature extraction, and classification for stratification, prediction, and prevention	
	4.5 Co-design of innovative solutions for the adoption of lifestyles aimed at wellbeing and prevention	
	4.6 Development of psychologically inspired technological platforms for the study and improvement of workers' safety and wellbeing	
5. Develop, implement, and sustain technological innovation in health	5.1 Business development and acceleration	UNIBOCCONI, TIM, ALMAVIVA, ASTRAZENECA, BRACCO, NOVARTIS, BIO4DREAMS
	5.2 Technology assessment	
	5.3 Support Innovation Implementation	
	5.4 Population Health Management and Prevention	
	5.5 Education programmes	
6. Economic impact of a structured collection of big data in life science	6.1 The impact on biomedical research in Lombardy	UNIMI, BRACCO, NOVARTIS, ASTRAZENECA
	6.2 The impact on the development of life science and pharmaceutical industry	
	6.3 The impact for the citizen health	

WP 1. A holistic, innovative digital architecture for the storage and safe exchange big data for life sciences

The goal of the WP is to conceive a novel digital infrastructure for the rapid exchange of data related to life sciences, medicine, and their inference by means of machine learning and artificial intelligence. The WP will be linked to WP2

Task 1.1 A novel architecture for big data exchange: a platform will be created for the management of the whole lifecycle of biomedical data and information coming from the monitoring of human behaviours, fully respecting all data protection regulations.

Task 1.2 Governance, management, and regulation of the access to services of data in silico: this task deals with the governance, management, and regulatory actions related to the access to the services for elaborating the biomedical data, creating a marketplace of services based on the emerging needs of the research community. Services include i) interfaces for the platforms built for data collection ii) key nodes for collecting and giving value to the data flows from sensors iii) centralised or decentralised models to use and give value to data to calculate relevant inferences for life science

WP 2. Using Big Data for the development and sharing of new technologies in life sciences and medicine research

The WP aims at enabling the transition towards an exchange system for biological data, creating the basis for a production system and personalised medicine benefitting from complex digital infrastructures, to build new approaches toward pre-clinic research in clinic, diagnosis, and training areas, as well as the development of sustainable processes for the production of chemical products, thanks to the development of cutting-edge

infrastructure for 3D printing and Virtual Reality. The WP also aims at providing a timely response to the demand for efficient, economically viable, safe, ready-to-patent, and applicable to large a manufacturing scale options of pharmaceutical products.

Task 2.1 Innovative digital technologies for data collection in the field of life sciences, pre-clinical, and clinical pharmacology, and diagnostics: development of a Hub infrastructure able to integrate data coming from different sources, including text communications, and transferring them to data storage solutions developed in WP1, with a coherent data ontology between data collection, data storage, and AI-powered data analysis systems.

Task 2.2 Artificial Intelligence methods for biomedical data analysis: design and experiment innovative combinations of methods from data science, machine learning, deep learning, and neurosymbolic processing to analyse data acquired from the platform envisaged in Task 2.1. The main goal of the data analysis will be supporting decision making including early diagnosis and personalised interventions.

Task 2.3 Digital twins for complex systems: develop methodological and technological approaches toward the definition of a personalised, digital twins to monitor citizen healthy status or to predict responses to therapeutic actions, changes in diet regimen, habits etc. The task will leverage on the availability of big-data infrastructures of WP2 and models of WP3 and will develop a flexible methodological framework where to integrate mechanistic models and AI-driven data analysis according to the Hybrid Digital Twin paradigm.

Task 2.4 Digital and technology-driven strategies for the development of innovative and sustainable synthesis of active ingredients and crucial intermediates, including antivirals, according to the green chemistry and circular economy principles: develop a strategy with innovative methodologies and technologies (flow chemistry, photocatalysis, organic electrochemical synthesis, continuous processes, alternative solvents) used for synthetised target molecules, identified together the involved companies, interested in transferring the new processes of synthetising key products.

Task 2.5 Use of digital datasets for the production of artificial organs for surgical planning and training: Use of digital datasets for the production of models – through 3D printing – corresponding to human organs for surgical planning, advanced training for trainees and lifelong learning of medical personnel. Technologies (based on 3D printing and virtual reality in e-health) will be integrated with telemedicine infrastructures to encourage the transition towards a personalised medicine system.

Task 2.6 Creation of virtual clinics for disease management: Research for the creation of virtual clinics where biometric parameters may be digitally collected through software specifically adapted to interface personal devices and personalised tools to enable the combined measurement and integration of cardiovascular, respiratory, and movement parameters. Additional research is aimed at the possibility to collect biological fluids (other than blood, such as saliva) to facilitate the collection of biochemical parameters that are informative of the state of health of the patient in order to create knowledge not only on the state of diseased people, but also on healthy citizens and on their response to specific environmental changes.

WP 3. Big data and innovative approaches to improve global health and wellbeing

The WP will build from three highly integrated ongoing projects that will be further consolidated and made sustainable in a single polycentric structure with a strategic mission, consisting of both research and services, to be delivered in cooperation with industrial partners. The objectives of this Work Package are: 1) to apply integrated and innovative strategies to implement prevention services at school, at work and remotely through digital technologies for collecting and interlinking data. To develop a screening and monitoring service based on a system for multi-source data integration and real-time analysis; 2) to develop a prevention culture among citizens, starting with the most fragile individuals, through promoting cutting-edge services, digital technologies, and healthy lifestyles in cooperation with industrial and local partners.

Task 3.1 Cardiovascular disease prevention: i) development of new strategies to evaluate and monitor traditional cardiovascular risk factors in an urban population through innovative person-centred digital methodologies; ii) investigation of the prevalence and impact of novel or under-studied cardiovascular risk factors (e.g.,, viral infections, air pollution, psychosocial condition, human microbiota, frailty) in an urban population in collaboration with local healthcare services; iii) application of novel personalised digital interventions to improve healthy behaviours and cardiovascular prevention, digital healthcare literacy, and overall quality of life and wellbeing. Innovative strategies for citizen involvement will be promoted with a special attention to vulnerable populations; iv) definition of new scores and algorithms for cardiovascular risk stratification through artificial intelligence algorithms; v) improvement of telemedicine services to connect citizens with healthcare professionals through the use of innovative technologies that will allow the monitoring of biological parameters directly at home; vi) building of a structured platform to store

biological (Biobank) and digital data (Data lake) in order to allow comprehensive data analysis – connection with WP1.

Task 3.2 Eye disease prevention: i) development of tele-optometry and tele-ophthalmology technologies aimed at carrying out visual exams and analyses for eye disease prevention in collaboration with industrial partners, including methods developed with approaches of artificial intelligence; ii) development of methods for prediction of cardiovascular risk factors from retinal fundus imaging via deep learning in collaboration with action 3.1; iii) opening of a tele-optometry and tele-ophthalmology university clinic where visual function analyses, correction of visual defects, prevention of eye diseases will be carried out with the remote supervision of optometrists and ophthalmologists through the use of the developed tele-optometry and tele-ophthalmology technologies; iv) visual analyses, correction of visual defects, prevention of eye diseases on children and adolescents in collaboration with action 3.3 and with schools with particular attention to: (a) the progression of myopia to carry out studies aimed at understanding what ocular, environmental, age, family, lifestyle factors, etc. have a role on the progression of myopia and, above all, on the effectiveness of the recent strategies proposed in this field to slow the progression, (b) "e-gamers", emerging population exposed to the risk of prolonged and intensive visual stress; v) visual analyses, correction of visual defects, prevention of eye diseases on economically disadvantaged subjects for whom ophthalmological assistance is not easily accessible in collaboration with local welfare agencies

Task 3.3 Sports medicine and population wellbeing: i) enhancing the role of Sports Medicine in primary health screening and support of physical activity in the general population, putting into evidence in particular its potential efficacy in the improvement of physical and psychosocial well-being and social inclusion of its fragile component; ii) generate databases on community health profile and develop new markers for risk stratification, using sport fitness certification activities as a mean for population recruitment/screening; iii) development and validation of new risk predictors in a suitable sample. In synergy with Cardiovascular prevention action; iv) evaluation of physical performance and exercise prescription in the target fragile population; v) research on neuromechanics and motion analysis and its application to the general and athlete populations; vi) monitoring of environmental risk factors playing role in population wellbeing.

Task 3.4 Development of human-mind inspired technological platforms for the study and improvement of workers' safety, personal skills, and wellbeing: The task aims to maximize the impact of interactive technologies and data collection on individual capabilities, behavioral change, organizational wellbeing, and work safety. Virtual/augmented reality interactive/immersive scenarios and wearables will be used together with up-to-date knowledge of human based principles for the improvement of people's wellbeing. This task will contribute to develop a platform for data collections of human variables capable of measuring (momentary assessment) stress related work issues, as well as develop and test prototype VR environments for the study of safety, behavioral change, and stress related issues in both real and mediated human to human interactions.

Task 3.5 Co-production of health: the role of citizens in the collection of Big data: the task is aimed at evaluating, within a selection of the case studies included in the WP 3: 1) the factors enhancing or hindering the adoption of the different technological tools proposed to citizens; 2) organizational features related to the management of the service (e.g. information flow, citizen and professional team training); 3) the interaction of these factors with the outcomes of co-production (e.g. health outcomes, patients activation, adherence and health literacy, perceived quality of care and satisfaction with the service, professional team engagement

WP 4. Development of technologies and customisable tools for continuous monitoring, wellbeing, and health

The goal of the WP is to enable citizens/patients to exploit the platform in terms of support for wellbeing and prevention and also for the adoption of healthy behavior and lifestyle. In addition, WP4 will provide tools which enable the citizen to contribute to enriching the platform with new data collected during specific activities and usual daily life. WP4 activities are connected to WP3 and WP2 and will develop the proper technologies for the different use cases and applications identified in WP3.

Task 4.1 Use case definition: In collaboration with WP3, in this task some exemplars use cases will be selected, in order to allow for the development of specific applications and personalised solutions. More specifically, the needs and the requirements will be identified in terms of sensors, functionalities, and usability.

Task 4.2 Wearable technology to evaluate physiological responses, m-health and smart objects for the prevention of health risks: Development of a Body Sensor Network Platform (SNP), i.e., a system for the continuous monitoring of physiological parameters using flexible and scalable wearable devices. The platform integrates state of the art sensors, inserted into clothing, or located above or under the skin. This task will also develop or integrate smart Internet of Things objects (e.g., a smart ink pen, or smart insoles) and m-health to monitor daily life gestures or behaviours and detect anomalies.

Task 4.3 M-health technologies at the service of a pedagogical vision of learning: Technological design in the form of serious games at the service of learning to support the whole process: 1) observation aimed at early screening learning delays, 2) training aimed at empowering specific delays, and 3) re-observation detecting persisting risks that should be alerted to the parents and clinicians. Multiple information engineering and bioinformatics methods for functional genomics and precision medicine will be applied.

Task 4.4 Data analysis, feature extraction, and classification for stratification, prediction, and prevention: Development of methodologies for data analysis and knowledge extraction, providing the specific tools for signal, image, and data processing. Integration and fusion of multi-source and multi-modal data collected from mobile and wearable devices will be implemented.

Task 4.5 Co-design of innovative solutions for the adoption of lifestyles aimed at wellbeing and prevention: The task will include: co-design of innovative solutions for the adoption of lifestyles for prevention and treatment, the creation of prototypes of digital and physical solutions for behavioural change, the implementation of tests based on neuro-scientific techniques, and the statistical interpretation of the data.

Task 4.6 Development of psychologically inspired technological platforms for the study and improvement of workers' safety and wellbeing: The task aims to maximise the impact of interactive technologies (AR/VR portable/wearables) and data collection on individual capabilities, work safety, and behavioural change. Virtual/augmented reality interactive/immersive scenarios and wearables will be used together with up-to-date knowledge of human based principles for the improvement of people's wellbeing.

WP 5. Develop, implement, and sustain technological innovation in health The WP has multiple objectives: i) Business development and acceleration, ii) Technology Assessment, iii) Support to innovation implementation, iv) Population Health Management and Prevention.

Task 5.1 Business development and acceleration: Mentoring start-up projects and business ideas and facilitating corporate connections. Pre-acceleration of selected early-stage ideas. Start-up acceleration and legal clinics.

Task 5.2 Technology assessment: Mapping current assessment frameworks for AI and ML-based technologies, analysing strengths and weaknesses of current assessment frameworks and developing new, ad-hoc assessment frameworks for AI and ML-based technologies.

Task 5.3 Support for Innovation Implementation: analyses of current providers' organisational models in order to establish the key factors that hinder full adoption and implementation of the new technologies in the delivery process, analysis of key enabling factors to fully exploit the potentials of the new technologies, development of key recommendations aimed at modifying current organisational processes and structures in compliance with the new technology requisites, and development of Key Performance Indicators (KPIs) aimed at measuring the impact of the new technological and organisational models on the efficiency and on the effectiveness of the delivery process and on patients' health outcomes and wellbeing.

Task 5.4 Population Health Management and Prevention: using big-data in order to stratify the population and to precisely identify their healthcare needs to keep them as healthy as possible, and modelling populations' healthcare needs in order to plan the quantity, quality and mix of healthcare services needed to respond to the needs in the most appropriate way.

Task 5.5 Education programmes: Starting from regulatory, policy and management issues, the improvement of populations' wellbeing can be successfully achieved only if appropriate competencies are developed at all levels and across all stakeholders through education programmes.

WP 6. Economic impact of a structured collection of big data in life science The objective of the WP is to conduct a socio-economic cost-benefit analysis of the research infrastructure for the storage and exchange of life sciences big data. The work will be organized in three tasks, concerning the impact on biomedical research in Lombardy, on the development of life science and pharmaceutical industry, and on citizen health.

Task 6.1 The impact on biomedical research in Lombardy: The use of cost-benefit analysis for the social evaluation of research infrastructures requires considering their specificities in terms of the benefits generated. These benefits can be linked to the direct and indirect benefits obtained by the users of the infrastructure services. At first, the economic-social evaluation of the platform will be carried out with respect to the territory of the Lombardy Region.

Task 6.2 The impact on the development of life science and pharmaceutical industry: The new approach of assessing socio-economic impact analysis will be extended to similar platforms developed at national level, as well as to projects developed at international level in the field of LS research and pharmaceutical industry.

Task 6.3 The impact for the citizen health: Finally, the benefits for the use of the new evaluation mode on the users of the infrastructure services will be measured. The aim of this task is to affirm the intrinsic value of knowledge as a public good, i.e. the social value attributed to scientific discoveries by the community.

Spoke 3 - Deep Tech: Entrepreneurship & Technology Transfer

Table B4: Spoke 3, work packages subjects involved and associated tasks

WP	Tasks	Subjects involved
1- Increase Qualified Deal Flow	1.1 Selection and development of the best ideas	POLIMI, UNIMI, UNIMIB, UNIBOCCONI, A2A, CAMOZZI, HUMANITAS
	1.2 Training courses	
2- Design and test Innovation: Proof of Concept, Pilot and Living Lab	2.1 Proof of Concept	POLIMI, UNIMI, UNIMIB, UNIBOCCONI, A2A, CAMOZZI, HUMANITAS
	2.2 Pilot and livings lab development	
3- Start-up Incubation and Acceleration	3.1 Study of venture building, incubation, and acceleration services	POLIMI, FONDAZIONE POLIMI, UNIMI, UNIMIB, UNIBOCCONI, OI
	3.2 Events and networking	
	3.3 Products e/o services test	
	3.4 Call4Ideas	
	3.5 Portal design	
4- Innovation4SMEs and Companies	4.1 Strategy for innovation	POLIMI, FONDAZIONE POLIMI, UNIMI, UNIMIB, UNIBOCCONI, HUAWEI, INFINEON
	4.2 Events and training	

WP 1- Increase Qualified Deal Flow

To develop valuable industrial research and to increase the qualified Deal Flow, through the support of applied research activities.

The objective is to identify and stimulate the best and most promising research able to generate an impact on the territory, to create new enterprises, coach these enterprises to reach market readiness, and help them to find potential investors, and to increase the competitiveness of national enterprises.

The sectors that will be considered refer to the specific interests of the national territory with a focus on Milan and Lombardy (S3), and in particular research in the following areas will be promoted.

The thematic sphere consists of: photonic technologies, batteries and energy storage systems, hydrogen, smart advanced materials, building materials and related supply chain (smart city, synergy with Urban Regeneration Spoke), technologies for environmental remediation (synergy with Urban Regeneration Spoke), aerospace (engines, materials, production processes, drones, communication systems, etc.), smart manufacturing (with 3D printing and advanced electronic devices and circuits), medical devices and smart sensors (synergy with Biomedicine Spoke), digital health (synergy with Biomedicine Spoke), life sciences, bioeconomy and enabling technologies (bioinformatics, systems biology, AI and machine learning), technologies for sustainable finance (synergy with Sustainable Finance Spoke) and fintech, technologies for sustainability (synergy Urban Regeneration Spoke), technologies for "Made in Italy" (synergy with Luxury, Fashion and Design Spoke).

Task 1.1 Selection and development of the best ideas (RI): Development of procedures for the selection and evaluation of innovative research and business ideas and creation of idea scouting events (for instance, idea contests or idea challenges), support for the development of the best research projects and business ideas through the growth of human capital, and the acquisition of new resources (RTD-a, PhD, research fellows).

Task 1.2 Training courses (FORM): Summer and winter schools, MOOCs etc. focusing on deep tech, technology transfer, and science-based entrepreneurship targeting early-stage researchers and training programmes on innovation and entrepreneurship targeting students (especially graduate and PhD). These activities will offer SMEs graduates and PhDs with a strong entrepreneurial orientation.

WP 2- Design and Test Innovation: Proof of Concept, Pilot and Living Lab

The European Union has identified innovation as a key driver for economic and social growth. At the same time, sustainability has increasingly become a global challenge. Sustainable development can only be a structural driver for innovation if it is pursued adopting a transdisciplinary approach (*Fourati-Jamoussi et al., 2019*). Furthermore, governments have invited universities to contribute to innovation and sustainable development by working with scholars, faculty staff and students, and with their stakeholders (*Purcell et al., 2019*). The citizens themselves can be key actors in a regional innovation ecosystem.

The aim of this WP is to study and test innovative ideas, selected within universities, in a multidisciplinary context and with all the actors involved.

We will select the most promising ideas from the deal-flow and to support them in the realisation phases. Depending on the goal we will use: Proofs of Concept, Pilots, and Living Labs. The work will be organized in two tasks, concerning the proof of concept (task 2.1), and the creation of pilot and livings lab development (task 2.2).

WP 3- Start-up Incubation and Acceleration

The goal of the WP is to: i) create an ecosystem to enhance successful ideas and encourage entrepreneurship ii) define strategies for selecting the most promising industrial research iii) support the teams that will win the call4ideas (assigned on a competitive basis) for the development of innovative start-ups, providing both the necessary skills and a technological environment that allows for a successful growth path iv) study of venture building activities for enterprises that want to generate spin-offs from IP or ideas for new products/businesses in the technological field v) creation, if not already present, of infrastructures to accommodate teams in the incubation and pre-acceleration processes, with qualified research staff vi) development of a platform and smart educational tools to support start-uppers and new, innovative, and fast-growing SMEs in the analysis of alternative finance ecosystems in Europe.

Task 3.1 Study of venture building, incubation, and acceleration services (RI): Researchers and start-ups need powerful support to scale their operations from promising ideas and proven minimum viable products (MPV) to high growth and market success in little time. They need effective services such as incubation, acceleration, and venture builder services. In this WP we will study the best strategies to support researchers and start-ups (per e.g., legal clinics, start-up Funding Labs, design of pre-acceleration activities, etc.)

Task 3.2 Events and networking: Organisation of contamination events and exchange of experiences in collaboration with foreign TTOs and incubators (e.g., UtrechtInc, Delft University of Technology, the Hague University of Applied Sciences, Chalmers Ventures, University of Toronto Entrepreneurship, Tel Aviv University)

Task 3.3 Products e/o services test (SP): Construction of lightweight infrastructures for researchers to test industrial research products and MVP

Task 3.4 Call4Ideas: Funding for start-ups participating in the Calls (cascade funding)

Task 3.5 Portal Design: Design a portal that will offer an open, resilient, friendly space of knowledge sharing, competencies, talents, and possibilities. The Portal will work on various dimensions of incubation and acceleration: (a) access to learning material (b) pitch and business game to test financial planning and feasibility, and the ability to attract investors (e.g., through crowdfunding) (c) access to mentorship by entrepreneurs, business angels etc. (e) matchmaking with partners and/or funds through the access to crowdfunding platforms and a virtual community of students, researchers, entrepreneurs, start-ups, and SMEs.

WP 4- Innovation4SMEs and Companies

To engage SMEs and companies and support their research exploitation process.

To optimize the Research, Development & Innovation environment for SMEs and companies, including through the establishment and facilitation of a range of support services, with the aim of strengthening the innovation capacity of SMEs and creating value on the market and/or into society, for smart, inclusive, and sustainable growth.

Task 4.1 Strategy for innovation (RI): Study of industrial research and technology transfer services for innovation (IP protection, TT). We will invest in our current TTO activities with the aim of improving the screening of technology transfer opportunities and the ability to interact with corporations and SMEs. To this end, the following actions will be undertaken: (a) performing a strategic review of research and innovation infrastructures (RII) to better understand the potential for TT, studying and developing new business models and market engagement strategies for IIRs (b) developing new Joint Labs with R&D-intensive industrial partners (c) evaluation of the impact of innovation: an analysis of the consequences of new companies and technologies at the level of the Lombardy territory will be conducted through indicators of personal wellbeing, environmental, social and ethical sustainability (the four universities could collaborate on this action).

Task 4.2 Events and training: organisation of events and development of joint training programmes in order to increase companies' innovation capacity.

Spoke 4 - Economic impact and sustainable finance

Table B5: Spoke 4, work packages subjects involved and associated tasks

WP	Tasks	Subjects involved
1. Best practice in finance 4 sustainability	1. Best practice in finance 4 sustainability	POLIMI
2. Financial education	2.1 Sustainable finance training lab	UNIBOCCONI, UNIMIB, UNIMI, POLIMI, FBK
	2.2 Behavioural economics and financial behavior	
	2.3 Edufin	
	2.4 Public finance education	
3. Impact analysis and sustainability measurement	3.1 Sustainability and Impact-weighted accounting measurement	UNIBOCCONI, UNIMI, POLIMI, FBK, RCS
	3.2 Data and algorithms for ESG and impact measurement	
	3.3 Impact analysis	
4. Fintech and tech4fin	4.1 Sustainable fintech and tech4fin	UNIBOCCONI, UNIMIB, POLIMI, RCS
	4.2 Digital nudging and financial well-being	
	4.3 Fintech & tech for finance	

WP 1. Best practice in finance 4 sustainability

The main goals of the WP are: promoting the awareness and the diffusion of knowledge related to impact investing and sustainable finance, fostering a new generation of social-tech start-ups and social enterprises that tackle social problems by means of technological innovation, supporting impact-driven organisations and enterprises for investment-readiness, matching needs of purpose-driven SMEs, social enterprises (SEs), and impact investors, prompting technology-driven impact scaling processes to the benefit of individuals, local communities, and industrial ecosystems. The implementation of WP1 will require software and hardware infrastructure for collecting and analysing social impact data.

Task 1.1 Impact finance 4 social tech: The task is designed to gain a better understanding of impact investing tools supporting and enabling scaling processes of impact-oriented enterprises i.e., organisations that intentionally pursue solutions to social problems alongside economic sustainability, including profit-for-purpose corporations, benefit corporations, social enterprises, and cooperatives.

WP 2. Financial education

The main goal of the WP is to build an infrastructure that can diffuse financial education to the community of stakeholders: citizens, savers/ investors, schools, workers, companies, in such a way that users can better understand the challenges and the opportunities associated with saving and investing. Sustainability will be the reference point for all tasks carried out in this WP.

Task 2.1 Sustainable finance training lab: the task aims at using innovative technology solutions to communicate the main concepts associated with sustainability and the practical behaviors that may help society at large to become more sustainable in simple, fun, and easy ways. Physical interaction will focus on the Milan area. The Lab will also develop online learning tools in order to make its contribution widely available at the country level, especially for schools.

Task 2.2 Behavioural economics and financial behaviour: the task aims at measuring the cognitive biases in the financial domain and empower people with debiasing tools to improve their financial decision making and welfare, promoting training courses to teach anomalies and shortfalls of financial behaviour to attempt to neutralise their effects. The target will be the financial decision makers.

Task 2.3 Edufin: the task is devoted to developing innovative educational and training activities to promote financial education for sustainability, impact, and social inclusion. The target of such activities will be students, citizens, small-scale and retail investors, employees of financial institutions, entrepreneurs, and civil servants, with a specific attention to any form of disadvantage.

Task 2.4 Public finance education: the task involves the foundation of a Centre for the Evaluation of the Economic Impact of Public and Private Investments aiming at pushing the frontier of impact evaluation techniques, by integrating approaches from applied social sciences and data science.

WP 3. Impact analysis and sustainability measurement

The main goal of the WP is to improve theories and methodologies (also through machine learning techniques for state-of-the-art cost benefit analyses) for capital allocation and turn them into tools that may be applied to individuals, firms, and financial institutions to measure their contribution to sustainability from a variety of dimensions. Particular attention will be devoted to SMEs, especially in the Milan area, and to sectors that are essential and, at the same time, need to improve their performance, e.g., luxury and real estate.

Task 3.1 Sustainability and impact-weighted accounting measurement: the task aims at translating best theories and methodologies into tools that may be applied to individuals, firms, and financial institutions to measure their contribution to sustainability from a variety of dimensions (carbon footprint, energy consumption, etc.) and their overall impact on society. Particular attention will be devoted to SMEs, especially in the Milan area, and to sectors that are essential and, at the same time need, to improve their performance, e.g., luxury and real estate.

Task 3.2 Data and algorithms for ESG and impact measurement: the task aims at improving the measurement methodologies and the scoring mechanism that regulate raising and allocation of financial resources to companies and projects that may contribute to sustainable development goals.

Task 3.3 Impact analysis: interactive data collection using flexible interfaces, adoption of novel scientific approaches and machine learning techniques for state-of-the-art cost benefit analyses with a special focus on impact evaluation for sustainable projects, also considering UN's Sustainable Development Goals. Diffusion of a culture for evidence-based decision making among public institutions and private firms operating in the Milan metropolitan area and beyond.

WP 4. Fintech & tech4fin

The main goal of the WP is to help the Milan financial Hub to gain centrality in the European context by supporting the application of new sustainable technologies to financial products, markets and the development of decentralised market infrastructures dedicated to the management of smart contracts. Particular attention will be devoted to the relationship between digital nudging and recommender systems in financial decision making.

Task 4.1 Sustainable fintech and tech4fin: this task aims at helping the Milan Hub to gain centrality in the European context by supporting the application of new sustainable technologies to financial products, markets and the development of decentralised market infrastructures dedicated to the management of smart contracts.

Task 4.2 Digital nudging and financial well-being: automated recommendations can be seen as digital nudges, because they determine different aspects of the choice architecture for users. There is a huge potential to develop future recommender systems that leverage the power of digital nudging in order to influence the decision-making of financial users and to improve their financial wellbeing. In this task Bicocca will examine the relationship between digital nudging and recommender systems in financial decision making.

Task 4.3 Fintech and tech for finance: the task investigates how technology may improve the social impact of financial instruments and its ability to scale impact for citizens and communities.

Spoke 5 - Sustainable Fashion, Luxury, and Design

Table B6: Spoke 5, work packages subjects involved and associated tasks

WP	Tasks	Subjects involved
1. Applied research on sustainable practices and innovative technologies	1.1 Maturity models to assess the level of adoption of sustainable practices	UNIMI, UNIMIB, UNIBOCCONI, POLIMI, LUMSON
	1.2 Research on existing materials and processes	
	1.3 Development of new materials and processes	
2: Achieving a Culture Driven Retail Model through innovative forms of collaboration,	2.1 Sustainable Luxury Smart Manufacturing and Retailing Platform (SL-SMRP)	UNIMI, UNIMIB, UNIBOCCONI, POLIMI, LUMSON
	2.2 Socially Inclusive Fashion and Luxury Start-up Incubator and Accelerator	
	2.3 Innovative and Sustainable Culture-Driven Retail and Service Models	

incubation, and acceleration		
3: Company Training and Cultural Dissemination	3.1 Company Training activities and tasks	UNIMI, UNIMIB, UNIBOCCONI, POLIMI,
	3.2 Cultural Dissemination activities and tasks	

WP 1. Applied research on sustainable practices and innovative technologies

This WP focuses on applied research, aimed at scouting new models, methods, and technologies for sustainable and inclusive business, and at analysing their contribution and potential impact in creative industries and in society at large. The objectives are: i) Helping companies in understanding their maturity level in terms of application of sustainable practices and innovative technologies, providing them with tools for self-assessment and definition of a roadmap. ii) Increasing awareness (both at single company and industry level) of existing and newly developed sustainable materials, production processes, and industrial paradigms, and fostering a better understanding of the role of digital technologies and their application in design processes (e.g., 3D prototyping) and construction/production (e.g., new production technologies). iii) Creating shared dedicated hybrid physical/digital spaces where companies can experiment new technologies and sustainable materials, with the aim of fostering the replacement of obsolete materials with sustainable eco-friendly products with improved performance, encouraging the adoption of cleaner production processes and advanced digital technologies, and supporting the transition towards more sustainable industrial paradigms.

Task 1.1 Maturity models to assess the level of adoption of sustainable practices:

Development of maturity models, to measure the current level of adoption of sustainable practices – both at company level and supply chain level – allowing companies to assess their current positioning and to define a roadmap.

Task 1.2 Research on existing materials and processes:

Execution of an extensive literature review and patent search, encompassing survey of industry adoption of best practices, with the aim of creating libraries or databases of sustainable materials, production processes, and industrial paradigms.

Task 1.3 Development of new materials and processes:

Supporting applied research - based on the outcomes of the previous task - through laboratories and infrastructures for prototyping and testing new materials or production processes by cross-disciplinary teams.

WP2: Achieving a Culture Driven Retail Model through innovative forms of collaboration, incubation, and acceleration

Objectives: i) proactively supporting fashion and luxury companies of the entire supply chain in the creation of new sustainable business models (circular models), facilitating collaboration with innovative actors (start-ups) and Italian companies (SMEs, in particular) excluded as a result of offshoring production processes, by means of an innovative physical and virtual platform (the "Sustainable Luxury Smart Manufacturing and Retailing Platform") ii) proactively supporting innovative fashion and luxury start-ups (with a focus on ventures started by women and young entrepreneurs) in all phases of their development, by means of mentoring, grants, and dedicated marketplaces iii) helping fashion and luxury firms develop innovative and sustainable retailing strategies and formats aimed at regenerating the urban landscape (cooperation with Spoke 1), enhancing cultural heritage (e.g., use of digitised historical archives), and harmonising different forms of physical/digital retailing and hospitality spaces.

Task 2.1 Sustainable Luxury Smart Manufacturing and Retailing Platform (SL-SMRP):

Creation of a "Sustainable Luxury Smart Manufacturing and Retailing Platform" by developing "Extended Enterprises" supported by digital tools, where large customers, suppliers, start-ups, SMEs, retailers, and technology partners can share ideas, solutions, competencies, and data for the development of new products through a sustainable value chain.

Task 2.2 Socially Inclusive Fashion and Luxury Startup Incubator and Accelerator:

Supporting incubation and acceleration of start-ups focused on sustainable and socially inclusive (in particular from young and female entrepreneurs) innovative business models in Fashion, Luxury, and Design.

Task 2.3 Innovative and Sustainable Culture-Driven Retail and Service Models:

Developing an incubator of innovative projects aimed at fostering new culture-driven distribution and retail models exploiting design and cultural heritage aimed at regenerating the urban landscape.

WP 3: Company Training and Cultural Dissemination

The objectives of the WP are: i) supporting companies in the process of training and placement of highly qualified sustainability experts and in assessing the cultural impact of products, also in terms of gender and social inclusion with dedicated analyses (cooperation with Spoke 5) ii) accelerating the transition of the consumer and society at large toward more sustainable consumer models in terms of use/recycle, limitation of waste, preference for short supply chains, use of RFID for traceability, focus on rental of personal luxury goods, and shared economy models, no "End of Life" of goods (with "certified" second-hand products, up cycling), custom products and consumer co-creation, active bottom-up role of the consumer in the various stages of the supply chain thanks to digital and hybrid environments iii) creating ad hoc courses for luxury resort staff who deal with environmental management, since many resorts base their economy on their strategic location from a naturalistic point of view and, at the moment, the skills of qualified personnel are still absent or fragmented. This lack has repercussions both on the environment and on the economy of the resorts.

Task 3.1 Company Training activities and tasks: Development of courses and programmes (targeting firms and professionals along the entire value chain), aimed at transferring skills required to create, diffuse, and maintain sustainable/circular business models, and at avoiding delays and failures due to socio-cultural motivations (including ethical and inclusion issues). Mapping and strengthening relationships among firms, certification bodies, and final customers through the development and diffusion of a practical guide and best practices to eco-sustainable labeling and the related requisite implementation skills, to avoid "green washing".

Task 3.2 Cultural Dissemination activities and tasks: Developing and executing creative formats for cultural diffusion, such as educational videogames, digital Apps, MOOCs, physical/digital expositions, and experiential labs where customers interact with professionals in watching, repairing, and making objects. These activities will be aimed at: (a) enhancing end-consumers' awareness, appreciation, and involvement in sustainability and the circular economy, gender parity, inclusion, and the preservation of heritage-related assets (b) showcasing manual work and revitalising the "pride of craftsmanship", in particular among younger generations, attracting them to educational initiatives to develop related skills and employability

Spoke 6 - Innovation for Sustainable and Inclusive Societies

Table B7: Spoke 6, work packages subjects involved and associated tasks

WP	Tasks	Subjects involved
1. Accelerating Participatory Processes Through Digital Technologies and Data Management	1.1 Cultural district	UNIMIB, POLIMI, UNIMI, UNIBOCCONI, OI, EDISON, THALES
	1.2 Citizen sciences activities	
	1.3 Metropolitan city of Milan higher education observatory (MCM-HEO)	
	1.4 Milan: city of rights and opportunities	
	1.5 Collaborative and inclusive emerging technologies	
	1.6 Organisational tools and approaches for achieving inclusion and social innovation	
2: Empowering Individuals, Communities, and Organisations	2.1 Actions to increase children and youth participation in civic engagement	UNIMIB, POLIMI, UNIMI, UNIBOCCONI, OI, EDISON
	2.2 Empowerment of persons with disabilities	
	2.3 Empowerment of foreign people	
	2.4 Gender equality	
	2.5 Activities to raise aspirations, foster opportunities and create a more inclusive work environment	
	2.6 Digital wellbeing	
	2.7 Language and non-discrimination	
3: Innovative Models against Social Inequalities	3.1 Supporting vulnerable individuals and groups	UNIMIB, POLIMI, UNIMI, UNIBOCCONI
	3.2 Cultural diversity	
	3.3 Territorial welfare	

WP 1. Accelerating Participatory Processes Through Digital Technologies and Data Management

Accelerating Participatory Processes Through Digital Technologies and data management aims at the permanent establishment of hubs, labs, cultural districts and observatories on the territory, focused on education, collaboration and public engagement. Through WP1 tasks, new digital experiences will be developed and offered to the whole citizenship of Milan for an immersive and socially engaging learning process and civic engagement on scientific and cultural project's results. Collaborative and inclusive technologies will be developed. Furthermore, an industrial PHD on inclusion topics will be implemented.

Task 1.1 Cultural district: Bicocca neighborhood as a space for participatory public engagement activities, a dissemination center for, and as a concrete example of, the results on sustainability in its various forms (environmental, social, economic), through actions, events, a Digital Documentation Centre on Sustainability practices and an annual main public engagement event, Festival GenerAzioni.

Task 1.2 Citizen sciences activities: relevant space technologies to open new observational windows inaccessible from ground are presented to citizens through real pieces of hardware developed by aerospace industries of the area, a telescope, and a digital platform in which citizens will be able to take part in participatory research projects, according to the principles of Responsible Research & Innovation (RRI).

Task 1.3 Metropolitan city of Milan higher education observatory: an observatory on the territory, focused on higher education and lifelong learning, monitoring and analyzing the scenario of higher education institutions in the Metropolitan City of Milan, and their interactions with relevant stakeholders.

Task 1.4 Milan: city of rights and opportunities: the task purposes to envision two major activities, that are the PhD Program on human rights and social inclusion and the Human Rights Hub. The P.hD Program will be centered on the education side, whereas the human rights HUB will hinge on the exchange of knowledge within the academic environment, but also especially on the establishment of long-standing links and cooperations with the University of Milan, the voluntary sectors and private companies on a territorially-based approach.

Task 1.5 Collaborative and inclusive emerging technologies: development of solutions that will exploit the available technologies, investigate the human factors affecting the use of collaborative and emerging technologies (comprising portable/wearable, VR/AR devices and AI based systems), in terms of acceptance, cognitive and sensory-motor capabilities, empowerment and inclusiveness, in order to obtain the maximum usability for persons who have access barriers, developing the culture of designing the user experience for all also in a context of gender equality. Creation of a "digital environment" to aggregate initiatives to empower collaboration in teams, and in learning and teaching dynamics.

Task 1.6 Organisational tools and approaches for achieving inclusion and social innovation: development of tools and solutions for different stakeholders in order to support organizations in improving their inclusion and social innovation capacities through the implementation of organizational changes aimed at generating enduring impacts.

WP2: Empowering Individuals, Communities, and Organisations

Empowering Individuals, Communities, and Organizations leverages on the existing opportunities to empower individuals, communities and organizations, by enhancing civic engagement (investing on the important role of the voluntary sector in Milan territory) and creating conditions for tackling discriminations (e.g. based on: gender, age, disability, sexual orientation, nationality, etc.) at work and in society by creating innovative ways to address emerging needs.

Task 2.1 Actions to increase children and youth participation in civic engagement: development of innovative practices for promoting active citizenship, involving children, adolescents and young people. It will be focused on activities of training and public engagement with high school students and university students, promoting as well training activities for teachers and professionals.

Task 2.2 Empowerment of persons with disabilities: The task will aim at analyzing and implementing strategies to foster the accomodation and the empowerment of the rights of persons with disabilities. The activities will be undertaken by interlacing the constitutional and supranational dimensions and they will tackle both the private and the public spheres.

Task 2.3 Empowerment of foreign people: As a key factor for promoting social inclusion, the task will develop a set of activities to boost foreign people's participation to the social, economic and public life of the national legal system, by way of a specific focus on the local level as an experimental ambit to test existing policies and to designing innovative ones

Task 2.4 Gender equality: development of actions for boosting gender balance in organizational bodies; supporting actions for STEM studies; improvement of actions for supporting women's empowerment in organizations and in politics)

Task 2.5 Activities to raise aspirations and fostering opportunities and creating a more inclusive work environment: development of an Hub (Raising Aspiration and fostering opportunities HUB) and activities for promoting more inclusive work environment)

Task 2.6 Digital wellbeing: development of training, products and services to increase digital skills and wellbeing in a permanent connectivity environment. Special attention will be put on building spaces for discussion between managers, workers, trade unionists and local actors on the relationship between smartworking and wellbeing. On the one hand, the Lab will offer free training and initiatives aimed at citizens. On the other hand, it will develop products and consultancy to be offered in the market.

Task 2.7 Language and non-discrimination: The task will unravel criticisms and challenges brought up by discriminatory languages, that result in violating the fundamental principle of equality. In addition it'll enhance language abilities as an inclusiveness key factor for L2 learners of Italian anch children with language disorders and develop Italian Sign Language inclusiveness actions.

WP 3: Innovative Models against Social Inequalities

Innovative Models against Social Inequalities tackles the existing obstacles to social inclusion, with a dedicated focus to the most vulnerable individuals and groups, developing innovative welfare services, supporting stakeholders and policy makers for the measurement of the social inclusion impact, identifying indexes of inclusion to suggest and develop technological strategies to reinforce the presence of unbalanced categories and groups.

Task 3.1 Supporting vulnerable individuals and groups: actions for reducing social gaps, implementation of strategies for preventing violence against women; implementation of legal clinics interventions (even connecting universities and prisons); development of strategies for strengthening local families network and supporting children in disadvantaged situations, by training professionals and services; activities for contrasting and preventing early school leaving in disadvantaged urban neighbourhoods.

Task 3.2 Cultural diversity: development of a Law and Pluralism Permanent Observatory, in order to promote initiatives for ethnic, religious and cultural pluralism; implementation of actions for promoting the inclusion of LGBT people in university and working life.

Task 3.3 Territorial welfare: promoting territorial interventions towards social inclusiveness and modelling them, the recognition and inclusion of marginal and precarious populations within local welfare services and policies; shaping local policies to improve work life balance; promoting the integrated access to social and health care services particularly for frail people or citizens.

B2. Previous experiences for each subject involved in the project & national and international collaborations

The activities that each subject will carry out as part of the Work Plan of each Spoke (see Part C) are supported by the competences acquired through the experiences over the last 10 years in national and international collaboration. For each university and each company involved in the Spokes, a brief description of the main thematic areas of expertise and a list of the key experiences and collaborations related to the technology transfer, digital transformation, higher education, applied research and innovation are presented below.

Università degli Studi di Milano-Bicocca (UNIMIB)

The Università degli Studi di Milano-Bicocca is a public university established in Milan in 1998, that, in few years, reached top positions in world-wide rankings concerning both research and teaching. With over 35,000 students and 1000 faculty staff, University of Milano-Bicocca is a modern, public, campus-district university, a culturally stimulating and sustainable environment where the professionals of tomorrow meet the most experienced researchers and engage with their peers from all over the world. The strong orientation to multi- and inter-disciplinary research places the University at the forefront of innovation and shapes the endeavors to fulfill the most urgent societal needs, including achieving a sustainable environmental development, social inclusion, gender equality, sustainability, human factors in technologically advanced device design and virtual/mediated environment interaction. From Law to Medicine, from Psychology to Physics, from Mathematics to Economics, Bicocca's standing in spreading new knowledge and ideas is highlighted by the astonishing achievements in research impact indicators: Bicocca ranks among the best universities in the world for citations to scientific publications, and at 55th place for the overall performance (Times Higher Education-Young University Ranking).

Table B8. Relevant experiences and collaborations for UNIMIB.

Spoke	Previous relevant experiences and collaborations
1. Urban regeneration (City of tomorrow)	PI in *SASS (Sistemi Agricoli e Sviluppo Sostenibile)* and *FOODNET (FOOD Social Senso Network)* Founder of *Graftonica*
2. Big Data-Open Data in Life Sciences	Coordinator of *Respiratory adaptations to high altitude, Factors in the response to hypobaric hypoxia* and *The CHARGE-APP trial* Sport Cardiology - IRCCS Centro Cardiologico Monzino, Milan Center of Sports Medicine AST PG XXIII-Bergamo
3. Deep Tech: Entrepreneurship & Technology Transfer	Beneficiary of *iDev4.0* and *Career4.0* Coordinator of *RItrainPlus* The University for Innovation (U4I) Foundation
4. Economic impact and sustainable finance	BIB-Behavioral Insights Bicocca *Financial Behavior*: Insurance behavior and literacy in Italy *Financial Education and Human Behaviour* Behavioral Insights and Sustainable Mobility (*SAMBA project*) Collaboration with Max Planck Institute of Human Behavior of Berlin on heuristics decision making in finance. Observatory on Sustainable finance, in collaboration with Banca Generali and AIFI Collaboration with Bank of Italy and Ivass on behavioral financial regulation.
5. Sustainable Fashion, Luxury and Design	PI in *NanoCosPha* Partner of *Joint Lab Intercos-Unimib* Founder of *Master in marine sciences for sustainable development* Marine Research and High Education Center (MaRHE Center), in collaboration with the Maldivian Ministry of Fisheries
6. Innovation for Sustainable and Inclusive Societies	Leader of *Developing and measuring digital literacy – Benessere Digitale – Scuole* Partner of *Giovani Connessi* Coordinator of *Inclusive Education and Social Support to Tackle Inequalities in Society*

Key top international collaborations: UNIMIB has been granted a total of 166 European projects, in collaboration with major research institutions worldwide. For 46 of them, UNIMIB acted or is currently acting as coordinator. This number involves, among others, projects within the H2020 programmes (102), COST Actions (1), Justice (8), EIT-KIC Raw Materials (27) and Erasmus+ programme (25). UNIMIB is an institutional partner of various Research Infrastructure belonging the the European Strategy Forum on Research Infrastructures (ESFRI), being part in and collaborating with a total of 8 ESFRI RIs (BBMRI-ERIC, Elixir, IBISBA, ISBE, MIRRI, EuroBioImaging-ERIC for the Health & Food ESFRI area; LifeWatch-ERIC for the Environment area; CESSDA-ERIC for the Social & Cultural Innovation area). The University also relies on several international agreements in various disciplines and a solid visiting professors programme. UNIMIB also created the Marine Research and High Education (MaRHE) Center in Magoodhoo (Maldives), in collaboration with the Maldivian Ministry of Fisheries, which aims at fostering development and sustainability.

Technology Transfer experience: UNIMIB since its foundation established a strong commitment to foster innovation. Technology Transfer has always had a role of paramount importance in UNIMIB strategy, as demonstrated by the numerous collaborations and projects with the industrial ecosystem on the territory. There are several examples of successful initiatives and results that have reinforced over time reciprocal esteem and recognition between UNIMIB and big industrial players. UNIMIB has 84 active patents in the areas of Materials&Manufacturing, Agrifood, Energy&Environment, ICT&Web, Life Science&Biotech (of a total of 146 registered patents since its foundation) and 17 operating Spin Off companies (participated and accredited).
The number of commissioned research contracts have been 168 in 2019, 132 in 2020 and 142 in 2021; these numbers testify the high interest of the industrial world in UNIMIB research and the appreciation of its high-level scientific services. Moreover, the number of contracts (DTA - Data Transfer Agreements and MDA - Material Transfer Agreements) signed by Bicocca Clinical Research Organization has risen from 47 in 2019 to 136 in 2021.
UNIMIB is also strongly committed with Civil Society. Sharing and communicating its scientific and technological knowledge is a pillar of BICOCCA mission. The involvement of citizens is reflected in the number of initiatives of RRI (Responsible Research and Innovation) and public engagement. UNIMIB participated or organized 265 public engagement initiatives in 2019, 125 in 2020 and 67 in 2021, despite the difficulties due to the pandemic that hit the World. Other initiatives to foster innovation also for the young researchers and students include BiUniCrowd,

Bicocca University of Crowdfunding, an alternative finance program, an opportunity for young researchers and graduates to carry out and implement their ideas through open innovation and it is also an opportunity for participation and visibility of quality for companies. Finally, U4I Foundation - University for Innovation was established in 2017 by the three universities of Bergamo, Milan-Bicocca and Pavia as a gateway to the market for the innovations developed by the three founding universities, following successful models at international level like Oxford University Innovation.

Università degli Studi di Milano (UNIMI)

The Università di Milano - also known as "la Statale" - was founded in 1924. It is the largest university in the city and in Lombardy in terms of size and number of students. It is divided into the faculties of humanities, medicine, social sciences, and natural sciences. It is well positioned in leading international ranking, both for the quality and the productivity of its research. As a public institution concerned with the development and progress of knowledge, the University has always been committed to research projects that influence the quality of life of citizens. Research at the University of Milan is mostly conducted in the departments and the many specialised structures, favouring the creation and growth of networks of collaboration locally, nationally, and internationally.

Table B9. Relevant experiences and collaborations for UNIMI.

Spoke	Previous relevant experiences and collaborations
1. Urban regeneration (City of tomorrow)	Partner of *T-FACTOR* PI in *Green age. Green space for active living. Older adults' perspectives* O.U. in *HybrInd: Global Changes, hybridization, and the tyranny of golden mean* Emerging pathogens and vectors Interuniversity Research Center on Malaria and vectors of malaria
2. Big Data-Open Data in Life Sciences	PI in *Toreador* Partner of *Smart Bear* and *Regional HUB Rare Earth recycling – REEMIX* Academic partnership agreement on research and training Agreement for joint laboratory on Artificial Intelligence
3. Deep Tech: Entrepreneurship & Technology Transfer	Coordinator of *Integrated platform for three-dimensional medical technologies -PRINTMED-3D* and *Smart valves based on active soft materials – ASSIST* MIND - Milano Innovation District
4. Economic impact and sustainable finance	Centre of Excellence in Economics and Data Science (CEEDS) and the Data Science Research Centre (DSRC). Collaborations with public and private institutions, include CERN, Banca d'Italia, ISTAT, INPS, World Bank, European Commission.
5. Sustainable Fashion, Luxury and Design	MIC Research Center for Fashion Image and Consumer Culture Partner of *VAST (Values across Space and Time), Aesthetics Unlimited",PROMETHEUS (Promotion Education of Scientific and Technological Societal Issue Through Sublime)*
6. Innovation for Sustainable and Inclusive Societies	Coordinator of *Migrants: reception policies, representation and representation, The European Fundamental Rights and Women's Rights (EFRiWoR) Jean Monnet Chair* and *Social inclusion and disability: pathways to Health Budget experimentation* UNIRES (The Italian Center for Research on University and Higher Education System) GREVIO ("Group of Experts on Action against Violence against Women and Domestic Violence", Council of Europe)

Key top international collaborations: The University of Milan qualifies as one of the Italian universities most committed to basic and applied research. The University's researchers play a leading role in several national and international research programs demonstrated by the 450 scientific and educational collaboration agreements in the international arena. This map clearly shows the several national and international collaborations agreements stipulated between the University of Milan and other universities and stakeholders: https://www.unimi.it/it/internazionale/la-statale-nel-mondo/accordi-internazionali. The University of Milan is the only Italian university member of the League of European Research Universities (LERU), association of leading European research-intensive universities whose main aims are lobbying, advocacy and dissemination at the European level. Furthermore, the University of Milan has partnerships with many public and private institutions, both at national and international level. UNIMI is part of the 4EU+ Alliance Consortium, an alliance with the

Universities of Paris Sorbonne, Heidelberg, Warsaw, Prague and Copenhagen, aimed at building a European model for teaching, research and governance and of U7+ Alliance, which is an international alliance among universities across the globe. UNIMI is also part of Elixir, which coordinates and develops life sciences resources across Europe to allow researchers easily find, analyse and share data, exchange expertise, and implement best practices.

Technology Transfer experience: The University of Milan has a long-standing tradition in the field of Innovation management. In 2020, it advanced its technology transfer functions with the establishment of the Deployment of Intellectual Property and Innovation Division (DIVCO) to empower the management of third mission. The University of Milan is the owner of 310 patent families, and in the last 10 years has filed 125 patents; more than 40% in the field of pharmacology and medical sciences (e.g. new drugs, medical devices, system for drug delivery) and 19% includes at least one granted patent. Worth mentioning not only is the high number of granted patents, but also that many were licensed or assigned to biotech and pharma companies. The University of Milan has a strong relationship with the pharma industry and in the last 10 years more than 20 patents resulting from sponsored research were filed and 2/3 of them were related to new drugs, new composition or new method and processes for drug production. Over time, the University of Milan was also capable to transfer and exploit its patents and intellectual property by means of Spin-off creation. More than 46 Spin-off were created since 2003, 17 in the last 10 years, of which 15 still operating on the market.

Politecnico di Milano (POLIMI)

Politecnico di Milano is a scientific-technological university that trains engineers, architects, and industrial designers. Founded in 1863, the Politecnico is one of the most important universities in the world, ranked in the QS World University Ranking 2022 (June 2021) as first in Italy and 142nd in the world. The University has always focused on developing a fruitful relationship with business and productive world by means of experimental research and technological transfer. The alliance with the industrial world allows the university to follow the vocation of the territories in which it operates and to be a stimulus for their development.

Table B10. Relevant experiences and collaborations for POLIMI.

Spoke	Previous relevant experiences and collaborations
1. Urban regeneration (City of tomorrow)	Proponent of *Method for calculating one or more isovists in a physical or XR environment* Member in *AR4CUP (Augmented Reality for Collaborative Urban Planning)* and *Luminous Planning Table*
2. Big Data-Open Data in Life Sciences	Beneficiary of *LiNK* and *SIDERA^b* Coordinator of *ESSENCE* Biomedical engineering, medicine, physiology and biology, and in particular on biomedical signal and image processing; multimodal data integration, neuroscience, big-data and computer sciences, biomaterials, nanotechnologies (MIT-Harvard Medical School, Boston, USA) Motor diagnosis and rehabilitation, in the area of neuroscience and of aging; (Don Carlo Gnocchi Foundation)
3. Deep Tech: Entrepreneurship & Technology Transfer	Participation in *Venture Funds* Promoter of the initiative *Dissemination of IP culture (Theorem and IP Experience project)*
4. Economic impact and sustainable finance	Partner of *Open Social Innovation for a Next Generation of Public Governance* Coordinator of *EduFin@Polimi+UniFI* and *Will* Tiresia (competence centre in the field of social impact finance and social entrepreneurship) Supply Chain Finance Observatory in collaboration with the financial providers, technological providers, information providers, user companies, trade associations
5. Sustainable Fashion, Luxury and Design	Founder of *Sustainable Luxury Academy* Leader of *PSYMBIOSYS (Product-Service sYMBIOtic SYStems)* Partner of *DIH4CPS - Fostering DIHs for Embedding Interoperability in Cyber-Physical Systems of European SMEs* Collaboration with primary company- master in luxury
6. Innovation for Sustainable and Inclusive Societies	Participation in the project *Autonomy for Autism through virtual reality, augmented reality, and conversational agents* of *5A-*

	MOVECARE (Multiple-Actors Virtual Empathic Caregiver For The Elder) *Ragazze Possono 1 e 2 (*to strengthen, motivate and support girls already enrolled in STEM degrees)

Key top international collaborations: Many international cooperations have been established with European and international universities in order to become capillary even out of national borders in the field of research and innovation, e.g: IDEALeage (ETH-Zurich, TU-Delft, RWTH Aachen, Chalmers University); ALLIANCE4TECH (CentraleSupélec in Paris, Technische Universität Berlin and University College London) and ENHACE (Chalmers University of Technology, Norwegian University of Science and Technology, RWTH Aachen, TU-Berlin, Universitat Politècnica de València and Technical University of Warsaw).

Politecnico di Milano annually attracts about € 140 million through research contracts and external funding. These self-financing activities account for a large part of its total budget. The University is the 1st in Italy and 11th in Europe for projects funded by the European Commission, which proves its ability to plan and attract funding. With the Horizon 2020 Framework Programme (2014-2020), funds were granted to 434 projects for a total of over 187 million euros. So far, 15 projects worth more than €7 million have been funded under the 2021-2027 Horizon Europe Programme. 43 ERC grants have been obtained by Politecnico di Milano, 39 as Host Institution and 4 as Partner. Politecnico is also a key player in the field of mobility addressing key societal trends such as GreenHouse Gas (GHG) emission reduction, road congestion and new technologies in the transport sector.

Moreover, Politecnico di Milano is part of 5 EIT KICs: climate, digital, urban mobility, raw materials and manufacturing. Creation of relationships of excellence in order to become capillary even at an international level in the field of research and innovation (IDEALeage; ALLIANCE4TECH and ENHACE).

Technology Transfer experience: Politecnico di Milano is particularly active in technological Transfer actions not only through its TTO work, but as well through initiatives such as the START-UP SUPPORT PROGRAMS "Cross the bridge" - a competition organized in cooperation with Chamber of Commerce of Milan Monza Brianza Lodi. The objective of the competition is to address those young companies that, despite having achieved a good company size, need support to overcome the phase between start-up and consolidation on the market, which can sometimes be critical. In particular, the competition is aimed at start-ups operating in the following business categories: Circular Economy, Green Energy Mobility, Transportation & Logistics, Life Science & Medtech, Tourism & Culture, Finance and Insurance and Omnichannel retailing. As part of "Cross the bridge", Politecnico di Milano supports the winning companies in the implementation of a development path, with particular reference to the implementation of a technological upgrade plan and the increase in the level of technological maturity (Technology Readiness Level).

Poli360 VENTURE FUNDS: launched in 2018, as Italian Venture Capital fund dedicated to universities. Poli360 is worth around € 50 million and is focused on the deal flow of the Politecnico di Milano and managed by 360 Capital Partners (a leading European Venture Capital company).

Teggwings IA BV VENTURE FUNDS: Established in march 2019, with the Technical University TU Delft, the Rheinisch-Westfälische Technische Hochschule in Aachen and ETH Zurich. Teggwings is dedicated to fundraising for the establishment of a European Venture Capital fund. It aims to integrate the innovation ecosystem of the associated universities by sharing the selection commissions of high-impact innovative projects and start-ups.

Università Commerciale Luigi Bocconi (UNIBOCCONI)

Università Commerciale Luigi Bocconi, founded in 1902, is a leading European research centre and university with a strong international orientation focused on economics, management, law, and the social sciences at large. The Università Commerciale Luigi Bocconi is an international research and training center on issues associated with Sustainability and ESG, with interest on the subject going back to the 1990s. The University promotes both economic advancement and civic values, contributing to the innovation and development of European business and society.

Table B11. Relevant experiences and collaborations for UNIBOCCONI.

Spoke	Previous relevant experiences and collaborations
1. Urban regeneration (City of tomorrow)	Partner of: Expanding PadovaFIT! HERON, COOPENERGY, URBAN GreenUP, MatchUP Funder of the Sustainable Urban Regeneration Lab (SUR). SUR Lab Bocconi is partner of the New European Bauhaus initiative
2. Big Data-Open Data in Life Sciences	Leader of *COMED* Partner of *Geronte - Transforming Patient Care* and *Big Data for Better Outcomes, Policy Innovation* and *Healthcare System Transformation*

		Bocconi's B4i/ICE have several MOU with technical-scientific partners, such as: Istituto Italiano di Tecnologia, Politecnico, Statale, Bicocca, Kilometro Rosso CERGAS SDA Bocconi leads the Italian Association of Health Economics (AIES)
3.	Deep Tech: Entrepreneurship & Technology Transfer	Partner of *POLISS* Coordinator of *GENERALI - Enterprize 2022* and *EVALIDEA - Designing Institutions to Evaluate Ideas* Initiatives targeted at disseminating entrepreneurial culture, such as the Bocconi Start-up Day (2016-2019), in collaboration with CITI, including a Start-up Training Camp and Award
4.	Economic impact and sustainable finance	Funder, in connection with SDA Bocconi School of Management of the Lab: *Real Estate Innovation Lab, Bocconi-Algorand Fintech Lab* and *Centro Baffi-Carefin*
5.	Sustainable Fashion, Luxury and Design	Partner of *RFID for MADE IN ITALY* and *SMALLBUTPERFECT* Coordinator of *Bocconi channel and retail lab* Funder of *DEVO Lab*
6.	Innovation for Sustainable and Inclusive Societies	Coordinator of *Tutoring Online Program: Mitigate the impact of Covid-19 on educational inequalities* and *OGEPO (Covid Gender Policies)* Partner of *CIVICA*

Key top international collaborations: Bocconi University was established in Milan in 1902 as a private, independent, non-profit university. Today it is considered the leading university in Business and Economics in Italy and worldwide and regularly appears in the most prominent rankings, which cover its areas of expertise in economics and management, and more generally the social sciences. Bocconi collaborates with 400 companies that are part of its Network and with which it develops collaborations especially through the SDA. Amongst the various initiatives, partnership programs, and strategic alliances with the business world two in particular stand out:

- The Partners for Development Program, which promotes constant dialogue and collaboration between businesses and the academic world
- The Corporate Associates Program, which involves close collaboration between the Career Service and firms, in order to work for the best possible professional placement of graduates.

Recently, Bocconi has also taken part in a number of university networks, including CIVICA, a new collaboration between European universities, founded as part of the European Universities project by the European Commission. Other international collaborations include: CEMS the Global Alliance in Management Education; U7+ Alliance of world universities; ALEUESS Alliance of Leading European Universities in Economic and Social Sciences; Themis Network in International and Business Law; APELIA The Asia-Pacific and Europe Law Institutes Alliance; PIM (Partnership in International Management); GULF (Global University Leaders Forum); GNAM (Global Network for Advanced Management)

Technology Transfer experience: In the field of technological innovation, Bocconi is building a digital infrastructure and skills to foster digital transformation and it does so with concrete programs that aim to support the entrepreneurial and economic development of the country and its public administration. Therefore, Bocconi continues to focus on start-ups and its B4i accelerator, Bocconi for Innovation.
In just two years, the university has selected 90 new companies, which have entered the acceleration and pre-acceleration programs. Bocconi has also activated ICE, the Innovation and Corporate entrepreneurship centre, which is at the service of companies that want to improve their innovation capacity and increase their entrepreneurial energy by leveraging all the potential of their human resources, as a catalyst for research, training, and business support. It aims to boost the entrepreneurial energy of corporates, while also supporting them managing the firm and the sources of uncertainty in the market to reduce the barriers to innovation. Thanks to strategic partnerships with the Italian Institute of Technology, Politecnico di Milano, Università Statale di Milano and Università di Milano-Bicocca, Bocconi is able to connect research, business and technology. Bocconi and the Italian Institute of Technology, for example, have signed a collaboration agreement for the development of initiatives and projects in the field of innovation and corporate entrepreneurship. Under the agreement, as a technological and strategic partner, the IIT will make its patent portfolio available and will allow access to its start-up projects, while, as a technology transfer partner, Bocconi will support the IIT in the development of strategies for the go-to-market phase of its patents and innovations; through initiatives, including mentoring, it will support start-ups and business ideas from the staff of the Institute and will allow IIT companies and staff access to a portfolio of training activities.

Building on the unique experience, know-how and legacy of the SDA business school, Bocconi's incubator B4I (Bocconi for Innovation) aims at promoting entrepreneurial culture, encouraging, and supporting innovative startups, and developing innovation within companies. B4I helps start-ups progress from prototype stage, through market validation, to a more advanced product-market fit.

A2A S.p.a. (Spoke 3)

A2A S.p.a. is a multi-utility operating in the environment, energy, heat, grids and technologies for smart cities sectors A2A S.p.a. A2A S.p.a. is committed to the study, research and development of new products and services with innovative technical solutions that can satisfy and anticipate the needs of customers, the technical safety of the service and the purchase of sustainable goods and services. Smart City: A2A develops projects for smart cities and beyond. Also for utilities and agritech, smart and sustainable agriculture that optimizes production processes and crop quality. A2A invests in technological innovation with its research center the Smart City Lab, based on the LoRaWAN® protocol used and tested worldwide. Our digital and technological solutions improve people's quality of life and environmental efficiency. Finally, we design and manage networks dedicated to security to best meet the needs of the customer. Distribution network: Our integrated and widespread management of electricity networks and gas networks supports the transformation of cities. Thanks to the technological evolution of smart grids, we guarantee increasingly safe, environmentally friendly, efficient and quality services. With smart meters, we offer citizens new ways consumption control. Energy production: We are able to meet all energy needs with flexibility and efficiency, thanks to the diversification of sources, the technologies used and the geographical distribution of our plants. Environment: A2A is at the forefront of environmental services, with technologically innovative plants. We design and build plants for proper disposal and energy recovery, transforming every waste into a resource. In the coming years a2a aims to strengthen our leadership also at European level and to integrate us into the material recycling chain. Heat and service: In Italy A2A is leader in the district heating sector, the most efficient and sustainable choice for the comfort of homes and offices. Urban hygiene: A2A manages all the essential services for hygiene and decorum of the cities of Milan, Brescia and several municipalities of Northern Italy. We adopt an integrated waste management system that allows 100% of waste to be recycled or destined for energy production.

- Previous relevant experiences: Project focused on the use of digitization (*drones*) by improving the quality of control and a simplified data archiving process; *Noisy Leaks project*, involving the experimental use of technology (using acoustic leak detectors) to locate water leaks
- Previous relevant collaborations: Collaborations with universities and research centers (among which, Università degli Studi di Milano, Univesrsità degli Studi di Brescia, Università Cattolica del Sacro Cuore e Università degli Studi di Brescia, Consiglio Nazionale delle Ricerche) to ensure operational excellence in all areas

Table B12. Relevant experiences and collaborations for A2A in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
3. Deep Tech: Entrepreneurship & Technology Transfer	- A2A is a founding member of the *National Centre for Sustainable Mobility* and founding member of the *Hydrogen Joint Research Platform* (both initiatives in collaboration with the Polytechnic of Milan, other universities and private entities) - Previous relevant collaborations with universities and research centers (among which, Università degli Studi di Milano, Università Cattolica del Sacro Cuore e Università degli Studi di Brescia, Consiglio Nazionale delle Ricerche) to ensure operational excellence in all areas - Together with start-ups, other businesses and research centres, creation and launching of a platform dedicated to the gathering of ideas. In order to get innovation projects under way quickly and help meet the needs of start-ups and SMEs, A2A has created a "Start-up Kit" which enables the launch of a project in just one week. - (Selection of) enabling technologies included in the innovation projects: wearable robotics for waste collection and management operatives; drones used for the inspection of our hydro-electric and thermo-electric facilities; artificial intelligence for the sorting of waste material, carbon capture utilization and waste to chemicals.

Almaviva – The Italian Innovation Company SpA (Spoke 2)

With 45,000 employees – 10,000 in Italy and 35,000 abroad – Almaviva – The Italian Innovation Company SpA is the 5th largest private Italian group in terms of employees worldwide, with total sales amounting to 891 million Euro in 2020. Almaviva – The Italian Innovation Company SpA supports the country's growth processes and takes up the challenge that companies must face to remain competitive in the absolute digital era, by innovating its own business model, organisation, company culture and ICT system. The goal is to tackle new challenges using a business model with innovation quality at its core.

- Previous relevant experiences: *MOP - Mobility Operation Platform, The educating city (La città educante), ITS Italy 2020*
- Previous relevant collaborations: *Sapienza University of Rome - Dipartimento di Ingegneria Civile Edile e Ambientale (DICEA), CTL – Centro di Ricerca per la Logistica e i Trasporti, The Center for Research and Technology – Hellas (Greece)*

Table B13. Relevant experiences and collaborations for ALMAVIVA in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
2. Big Data-Open Data in Life Sciences	- *MOP (Mobility Operation Platform):* ICT platform for commercial purposes, capable of integrated transport service planning (for passengers and goods), execution management and monitoring, service quality analysis and reporting. (Financing body: MISE Italian Minister) - *The educating city (La città educante)*: application of advanced information technologies of the learning environment for continuous training over time (life-long learning) and in space (school, outdoor environments, free time). (Financing body: MUR Italian Minister) - *ITS Italy 2020:* ICT based innovative solutions for surface freight transport and intermodal logistics, with a particular focus on multimodal transport of goods. (Financing body: MUR Italian Minister) - *SCENE (Smart City on the Edge Network Enhancements)*: open and mobile platform for applications for smart cities, through IOT wireless networks, with a high level of infrastructural cybersecurity. Through the public transport network, the municipalities will be able to have network coverage without infrastructure investments. (Beneficiary; EU Grant Nr 831138) - *FORENSOR*: innovative system for security, video surveillance and collection of evidence with forensic validity, to support the fight against crime, based on an innovative ultra-low power visual sensor. (Beneficiary; EU Grant Nr 653355) - *ADVICE*: a unification framework for surveillance-footage archive systems, in an effort to deal with the increasingly critical need to provide automated and smart surveillance solutions. (Beneficiary; EU Grant Nr: 285024)

AstraZeneca S.p.A. (Spoke 2)

Driven by innovative science and their entrepreneurial culture, they are focused on the delivery of life-changing medicines that are fueling growth and contributing value to patients and society. They are focused on innovative science and leadership in their three main therapy areas: oncology, cardiovascular, renal and metabolism and respiratory diseases. All this is reflected in their three strategic priorities: accelerate innovative science, deliver growth and therapy area leadership, and be a great place to work. In Italy, AstraZeneca is positioned among the leading companies for its contribution to the advancement of scientific knowledge, also thanks to the consolidation of a wide network of collaborations with the scientific community, institutions and the industrial chain of the country, developing drugs, therapeutic solutions and services, with a specific attention to the innovation and the digital transition. Since 2020 AstraZeneca Italia started a three-year collaboration with Lifegate, environmental sustainability consultancy company, to offset its CO2 emissions by protecting green areas and planting new trees, acting on the Ticino Park, a part of the tropical forest in Madagascar. Thanks to AZ Forest and the Green Car project, AstraZeneca Italia contributes to the Group's global ambition to become Carbon Negative in 2030.

- Previous relevant experience: *partnership with the pharmaceutical company Zambon*;
- Previous relevant collaboration: *collaboration agreement with Oxford University and the IRBM Group;* Corden Pharma

Table B14. Relevant experiences and collaborations for ASTRAZENECA in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
2. Big Data-Open Data in Life Sciences	- Collaboration with Corden Pharma (2010 to 2018) for global supply of anesthetics and antibiotics. - Partnership with Zambon pharmaceutical company (since 2018) for the production of acetylcysteine directed to the Chinese market for hospital use: in China, AstraZeneca deals with the import, promotion, distribution and sale of the therapeutic solution. - Collaboration agreement with Oxford University and the IRBM Group of Pomezia (signed in 2020) for the development of the anti Covid-19 vaccine. The IRBM laboratories took care of the production of the vaccine vials, Oxford University was in charge of clinical trials. AstraZeneca's commitment was to continue to provide its scientific expertise and production capacity in the subsequent phases of vaccine development, validation and production. The role of AstraZeneca is that of enabler and accelerator of the clinical trial process and of manager of the subsequent phases: once the trial was completed, the company organized the production process and distribution of the vaccine worldwide in a non-for-profit mode for the entire duration of the pandemic. - Long-lasting collaborations with universities and research institutions: AI Innovation Center, Cardio Metabolic Center at Karolinska Institute (Sweden); Max Planck Chemical Genomics Center III (Germany); Francis Crick Institute, Functional Genomics Center at Milner Institute, Antibody Alliance Laboratory and Cancer Research UK, Medical Research Council Laboratory for Molecular Biology (MRC LMB), Respiratory Hub at Imperial College and Cambridge University.

Bio4Dreams SpA (Spoke 2)

As a certified incubator fully dedicated to very early-stage innovative start-ups in Life Sciences, BIO4Dreams SpA helps exceptional people to exploit the results of their scientific research, working alongside all the subjects of the innovation chain to create sustainable, pragmatic, and long-lasting business paths with an international scope. Its ability is to create a broad international innovation ecosystem in Life Sciences, with BIO4Dreams SpA standing as a reference point and beacon for entrepreneurial ideas. They work on business projects and start-ups since their very initial phases, collaborating with local innovation ecosystems, contributing to enhance their excellences by integrating them into a wider national and international network.

- Previous relevant experience: *Geniusphood srl; BrainDTech spa; Chemicare srl*
- Previous relevant collaboration: *EU ERASMUS+-project "Innocore"; EU COST ACTION – project "Relieve".*

Table B15. Relevant experiences and collaborations for BIO4DREAMS in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
2. Big Data-Open Data in Life Sciences	- Co-founder of *Geniusphood srl* for the development of digital solutions to help consummers choice in the agrifood tech field, promoting the prevention of risks associated with health. - Co-founder of *BrainDTech spa* for the development of AI driven biomarkers for precision medicine, in the early diagnosis of chronic, neurodegenerative and inflammatory diseases. - Co-founder of *Euleria srl* for the development of wearable devices and technologies for telemedicine, data collection and health prevention. - Partner in *Chemicare srl* for the development of new molecules for treatment of rare deseases. - Participation in BioValley Investments Partner (BIP), the industrial holding company controlled by Bio Valley Investments Spa, that invests in BioMed, BioTech and BioICT for the development of new business initiatives related to biohightech, AI-driven solutions and development of customized therapeutic monitoring systems. - Partner in the European Erasmus+ *Innocore* project: education and training programs; development of new public / private partnership cooperation models

	- Partner in the European COST Action, *Relieve* project: mentoring and entrepreneurial training, acceleration of entrepreneurial initiatives.

Bracco spa (Spoke 2)

Bracco S.p.A is an international Group active in the healthcare sector and a leader in diagnostic imaging. For years the Bracco Group has been investing substantial resources in research, pre-clinical and clinical development of Imaging Agents (IA) for in vivo imaging. IA are used to provide physicians with detailed information for diagnoses and to monitor minimally invasive operating procedures. Technological advances in equipment, combined with IA, permit a very high level of diagnostic accuracy and procedure monitoring for most pathologies. The Group's main products are contrast agents, medical substances used to improve the diagnostic accuracy of biomedical imaging and the care of patients affected by diseases of varying type and severity. Contrast agents are routinely and widely used in all diagnostic imaging modalities, such as radiographic procedures, including computed tomography (CT), magnetic resonance imaging (MRI), ultrasound and nuclear medicine. In the R&D area, the company invests approximately 10% of reference turnover in the imaging diagnostics and medical devices sectors and has a portfolio comprising over 2,000 patents. The Bracco research network works on an open basis with university centers and public and private clinical research bodies. The Group is involved in wide-ranging Italian, European and American projects as a member of an active network of partnerships.

- Previous relevant experiences: *Predicting the clinical outcomes in patients with COVID-19 applying AI to chest X-rays, An Italian multicentre, A machine learning approach for differentiating malignant from benign enhancing foci on breast MRI, Tackling imbalance radiomics in acoustic neuroma*
- Previous relevant collaborations: *Use of image analysis methods for the diagnosis of cardiovascular disease, Development of artificial intelligence methods for the diagnosis of liver disease based on contrast-enhanced ultrasonography images, Development of AI models and procedures applied to AI for COVID database*

Table B16. Relevant experiences and collaborations for BRACCO in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
2. Big Data-Open Data in Life Sciences	- Realization of several multi-center observational studies: Predicting the clinical outcomes in patients with COVID-19 applying AI to chest- X-rays. (Italian multicentre); Tackling imbalance radiomics in acoustic neuroma (partner centre); Pareto optimization of deep networks for COVID-19 diagnosis from chest X-rays. (partner centre); Machine Learning to Predict In-Hospital Mortality in COVID-19 Patients Using Computed Tomography-Derived Pulmonary and Vascular Features (partner centre); Artificial Intelligence Applied to Chest X-ray for Differential Diagnosis of COVID-19 Pneumonia (partner centre); A machine learning approach for differentiating malignant from benign enhancing foci on breast MRI (promoter centre); A multi-expert system to detect COVID-19 Cases in X-ray images (promoter centre); A machine learning approach for differentiating malignant from benign enhancing foci on breast MRI (promoter centre); Tackling imbalance radiomics in acoustic neuroma (partner centre). - Currently ongoing collaboration with Bracco Imaging - Ospedale Monzino - Politecnico di Milano in the usage of imaging analysis methods for the diagnosis of cardiovascular disease. - Currently ongoing collaboration with Bracco Imaging - MOXOFF for the development of artificial intelligence methods for the diagnosis of liver disease. - Collaboration (2020-2022) with CDI, Bracco Imaging, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico (Milan), Fondazione IRCCS Policlinico San Matteo (Pavia), Azienda ospedaliero-universitaria Careggi (Florence), ASST Santi Paolo e Carlo (Milan), ASST Fatebenefratelli-Sacco (Milan), ASST Ospedale San Gerardo (Monza), Ospedale Casa Sollievo della Sofferenza (San Giovanni Rotondo), Università Campus Bio-Medico (Roma), and Istituto Italiano di Tecnologia (Genova) within the *AIFORCOVID project*: collect and share data from COVID-19 positive patients for the development of artificial intelligence methods for the prediction of the clinical course.

Camozzi Automation s.p.a. (Spoke 3)

Camozzi Automation s.p.a. is a global leader in the design and production of motion and fluid control components, systems and technologies for Industrial automation, Transportation and Life science industries. Camozzi Automation s.p.a. proposes the study and construction of a certified safety integrity level actuator, with added features of energy harvesting, condition assessment and health monitoring. It is part of the Camozzi Group which reinvests 3% of its turnover in R&D, an area that employs many engineers and researchers around the world. Camozzi Group oversees the initiatives financed by the promotion of research with an internal body deputy - Camozzi Research Center.

- Previous relevant experience: *International Research Center for Robot and Additive Manufacturing 4.0, Analytics for smart components, Device and diagnostic method for solenoid valves*

- Previous relevant collaboration: *Collaboration with: Politecnico di Milano, aimed at implement research and scientific training; SCM Group for the utilization of new technologies*

Table B17. Relevant experiences and collaborations for CAMOZZI in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
3. Deep Tech: Entrepreneurship & Technology Transfer	- *IRCRAM4.0 "International Research Center for Robot and Additive Manufacturing 4.0"*: The project aims to develop innovative manufacturing solutions in additive manufacturing and heavy robotics for processing advanced materials for large parts (coordinator of the project; Lombardy Region "Open Innovation" Call, POR-FESR 2014-2020) - *SMART4CPPS "Smart Solution for Cyber Physical Production Systems"*: the project aims to design the Smart Factories of the future, developing innovative applications in the Lombard manufacturing context of component and machine manufacturers (beneficiary of the project; Lombardy Region Grant "Open Innovation" Accordi per la Ricerca, lo Sviluppo e l'Innovazione POR-FESR 2014-2020 call) - Framework agreement between Camozzi Automation and Politecnico di Milano, for research and scientific training, to develop joint research and scientific training initiatives. Topic: industrial digitalization and new collaborative robotics requirements to component production; creation of smart solutions with original functional performance, able to be connected to innovative production process management systems. Patents: QUICK-FIT CONNECTOR FOR PNEUMATIC EQUIPMENT (N° EP3353458), owner - DAMPER SLEEVE AND PNEUMATIC CYLINDER (N° EP3221596), owner - DAMPING DEVICE FOR A FLUID PRESSURE ACTUATOR N° (N° EP17809375), owner - PRESSURE REGULATOR (N° 102018000004110), owner - DIAGNOSTIC DEVICE AND METHOD FOR SOLENOID VALVES (N° 102017000096979), owner - PNEUMATIC MODULES AND SYSTEM FOR PROPORTIONAL CONTROL (N°102018000004796) , owner - SUPPORT DEVICE FOR A PNEUMATIC GRIPPING MEMBER (N° 102016000114172), owner

RCS MediaGroup SpA (Spoke 4)

RCS MediaGroup SpA is the first Italian news brand, the brand that has been able to strengthen the relationship with its readers over time thanks to the integrated development of its information offer through digital platforms, website, mobile, app, social media and newsletter. RCS MediaGroup SpA with its website, digital editions, magazines, vertical channels, local newspapers, presence on social networks, offers a complete and constantly evolving information system. RCS MediaGroup is one of the leading multimedia publishing groups, operating primarily in Italy and Spain across all publishing areas, from newspapers to magazines, from digital to books, from TV to new media and training, as well as being one of the top players on the advertising sales market, organizing iconic events and renowned sporting formats such as the Giro d'Italia. The RCS Group publishes the daily newspapers Corriere della Sera, La Gazzetta dello Sport, El Mundo, Marca and Expansion, as well as numerous magazines. Leader in the information landscape and beyond, Corriere.it guarantees coverage of 80% of the web population in Italy thanks to the various multimedia access platforms through which to consult the news.

- Previous relevant experience: *Economia.corriere.it section devoted to financial education.*

● Previous relevant collaboration: *Collaboration with Università Commerciale Luigi Bocconi for the production of web series*

Table B18. Relevant experiences and collaborations for RCS in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
4. Economic impact and sustainable finance	- *L'Economia*, the economic voice of Corriere della Sera: an in-depth tool on the world of economics, finance, companies and work (weekly release). *L'Economia* deals with the universe of business, from socio-economic aspects to the evolution of technologies, from the analysis of mature and emerging markets, placing itself as a vademecum for the reader on the topics of savings, taxes, finance and investments. *L'Economia* section, devoted to financial education, also offers its readers a series of practical guides on savings, taxes, social security and pensions and organizes numerous thematic events in the area, focused on the themes of savings, business and sustainability. *(corriere.it/economia)* - *Corriere Innovazione magazine*, dedicated to innovation issues, capable of disseminating science, is a multi-platform project that promotes a new culture of innovation in all sectors, beyond the borders of hi-tech. Reference point for the technological, scientific, research community and for companies and start-ups. A media partner for the realization of ad hoc projects and events. - co-organization, together with Bocconi University, of the #SNACKNEWSASCUOLA contest, targeting high school students and challenging them in the creation of videonews to interpret current events and issues in a journalistic key, developing critical thinking, creative and entrepreneurial skills.

Officine Innovazione S.r.l. (Spoke 3, 6)

Officine Innovazione S.r.l., operational since 2018, provides companies, universities and, in general, all the actors of the innovation ecosystem with innovation management services, promoting the culture of innovation, through the development of methodologies and content on the themes of open innovation and technology transfer. The company operates within and for the Deloitte network thanks to both established and new partnerships, with the aim of driving the evolution of the business community in Italy in a logic of Technology Transfer and Open Innovation, integrating companies, the world of start-ups, Universities and research centers at 360°, implementing the concepts underlying business innovation and entrepreneurship.

● Previous relevant experiences: *Accelereratore DIGICIRC, Next Futuro Sud, Switch2Product, StartCup Lombardia, Seed4Innovation*
● Previous relevant collaboration: *Partnerships with PoliHub: Startup District & Incubator; Switch2Product Innovation Challenge*

Table B19. Relevant experiences and collaborations for OI in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
3. Deep Tech: Entrepreneurship & Technology Transfer	- *DIGICIRC Digital innovations for the Circular Economy*: The project will establish and coordinate the DigiCirc innovation network, bringing together a wide range of stakeholders. This ecosystem will establish the foundation for an integrated, dynamic and cross-border/sector open space for innovation performed through the DigiCirc accelerators that are managed by innovation specialists able to transform validated concepts into solid business models towards a commercial launch.((Beneficiary of European Grant Agreement Nr. 873468; H2020-INNOSUP-2018-2020) - *SWITCH2PRODUCTS*: programme designed to highlight the most revolutionary innovative, scientific and technological solutions and business ideas emerging from the research and entrepreneurial mindset of students, researchers, PhD students, teachers and alumni at Politecnico di Milano and other affiliated universities and research centres. 90 projects submitted, 13 accelerated, 4 industrial partners involved, investment of about 400K€. (co-organizer with PoliHub s.c.a.r.l., and Politecnico di Milano) - *STARTCUP LOMBARDIA*: Competition organized by Lombardy's Universities and University Incubators, promoted by the Lombardy Region, which fosters the birth of new high-potential companies, born, hosted or linked

	by collaborative relationships with Lombardy's Universities and University Incubators (Consultancy support for Validation and strengthening of business plan of more than 60 start-ups in the all editions)
	- *SEED4INNOVATION***:** scouting program designed to accelerate the development of highly innovative solutions born from research and foster their industrial or market application. 450 ideas collected, 64 projects accelerated, 30 companies involved (last edition data), 6.4 million euros of investment on the startups analyzed in the different years (Consultancy support for program management)
	- Partnerships with PoliHub: Startup District & Incubator for Switch2Product Innovation Challeng*e*
6. Innovation for Sustainable and Inclusive Societies	-*NEXT FUTURO SUD*: Implementation of a digital hub for open innovation programs. Supporting the launch of the first call4project (Next Futuro Sud) aimed at selecting and incubating innovative projects proposed by migrants for their benefit that led to the birth of 5 microenterprises. (https://next.oinnovazione.it/en/page/next-futuro-sud-en Italian Ministry project, bando PON legalità)
	- *FAO Digital Council for Food and Agriculture*: support to the Food and Agriculture Organization (FAO) in the development of a Concept Note for the establishment of an "international Digital Council for Food and Agriculture". The Concept Note was developed through a consultation process facilitated by Deloitte, that involved more than 350 individuals from over 100 organization in more than 50 countries, including representatives of agricultural and rural communities. This ensured the inclusion in the mission of the council of the real needs of the agricultural global community, especially in terms of decreasing geographical, gender and technological gap within the sector. The final Concept Note for an "International Digital Council for Food and Agriculture" was presented in Berlin by FAO during a side event at the 2020 GFFA (Global Forum for Food and Agriculture, yearly event). The Concept Note and the idea of establishing the Digital Council received the endorsement from the GFFA participants and was included in the 2020 final Communiqué.
	- *PUGLIA SOCIALEIN* was a call4project fully dedicated to the southern Italian region of Puglia and its social initiatives. The goal was to scout startups and innovative projects with a social-related mission and support them in business plan development through learning and coaching activities, boosting social innovative solutions on the territory and spreading innovation culture and business innovation know-how
	- *MATCHER HUMAN CENTRIC INNOVATION*: international matchmaking program designed to create business meetings between corporates of the Emilia-Romagna region and Italian and international startups/scaleups. Topic for 2022 edition: Human Centric Innovation.

Edison S.p.A. (Spoke 1, 6)

A leading company in Italy and Europe, Edison S.P.A. is the leading energy operator in Italy with over 130 years of history behind them. Edison S.P.A. operates in the supply, production and sale of electric power and gas and in the energy and environmental services. The biggest plants in the country that use waterpower belong to Edison S.P.A.. Edison S.P.A. is committed to sustainable mobility with alternative fuels that can concretely reduce CO_2 emissions and develops energy efficiency solutions for more conscious use of energy. EDISON's Research, Development & Technical Innovation (RD&TI) pays special attention to sustainability, exploring and testing the most advanced technologies for e-mobility, photovoltaic power generation, energy storage and hydrogen production to support the energy transition and decarbonization. This includes Smart Home and IoT activities focusing on the use of locally self-produced renewable energy and improving the quality of life at home. Particular attention is paid to research into innovative interfaces that make the most advanced technologies accessible to customers, and to the exploration of frontier topics such as service robotics. EDISON is also committed in accelerating the digital transformation through training and up-skilling support initiatives. EDISON's corporate foundation Fondazione Eos – Edison Orizzonte Sociale – is created in 2021 to direct EDISON's activities towards the civil society, the cultural world and the third sector, promoting initiatives on sustainability issues, from the standpoint of Corporate Social Responsibility. It

contributes to Edison's commitment to achieve the United Nations 2030 Agenda goals (quality education, SDG4; social inclusion and reduction of inequalities, SDG10; promotion of sustainable communities, where cultural and natural heritage are essential elements, SDG11; in a multistakeholder partnership perspective, SDG 17).

- Previous relevant experiences: *BeBop Italia, Turin Cityplatform, Monster Pienerolese*
- Previous relevant collaborations: *Collaboration with University (Università commerciale Luigi Bocconi, Politecnico di Milano), Foundations and Associations among which: Edison Start/Edison Pulse; Edison Green Movie; Eco -Generation*

Table B20. Relevant experiences and collaborations for EDISON in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
1. Urban regeneration (City of tomorrow)	- The Milan Officine Edison, created in collaboration with Polihub, the startup accelerator of Milan's Politecnico University, host activities related to digital transformation and two technology research laboratories, one devoted to Internet of Things (IoT) solutions for the home environment and the other to two-way charging systems for electric vehicles (Vehichle-to-Home) - Partnership with Gabetti Lab in Milan, for the development of condominium energy communities that call for the installation of photovoltaic systems on roofs for collective self-consumption. - *BeBop Italia, Monster Pienerolese*: digital tools to map and analyse the energy resources and consumption of specific territorial areas (pilot on Comunità Montana di Valle Sabbia; Piemonte territory Pinerolese) - *Turin Cityplatform,* urban planning tool for Turin historical city center
6. Innovation for Sustainable and Inclusive Societies	- Edison Digital Academy (EDA), launched in 2020, as an Academy of Professions, developed in collaboration with Talent Garden, to provide permanent training in digital transformation - Partnership agreement with Amazon Web Services to accelerate the digital transformation process; initiatives to support up-skilling and acquisition of competencies related to the use of new technologies. - Ex Manifattura Tabacchi Audio-Visual hub (Milan, Bicocca district): a set of actions co-designed with the audio-visual schools and other entities, promoting the empowerment of cinema and audio-visual sector professionals (students and professionals) on the issues of sustainability, to contrast educational poverty and favour social inclusion through the audio-visual tool.

Eni S.P.A. (Spoke 1)

Eni S.P.A. is a global energy company present in 68 countries with over 30,000 people operating along the entire value chain. It concretely supports a fair energy transition for a net-zero carbon future, with the objective of preserving our planet and promoting efficient and sustainable access to energy for all and respecting society and world's ecosystems. Eni S.P.A. has committed to becoming a leading company in the production and sale of decarbonised energy products and fosters several scientific research projects on renewable energy, hydrogen, CCUS, energy efficiency, energy storage and circular economy. Research and technological innovation are two pillars of the company's organic growth. Biorefineries play a central role in the Company's evolution because they contribute to the achievement of Eni's main goal: the total decarbonization of all products and processes by 2050. In 2014 Eni's refinery in Venezia was the first traditional refinery to be converted into a biorefinery worldwide. Today Eni has a total processing capacity of 1.1 million tons per year of advanced biofuels and has the goal of significantly increase this capacity to 5÷6 million tons by 2050. Furthermore by 2023 Eni's biorefineries will be palm oil free; alternative feedstocks and other advanced inputs will be used instead. In the field of advanced fuels produced from waste, a further line of development concerns the possibility of obtaining pyrolysis oil from the treatment of End-of-Life Tyres (ELTs). Eni is also working on all aspects of low-carbon hydrogen production: from natural gas reforming in combination with emissions capture ('blue hydrogen') to renewable energy ('green hydrogen') and, following a circular economy approach, developing technologies for producing sustainable hydrogen from waste products. Eni has strong in-house research and development expertise and a world-class network of alliances and partnership, built on framework and collaboration agreements. Strategic alliances have been formalized with Italian universities (Università di Padova, Università di Bologna, Università Federico II di Napoli, Università di Pavia, Politecnico Torino, Politecnico Milano) and Research Institutions (CNR, ENEA, and others) and, internationally, with MIT.

- Previous relevant experiences: *Porto Marghera: Land reclamation and Waste to Fuel, Katherine: the development of photovoltaics in Australia, Gela: investment in the circular economy and renewables; CE4WE – Circular Economy for Water and Energy*

- Previous relevant collaborations: *Collaboration with Cariplo Foundation: launched Eni's Call for startups "Digital HR: Innovate to grow", Participation to the Hydrogen Innovation Report 2021 (Energy & Strategy - PoliMI); Partnership with Air Liquide with the aim to expand hydrogen mobility in Italy*

Table B21. Relevant experiences and collaborations for ENI in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
1. Urban regeneration (City of tomorrow)	- Partner of the Project CE4WE (Circular Economy for Water and Energy), co-financed by the Lombardy Region. The project focuses on the development and application of technologies and processes for a circular economy in the integrated water cycle, through the study of the quality of underground and surface water and the energy enhancement of waste products from purification processes. The project also aims at minimizing waste products from water treatment processes, by improving the quality of sewage sludge and the transformation of waste material into bio-oils, biodiesel and other bio-based products. - In collaboration with Cariplo Foundation, launch (in 2021) of the Eni's Call for startups "Digital HR: Innovate to grow", an Open Innovation project aimed at identifying innovative tools in the field of human resources for management and training of people. Eni is now starting a progressive involvement of the three winning startups, aimed at developing an innovation path. - Eni is currently Partner in 11 Consortia for projects funded by the European Commission and in 5 National Consortia covering several research topics, including processes decarbonization (reduce, capture, transform or store CO_2, increasing energy efficiency, reducing emissions and promoting decarbonized energy vectors), circular and bio-products (reduce, recycle and reuse products and by-products, transforming wastes to valuable products for bio-refinery, sustainable mobility and green/circular chemistry), renewable energies (sustain the development of renewable energies and storage solutions and developing breakthrough energy technologies such as magnetic fusion). Total financed budget of more than 4 M€.

Fondazione Bruno Kessler (Spoke 4)

Fondazione Bruno Kessler (FBK) is the top Research Institute in Italy, ranked first place for scientific excellence within three different subject areas and for the economic and social impact according to the latest quality of research ANVUR evaluation. Fondazione Bruno Kessler acts as a scientific and technological Hub, its premises and platforms hosting a lively ecosystem of co-located ventures, spin-offs, projects and training opportunities. Their focus is based on collaborations and exchange activities with public administration and institutions, as well as small, medium-sized and multinational companies, European and international institutions, which broaden the capacity for innovation and involve the local community and the local economy in the circulation of knowledge and technologies. IRVAPP (Research Institute for the Evaluation of Public Policies, http://irvapp.fbk.eu/) is one of the eleven Research centers of the Fondazione Bruno Kessler. FBK-IRVAPP's scientific mission includes: i) public policy evaluation through rigorous counterfactual approaches; ii) dissemination of findings within the broader scientific community; iii) promotion of the culture of causal inference in social and economic research; and iv) training of Ph.D. students, scholars, civil servants and policy makers in methods for counterfactual policy evaluation. FBK-IRVAPP carries out impact evaluations in the following fields: education, labour market, anti-poverty and welfare measures, industrial policies and development programs for developing countries.

- Previous relevant experience: *New Protectionist Policies: Political Determinants and Economic Consequences; The impact of EU Research and Innovation Policy upon Services of General Interest*; *Study on Distributional Impact Assessment*
- Previous relevant collaboration: *Collaboration with INPS; Collaboration with Centro Luca D'Agliano*

Table B22. Relevant experiences and collaborations for FBK in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
4. Economic impact and sustainable finance	- *DIA (Study on Distributional Impact Assessment)*: aims to understand to what extent and how EU Member States make use of (ex-ante) distributional impact assessments (DIA) for budgetary measures, to identify the main reasons limiting

the use of DIA in Draft Budgetary Plan, and to assess the degree of similarity in the use of DIA among Euro Area Member States. Project coordinator: Università degli Studi di Milano - Department of Economics, Management and Quantitative Methods. Funded by European Commission DG Employment, Social Affairs and Inclusion.

- *Cost-Benefit Analysis of vocational training programmes.* This project compares the benefits of training courses with the costs borne by the public administration to implement them. The study is concerned with two sets of long-duration training programmes directed to the unemployed living in the autonomous Province of Trento (PaT). The analyses relied on data from administrative archives. Funded by the Autonomous Province of Trento

- *Disability card*: The main purpose is to assess the implementation of the pilot action in each Member States, the benefits produced, its cost-efficiency, and its transferability in the rest of the EU. Project coordinator: Ernst&Young. Funded by European Commission DG Employment, Social Affairs and Inclusion.

- *Teachup - TEACHer Upskilling Policy experimentation*: it is a policy experimentation aimed at investigating the effectiveness of an innovative intervention intended to increase teachers' retention in online courses as well as their self-regulated online learning competences. Within TEACHUP, four Massive Open Online Courses (MOOCs) on new teaching competences are developed. Project coordinator: EUN Partnership. Funded by Education, Audiovisual and Culture Executive Agency within the ERASMUS+ Programme for the Key action 3

- *EUROMOD*: tax-benefit microsimulation model for the European Union that enables researchers and policy analysts to calculate, in a comparable manner, the effects of taxes and benefits on household incomes and work incentives for the population of each country and for the EU as a whole. IRVAPP is part of the Italian team of Euromod.

- *Higher Education on Impact Evaluation of Public Policies:* Irvapp organizes annually two schools on Fundamental and Advanced Methods for Impact Evaluation of Public Policies and, on demand, courses for national and European bodiest: e.g. Banca d'Italia, Ufficio Parlamentare di Bilancio, JRC Seville, DG ECFIN Bruxelles.

Fondazione Politecnico di Milano (Spoke 3)

Fondazione Politecnico di Milano (FPM) develops multidisciplinary innovation projects in partnership with companies, public authorities and research centres, in Italy and across Europe, in many of the University's areas of competence. It supports the creation of enterprises and sustains the finest startups through its management of the PoliHub Innovation Park & Startup Accelerator incubator. Technology Transfer: FPM intends to empower companies with technology and innovation, introducing them to research, directing them towards efficient solutions and working with them on precise programmes. PoliHub & Supporting New Entrepreneurship: Managed by FPM and classified among the first five university incubators at global level, PoliHub Innovation Park & Startup Accelerator is a consolidated reality that can give its support to this pool of companies.

- Previous relevant experience: *OpenAgri - New Skills for new Jobs in Peri-urban Agriculture; Sharing Cities; INNO-WISEs - Technologies, Competences and Social Innovation for Work Integration Social Enterprises*
- Previous relevant collaboration: *Collaboration agreement with Politecnico di Milano for research, innovation and transfer technology; Innovation project with large enterprises and SMEs*

FPM has a long lasting experience in International funded project,more than 220 PROJECTS MANAGED IN 2020 and relying on different funding scheme, from H2020, Interreg (i.e. Mediterran, Alpine space. IT-CH, UIA, EIT, and now is active on RFF initiatives. Besides, Fondazione Politecnico di Milano is qualified as World Bank Vendor under the reference N° 129224.

Table B23. Relevant experiences and collaborations for FONDAZIONE POLIMI in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
3. Deep Tech: Entrepreneurship & Technology Transfer	- *OpenAgri - New Skills for new Jobs in Peri-urban Agriculture*: developing peri-urban agrifood sector in a way that will enable it to attract investments for producing further innovative processes contributing to food availability, particularly of fresh products, increasing food security and improving eating

| | habits regenerating a peri-urban zone of the city by making it an example of social inclusion and innovation becoming an international model of peri-urban integration for other cities (UIA Initiative)
- *Sharing Cities:* empowering cities to explore and exploit the potential of smart technologies (sensors, mobility and data integration) in order to improve city services, support innovative new businesses and deliver a better quality of life. Development and deployment of replicable smart solutions in regards to energy, transport and the built environment. Attract external investments. Successfully engage with citizens. (European granted project; Grant agreement ID: 691895; H2020-SCC-2014-2015)
- *INNO-WISEs - Technologies, Competences and Social Innovation for Work Integration Social Enterprises (WISE):* To improve technological, technical, ICT and managerial skills and competences of WISEs and to reduce the technological gap currently affecting WISEs; an online platform (https://wisebusiness.eu/it/) has been developed and effectively used for support and training, includes the MOOC on 'Business for WISEs' (Interreg Central Europe project)
- Healthcare Infrastructures JRP (Joint Research Platform), between universities and companies of the Healthcare Infrastructures sector (POLIMI; FPM; Eredi Rossini Domenico srl; Mario Cuccinella Architects; Philips; Politecnica; Siemens; Tecnicaer Engineering srl; Coopservice; Humanitas Mirasole; Lenzi Consultant; Mapei; Areu Regione Lombardia; AUSL Bologna; Asst Lodi), promoting collaboration between universities, businesses and public administrations. The project aims to define the performance requirements for the new 4.0 Hospitals.
- Hydrogen JRP (Joint Research Platform) between universities and companies (POLIMI; FPM; Snam; Edison; Eni; Ansaldo Energia; Swiss Re ; Polynt Spa) to promote research and innovation on: production of clean hydrogen, hydrogen transport solutions and related accumulation systems; innovative electrochemical and thermal uses in residential, industrial and transport applications; development of best practices for the design and construction of infrastructures for the transport and storage of hydrogen.
- PoliHub was ranked third among the best university incubators in the world by UBI Global's World Top University Business Incubator Rankings 2017-2018; and is the only Italian university among the top 20. Citing numbers, Politecnico has 2084 patents; 791 patent families; 392 inventions evaluated; 15083 ideas analyzed by TTO and PoliHub; 85 corporate spin-offs of which 73 are active and 117 start-ups. In particular, in the field of mobility, from the connected vehicle to hydrogen, considering all spokes of the CNM, has a total of 149 patents in the last 10 years.
- ENI Joule Initiative: Joule's mission is to support the growth of sustainable businesses through courses dedicated respectively to the training of a new generation of entrepreneurs and the acceleration of startups, providing tools, developing skills and keys to reading with face-to-face and remote modules. The most deserving project will receive an incubation program provided through PoliHub, the Innovation Park & Startup Accelerator of the Politecnico di Milano and personalized mentorship programs. |

Huawei Technologies Italia S.r.l. (Spoke 3)

Huawei Technologies Italia S.r.l (Huawei) is a leading global provider of information and communications technology (ICT), infrastructure and smart devices. Through open collaboration and innovation, Huawei helps to promote and protect unified global standards, establish industry and ecosystem alliances, support global open source projects, and drive breakthroughs in key technologies. Huawei collaborates with industry partners to build an open, global ecosystem that will help the ICT sector to develop more sustainably. research activities focus on 1) Microwaves (millimeter waves in the V/E/D bands, antennas, architectures and technologies); 2) High frequency technologies for 5G and beyond (architectures and technologies, antenna arrays); 3) Optical RFIC (drivers and TIA) and power amplifiers; 4) Optical packages and microwave over fiber. Since 2012 Huawei participated in more than

40 research projects with different Italian universities (e.g. Politecnico di Milano, Politecnico di Torino, Università di Pavia, Università di Padova, CNIT, Università di Siena, Università di Cagliari), focussing on high frequency technologies (antennas, materials, electromagnetic propagation), reliability, support for PhD scholarships and patents filing.

- Previous relevant experiences:*innovation Lab Huawei – Università di Pavia; Joint Lab Huawei - Politecnico di Milano; 120 GB SiGe Linear EML Driver & TIA*

- Previous relevant collaborations: *Research project - D-Band BiCMOS Chipset Technology; Research project - Optical-CDMA detection scheme for Silicon Photonics applications; Research project - oRFIC TIA design in CMOS technology*

Table B24. Relevant experiences and collaborations for HUAWEI in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
3. Deep Tech: Entrepreneurship & Technology Transfer	- *Innovation Lab Huawei - University of Pavia:* the lab operates in the field of microelectronics and high-frequency technologies. The focus is on research for the development of new generations of devices for coherent and non-coherent optical applications in CMOS (Complementary Metal-Oxide Semiconductor) and FinFET (Fin-shaped Field Effect Transistor) technologies, with the aim of extending, over the next three to five years, research to technological innovation in the field of semiconductors for wireless applications in the context of 5G (promoting and financing entity). - *Joint Lab Huawei - Politecnico di Milano:* the lab develops advanced research for wireless technologies, in particular studies of architectures, algorithms, and technologies for high-frequency apparatus are carried out (promoting and financing entity) - *120 GB SiGe Linear EML, Driver & TIA :* Driver and TIA project in SiGe (promoting and financing entity, in collaboration with University of Ghent) - *D-Band BiCMOS Chipset Technology:* research project on performance verifications of BiCMOS Chipset Technology in D-band (promoting and financing entity, in collaboration with University of Pavia) - *Optical-CDMA detection scheme for Silicon Photonics application:* research project on Optical-CDMA algorithms applied to photonic devices (promoting and financing entity, in collaboration with University of Pavia) - *oRFIC TIA design in CMOS technology:* research project on development ofNew designs of oRFIC TIA in BiCMOS technology (promoting and financing entity, in collaboration with University of Pavia)

HUMANITAS UNIVERSITY (Spoke 3)

Humanitas University (HUNIMED) is an international higher education institution, established in 2014 and recognized by the Italian Ministry of University and Research (MUR). HUNIMED research interests focused on basic and translational research in life sciences. Humanitas University provides its researchers with laboratories, fully equipped with instruments for molecular and cellular biology research. The research center is also equipped with facilities at the forefront of technological innovation, outstandingly supporting preclinical and clinical research. Humanitas University prepares its students to thrive in the clinical and research areas in Italy or overseas. By training professionals in the Life Sciences with a model that integrates Education, Research and Clinical Practice, Humanitas University brings out the talent in its students. It is an international hub for the training of doctors, nurses, physiotherapists and researchers capable of dealing with future scientific, technological and social change. The close integration between the Hospital, the Research Laboratories and the University creates synergy between clinical and laboratory practice in an educational context. Humanitas University, in agreement with the Politecnico di Milano, activated the MEDTECH School, Master's Degree course (6 years), for training of new professional figures capable of integrating and enhancing Surgery with Biomedical Engineering, understanding and managing the advanced technologies that characterize the medical profession and able to apply an increasingly personalized medicine for treatment, clinical evaluation of patients and diagnosis. The integrated training course will allow graduates to obtain a Bachelor's Degree in Biomedical Engineering from Politecnico di Milano, immediately following the release of the Degree in Medicine and Surgery by Humanitas University.

- Previous relevant experience: *Image Mining and ctDNA to Improve Risk Stratification and Outcome Prediction in NSCLC applying Artificial Intelligence; Chemical and mechanical characterization of*

pancreatic tissue in order to develop new tools to reduce the problem of postoperative pancreatic fistula; Decoding the immune heterogeneity of intrahepatic cholangiocarcinoma and building precision medicine on a 3D chip

- Previous relevant collaboration: *Collaboration with Politecnico di Milano: Medical degree course, the MEDTEC School that will combine the skills of the doctor with those of the engineer so that future doctors will be able to apply new technologies (artificial intelligence, neuro-robotics, big data, etc.); Collaboration with University of Trento: preparation of a new generation of hi-tech doctors and researchers*

Table B25. Relevant experiences and collaborations for HUMANITAS in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
3. Deep Tech: Entrepreneurship & Technology Transfer	- Image Mining and ctDNA to Improve Risk Stratification and Outcome Prediction in NSCLC applying Artificial Intelligence (AIRC project 2020, coordinator, in collaboration with POLIMI): Identification of imaging and circulating biomarkers for the risk stratification of patients affected by lung cancer. - Decoding the immune hetereogeneity of intrahepatic cholangiocarcinoma and building precision medicine on a 3D chip (AIRC project 2020, coordinator, in collaboration with POLIMI): Aims to develop a 3D platform for personalised assessment of therapy in intrahepatic Cholangiocarcinoma using a small amount of human tissue from resected patients. - Chemical and mechanical characterization of pancreatic tissue in order to develop new tools to reduce the problem of postoperative pancreatic fistula (Ricerca finalizzata, coordinator, in collaboration with POLIMI): Creation of a synthetic phantom of the pancreas and new adhesive biomaterials to seal pancreatic tissue for experimental purposes
Key top international collaborations: Collaboration with Politecnico di Milano; University of Trento; OSLO UNIVERSITETSSYKEHUS HF; MAGIC Evidence Ecosystem Foundation; AARHUS UNIVERSITET DK 5 KAROLINSKA INSTITUTET; Narodowy Instytut Onkologii im. Marii Sklodowskiej-Curie - Panstwowy Instytut Badawczy; FUNDACIO CLINIC PER A LA RECERCA BIOMEDICA; HOSPITAL CLINIC DE BARCELONA; UNIVERSITAETSKLINIKUM HAMBURG; EPPENDORF; ETHNIKO KAI KAPODISTRIAKO PANEPISTIMIO ATHINON; KING'S COLLEGE HOSPITAL NHS FOUNDATION TRUST; UNIVERSITY COLLEGE LONDON UK 14 MAPLESOFT EUROPE LIMITED; BETH ISRAEL DEACONESS MEDICAL CENTER, INC NON PROFIT CORPORATION; The Pennsylvania State University; Showa University; Nagoya University Department of Electronics, Graduate School of Engineering, Nagoya University	
Technology Transfer experience: HUNIMED has a TTO office that supports and conducts the innovation process, adding value to the outstanding research developed at HUMANITAS in the lifescience field, including biomedical, medtech and digital health. Humanitas patent portfolio comprises 18 patent families belonging to 44 patent applications and 19 granted patents covering several fields such as immunology, oncology, markers for diagnosis and medical tech devices	

Infineon Technologies Italia S.r.l. (Spoke 3)

Infineon Technologies Italia S.r.l is a leading company in the semiconductor market for industrial and automotive applications. Its core challenge is that of taking a conscientious approach to the use of natural resources through efficient use of energy, environmentally-friendly mobility and security in a connected world. Infineon's semiconductors solutions enable efficient energy management, smart mobility, as well as secure, seamless communications in an increasingly connected world, tackling the society megatrends of demographic and social change, climate change and resources scarcity, urbanization and digital transformation. R&D activities concentrate on innovation of power semiconductors (automotive, lighting, appliances, motor control renewables…), digitization of products and systems, advanced connectivity solutions and software, increased application of artificial intelligence in different application (automated driving, edge computing, product testing), development of novel sensor range for IoT and longer-term future-related topics in the fields of quantum computing and post-quantum cryptography. To ensure high-level innovation in R&D activities, Infineon Technologies Italia S.r.l. maintains profitable relations with the Academic world in order to guarantee constant levels of knowledge exchange. Infineon finances several PhDs (mainly from Universities of Milano Bicocca; Padova and Pavia), permanently host students preparing the master

graduation work from many universities and promotes electronic studies by offering 4 scholarships at University of Padova for students Master's Degree ICT Internet and Multimedia Engineering.

- Previous relevant experiences: Partner of *iDev40 (Integrated Development 4.0); iRel40 (Improving the reliability of electronic components for future applications)*
- Previous relevant collaborations: *Agreement with Politecnico di Milano for the creation of a new research center for electronic circuits; Infineon best student scholarship!,* collaboration with *University of Padova to help deserving students continue their studies in the Second-cycle (Master's) degree in "ICT for Internet and multimedia" (MIME)*

Table B26. Relevant experiences and collaborations for INFINEON in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
3. Deep Tech: Entrepreneurship & Technology Transfer	- *Joint Research Centre Infineon Technologies – Politecnico di Milano*: launched in March 2019 with the main objective of studying and developing innovative integrated circuits for wireless applications (5G, IoT, Bluetooth, WiFi, etc.), radar for gesture recognition and automotive applications, aiming at supporting the development of autonomous vehicle driving. - *Project iDev40* - Project Integrated Development 4.0, aiming at boosting the digital transformation towards an integrated digital value chain based on the "digital twin" concept improving Development, planning and manufacturing processed with highly digitized virtual processes along the whole product lifecycle. Project financed by ECSEL JU, partners (among others): University of Milano Bicocca, Fraunhofer institute, Universities of Klagenfurt, Wien, Bucharest and Dresden. - *Project Irel40* - Intelligent Reliability 4.0 project with the ultimate goal of improving reliability of electronic components and systems by reducing failure rates along the entire value chain. Project financed by ECSEL JU and MISE, partners (among others): Universities of L'Aquila, IUNET, Fraunhofer institute, Universities of Graz, Bremen, Lyon, and Chemnitz. - *Project AI-TWILIGHT* - AI powered Digital twin for lighting infrastructure in the context of front-end Industry 4.0. The main goal is to merge the virtual and physical worlds to pave the way for innovations in fields where the European lighting industry is developing self-learning digital twins of lighting systems (LED source, driver of a lighting application) able to predict performance and lifetime of product and infrastructure design and management in an autonomous world. Project financed by ECSEL JU and MUR, partners (among others): University of Padova, Universities of Darmstadt, Delft and Eindhoven.

LUMSON S.p.A. (Spoke 5)

Lumson S.p.A. is a leading company in Europe in development, production, and decoration of primary packaging for the cosmetic market. Lumson Group strongly believes in the balanced mixture between Tradition and Innovation, promoting the concept of "Made in Italy" both in its territory and worldwide, conscientiously adhering to sustainability and an environmentally conscious attitude. The company is also strongly concerned with Welfare, under both economic and social profiles. Lumson is a member of POLO TECNOLOGICO DELLA COSMESI, a non-profit association founded in 2005, which aims to represent and become the reference point for all the Italian companies active in the cosmetic industry, from direct producers of cosmetics and related products, to designers and producers of both primary and secondary packaging, to plant and machinery manufacturers and contract fillers, to service companies having a focus on the cosmetic industry. Being an active member of POLO lets Lumson get in touch and establish synergic collaborations at an international level with different Associations of Cosmetic Business, like the French Association Cosmetic Valley, the Japan Cosmetic Centre from Saga Prefecture in Japan, and the Spanish Barcelona Beauty Cluster.

- Previous relevant experience: *Specchio bando fashion tech; Ad-com*
- Previous relevant collaborations: *Lumson is an institutional participant of FPM*.

Table B27. Relevant experiences and collaborations for LUMSON in the relevant spoke.

Spoke	Previous relevant experiences and collaborations

5. Sustainable Fashion, Luxury and Design	- Since 2010 Lumson is awarded with the "Prix Formes de Luxe", honoring the successful collaborations collaborations with relevant French brands in the beauty and cosmetics sector: Yves Rocher (2010), B3 (Groupe Auriège) (2011), Franck Provost (2012), Caudalie (2013), Sothys (2014), Lierac (2015), L'Oréal (2016), Tata Harper (2017). - 'Recognition of Excellence Award': Certificate of Merit (Pandino, CR) stating the commitment in the enhancement and development of the Italian Beauty District. - Development of advanced protective airless packaging for maintaining the integrity of the most sensitive ingredients in cosmetics (airless pump with no venting hole, preventing any air entering during use) with ECOCERT certificate of conformity according to packaging natural and organic standard.

Novartis Farma S.p.A (Spoke 2)

Novartis Farma S.p.A. is one of the largest pharmaceutical groups operating in Italy. Its mission is to re-imagine medicine to improve and prolong people's lives. It relies on technology and scientific innovation to address society's greatest health challenges. It discovers and develops innovative treatments, identifying new ways for them to reach as many people as possible. In recent years, Novartis has intensified its commitment to the development of new therapeutic platforms in digital health, for the early intervention and management of chronic diseases, where digital technologies, advanced analysis and artificial intelligence help drive innovation and improve efficiency.

- Previous relevant experiences: *WelCare Platform, RiAtlas Healthcare*
- Previous relevant collaborations: OPeNet, NoEmi platform (No Migraine)

Table B28. Relevant experiences and collaborations for NOVARTIS in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
2. Big Data-Open Data in Life Sciences	- *WelCare platform*: digital platform to help clinicians in the management of innovative therapies such as those of the CAR-T family, allowing them to share information relating to patients potentially eligible for treatment, to follow their screening and, subsequently, their follow up. - *OPeNet platform* (https://openet.netmedicaitalia.it/s/): platform for remote medicine by collaboration between Novartis, Net Medica Italia, IBM Italia. Supports general practitioners in the remote management of patients suffering from chronic diseases, using artificial intelligence. Allows the integration and exchange of data with most of the management systems and platforms used by general practitioners - *RiAtlas Healthcare digital solution*, certified as a Software Medical Device, for taking charge and active monitoring of cancer patients starting a therapeutic care path. The solution consists of a Mobile App dedicated to the patient, a Web App for the clinician and an AI tool for classifying the patient's health status. This solution will be used for the first time by Novartis Oncologia Italia in clinical trials and projects dedicated to patients. - *NoEmi platform* for telemedicine for easier communication between doctor and patient in relation to the management of migraine pathology, both as regards the diagnosis and the definition of the appropriate therapeutic path. In collaboration with Paginemediche platform.

Pirelli &C. S.p.A. (Spoke 1)

Pirelli &C. S.p.A.. was founded in Milan in 1872 and today stands as a global brand known for its cutting-edge technology, high-end production excellence and passion for innovation that draws heavily on its Italian roots. Recognized by consumers as high value products, the company's product range consists of innovative tyres for **cars, motorcycles**, and **bicycles** with a large interest in advancing technology in the field of sustainable mobility. According to the growing relevance of soft mobility options in the mobility market space, in 2020 Pirelli launched the Micromobility Solutions business unit with the aim of exploring and intercepting most promising revenue and profit pools in the industry. All of this has grown from a strong commitment to Research and Development based on an "*Open Innovation*" model. Pirelli has also established a series of R&D collaborations and Joint Development Agreements with external players such as suppliers, universities and car manufacturers. It has 50 collaboration

projects with Universities, more than 20 Joint Development Agreements and collaborations with suppliers and a huge number of R&D collaborations with Premium car manufacturers in innovative technologies.

- Previous relevant experiences: *FSC-certified, CYCL-e around, Micro-Mobility, urban mobility and Smart Cities*
- Previous relevant collaborations: *Joint Research with Università degli Studi Milano-Bicocca The filler–rubber interface in styrene butadiene nanocomposites with anisotropic silica particles: morphology and dynamic properties doi: 10.1039/C5SM00536A)*

Table B29. Relevant experiences and collaborations for PIRELLI in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
1. Urban regeneration (City of tomorrow)	- Launch of the Mobility service CYCL-e around (also presented at SMAU 2021): customized High-end Electric Bikes rental solution for "private communities" (e.g. High-end Hotels; Rental Points; Corporation; University campus etc.) fully digitally enabled. Explores added value collaborations in Micromobility with regards to: vehicle manufacturing; operations; vehicle as a service business models; IoT devices; tyres for eScooters. - Production of the first certified tyre in the world to have natural rubber and rayon certified to the standards of the Forest Stewardship Council (FSC) NGO, towards the sustainable management of the natural rubber supply chain. FSC certification of forest management confirms that the plantations are managed in a way that preserves biological diversity and brings benefits to the people of the local communities and workers, ensuring at the same time economic sustainability. - Industrial partner in the European EIT KIC (Knowledge and Innovation Community) - Raw Materials - Through the Corimav Consortium (Pirelli-UNIMIB) Pirelli finances an industrial PhD curriculum in Science and Nanotechnology of Materials at UNIMIB, with focus on research on tires, nanotechnologies and modeling of materials. Pirelli staff holds lectures on management and intellectual property issues for students of the UNIMIB Doctoral School of Science. - Launch (in 2021) of the second level University Masters program "R&D Excellence Next", devised in collaboration with the Politecnico di Milano, which involved 34 recently hired young engineers with the goal of training specialized engineers.

Thales Alenia Space Italia S.p.A. (Spoke 1, 6)

Thales Alenia Space Italia S.p.A.., a joint venture between Thales (67%) and Leonardo (33%), is a global space manufacturing company that for over 40 years has been providing high technology solutions for telecommunications, navigation, Earth observation, environmental management, scientific research and orbital infrastructures. Together with Telespazio it forms the "Space Alliance", able to offer a complete set of solutions and services. Thales Alenia Space Italia S.p.A. is the industrial reference in global satellite constellations by offering the world's most efficient services for mobile connectivity (maritime, in-flight), the connection of 4G and 5G communications, government networks and enterprise communications. Governments and private industry alike count on TAS-Italia to design satellite-based systems that provide anytime, anywhere connections and positioning, monitor our planet, enhance management of its resources, and explore the Solar System and beyond.

- Previous relevant experiences: *The Sentinel series of satellites, GEONAV IoT*

- Previous relevant collaborations: *Collaboration with the University of Turin where research, innovation and training are closely linked to the economic and production context; Collaboration with the University of L'Aquila: new methodology for the design of digital transparent processors (DTP) for modern satellite transponders for telecommunication*

Table B30. Relevant experiences and collaborations for THALES in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
1. Urban regeneration (City of tomorrow)	- TAS-Italia is the pioneer in European satellite navigation, as prime contractor for the Galileo "System Support" and is currently prime contractor of Galileo System and Service support for the Galileo exploitation phase. TAS-Italia is also leading manufacturer of the GNS Generation Payload and Ground Reference Receivers for EGNOS and Galileo.

	- TAS-Italia is a leader in Earth Observation systems, based on its high or very-high resolution optical and radar payloads. The company is a major supplier in export markets, covering military, dual and civilian missions: intelligence gathering, target designation, mapping, crisis management, meteorology, oceanography, climatology, etc. - TAS-Italia is a key contributor to the EU Copernicus Programme with the Sentinel missions, including foreseen evolution on the ROSE-L and CIMR, as well as national contributing assets like Cosmo Skymed and recently launched CosmoSkyMed 2nd Generation. - TAS-Italia is a major contributor to the International Space Station (ISS), responsible for over half of its pressurized volume, and played a major role on the Automated Transfer Vehicle cargo vessels for ESA and on NASA's Cygnus program, which will also bring supplies to the ISS. - TAS-Italia is one of the world's leading designers of telecommunications satellites, platforms and payloads and is contributing to worldwide, European and National communication space assets. The company is also contributing to the main European programs for future telecommunication infrastructure (ESA study "SAGA" on Quantum Key Distribution constellation to enable the connection of EuroQCI ground quantum networks and ESSCS for European space-based secure communication systems.
6. Innovation for Sustainable and Inclusive Societies	- TAS-Italia has been and is the prime contractor for several key exploration and science space missions like ExoMars and Herschel and Planck, the two largest space observatories ever built in Europe. TAS-Italia also played a lead role in the recent Rosetta-Philae comet landing mission, in Europe's Bepi-Colombo mission to explore the planet Mercury, in the landing on Saturn's moon by the Huygens probe (built by TAS-Italia as prime contractor). Next scientific challenge is the European program Euclid, designed to help further our understanding of dark matter. - Activities with schools with dissemination about the Earth Observation missions Sentinel and CosmoSkyMed

TIM S.p.A. (Spoke 2)

TIM S.p.A. is the leading group in Italy and Brazil in the ICT sector. It develops fixed, mobile and cloud infrastructures and data centres and offers services and products for communications and entertainment, placing itself at the forefront of digital technologies. The Group uses specialised factories that offer integrated digital solutions for citizens, businesses and public administrations, also in partnership with groups of primary importance: Noovle, Olivetti, Telsy and Sparkle. The Group has made environmental protection and social inclusion objectives its own in developing its business with the aim of achieving a tangible and relevant impact and becoming carbon neutral in 2030. TIM pushes for a digital transformation, with the aim of everyone being able to use digital to have the opportunities for a better life, through the development of technologies capable of promoting sustainable behaviours and lifestyle, while helping to create a circular economy and achieve zero emissions. European Funded Projects and international collaboration are a relevant leverage to support R&D and innovation activities.

- Previous relevant experiences: *UNIFY - Unifying Cloud and Carrier Networks*, *eVACUATE, EEB (Energy Efficient Buildings)*
- Previous relevant collaborations: about 10 academic partnerships running, most of them focalised on 5G aspects, while others are on more general ICT matters. With universities TIM has developed a new model of collaboration based on JOL – Joint Open Labs

Table B31. Relevant experiences and collaborations for TIM in the relevant spoke.

Spoke	Previous relevant experiences and collaborations
2. Big Data-Open Data in Life Sciences	- TIM is actually active in more than 20 European granted projects, in collaboration with universities (Eindhoven, Berlin, Darmstadt, Dresden, Madrid, Catalunya, Oxford, Taiwan, Bolzano, Sant'Anna, Milano, Firenze, Roma La Sapienza, Trento, POLIMI, POLITO), research centres (Fraunhofer, NEC lab, CNR, ISMB) and vendor's development centres (Alcatel, Ericsson, Huawei, Nokia)

	- *UNIFY - Unifying Cloud and Carrier Networks*: integration between the telecom networking assets and data centres of telecom providers (cloud computing, networking), from home networks up to data centre, as a "unified production environment" (Beneficiary of European Grant Agreement Nr. 619609; FP7-ICT-2013-11) - *eVACUATE*: using smart communication devices and spaces for rapid, timely guidance and safe active evacuation routes for large crowds; dynamic capture of situational awareness concerning crowds in specific mass gathering venues (Beneficiary of European Grant Agreement Nr. 313161; FP7-SEC-2012-1) - *EEB (Energy Efficient Buildings - Edifici a zero consumo energetico in distretti urbani intelligenti):* aimed at increasing the energy efficiency of buildings and urban districts, through real-time monitoring and control of environmental parameters and the consumption / production of the necessary energy (https://www.eebportal.it/: MISE Italian Ministry project, bando MIUR Cluster Tecnologici Nazionali, Cluster Smart Community) - Partner in *MIND FoodS Hub project* (Regional project): Innovative concept for the eco-intensification of agricultural production and for the promotion of food models for human health and longevity through the creation of a digital Hub food system within MIND - *Hexa-X: A flagship for B5G/6G vision and intelligent fabric of technology enablers connecting human, physical, and digital worlds*: advanced future wireless communications; technologies, architectures and artificial intelligence-enabled networks (Beneficiary of European Grant Agreement Nr. 10101595; H2020-ICT-2018-20)

PART C - CHARACTERISTICS, FEASIBILITY AND CONTROL

C1. Critical mass

MUSA ecosystem includes **24 institutions**, 4 universities involved as founders of the Ecosystem (UNIMIB, UNIMI, POLIMI, UNIBOCCONI), 20 private and public companies organized in 6 **spokes**.

The four universities decided to undertake a synergy based on different but complementary vocations: UNIMI and UNIMIB are generalist universities, while POLIMI and UNIBOCCONI specialize in design-engineering, economics, and finance, respectively. This research component thus established rests well with the Milanese and Lombard industrial tissue, characterized by: (i) the presence of complete and competitive production facilities; (ii) a notable presence of SMEs and large companies capable of cooperating and responding to needs emerging from the social fabric; and (iii) a solid support from government bodies aimed at increasing the solidity of the supply chains and international competitiveness.

Affiliates to the Spokes have been identified in the Lombard industrial ecosystem. The involved companies have recognized leadership in energy, sustainability, smart cities and mobility, environmental monitoring, communication and health. Moreover, they undertake massive R&D in these frontiers of technology and more in general, in innovation, thus placing themselves as perfect partners in the MUSA ecosystem.

C1.1 Human resources

Table C1 represents the figures of the critical mass that will be involved in the Ecosystem, displaying – with the granularity of years, spokes, and affiliated entities - the total number of employed resources, also highlighting those with and effort equal or bigger than 3 person-months per year (PM/y).

Table C1. Critical mass for each spoke, indicating the total number of persons employed per year, and the number of persons with a minimum effort of 3 months/year.

Spoke	Subject	Year 1		Year 2		Year 2	
		No. per.	No. per. min 3PM	No. per.	No. per. min 3PM	No. per.	No. per. min 3PM
Spoke 1	**UNIMIB**	67	21	61	23	59	23
Spoke 1	POLIMI	10	4	10	4	10	4
Spoke 1	UNIMI	17	8	16	6	15	6
Spoke 1	UNIBOCCONI	8	4	8	4	8	4
Spoke 1	ENI	7	4	7	4	7	4
Spoke 1	EDISON	8	4	8	4	8	4
Spoke 1	PIRELLI	7	4	7	4	7	4
Spoke 1	THALES	10	7	10	7	10	7
Subtotal Spoke 1		**134**	**56**	**127**	**56**	**124**	**56**
Spoke 2	**UNIMI**	55	48	55	46	55	46
Spoke 2	POLIMI	11	4	11	4	11	4
Spoke 2	UNIMIB	27	6	27	6	27	6
Spoke 2	UNIBOCCONI	11	4	11	4	11	4
Spoke 2	ALMAVIVA	19	19	19	19	19	19
Spoke 2	TIM	7	4	7	4	7	4
Spoke 2	ASTRAZENECA	7	4	7	4	7	4
Spoke 2	NOVARTIS	7	5	7	5	7	5
Spoke 2	BRACCO	8	4	8	4	8	4
Spoke 2	BIO4DREAMS	7	5	7	5	7	5
Subtotal Spoke 2		**152**	**103**	**151**	**101**	**152**	**101**
Spoke 3	**POLIMI**	41	31	41	31	41	31
Spoke 3	UNIMI	7	4	7	4	7	4
Spoke 3	UNIMIB	24	15	24	15	24	15
Spoke 3	UNIBOCCONI	9	4	9	4	9	4
Spoke 3	FONDAZIONE POLIMI	19	18	19	18	19	18
Spoke 3	OI	7	4	7	4	7	4
Spoke 3	CAMOZZI	7	6	7	6	7	6
Spoke 3	HUAWEI	9	7	9	7	9	7
Spoke 3	HUMANITAS	7	4	7	4	7	4

Spoke 3	INFINEON	7	4	7	4	7	4
Spoke 3	A2A	7	4	7	4	7	4
Subtotal Spoke 3		**144**	**101**	**144**	**101**	**144**	**101**
Spoke 4	**UNIBOCCONI**	16	5	16	5	16	5
Spoke 4	POLIMI	19	18	19	18	19	18
Spoke 4	UNIMI	19	6	19	6	19	6
Spoke 4	UNIMIB	13	4	13	4	13	4
Spoke 4	RCS	7	4	7	4	7	4
Spoke 4	FBK	7	4	7	4	7	4
Subtotal Spoke 4		**81**	**41**	**81**	**41**	**81**	**41**
Spoke 5	**POLIMI**	26	5	26	5	26	5
Spoke 5	UNIMI	11	4	11	4	11	4
Spoke 5	UNIMIB	19	11	19	13	19	11
Spoke 5	UNIBOCCONI	10	6	10	6	10	6
Spoke 5	LUMSON	9	4	9	4	9	4
Subtotal Spoke 5		**75**	**30**	**73**	**32**	**75**	**30**
Spoke 6	**UNIMIB**	60	17	59	14	61	16
Spoke 6	POLIMI	21	5	21	5	21	5
Spoke 6	UNIMI	29	20	29	20	29	20
Spoke 6	UNIBOCCONI	16	4	16	4	16	4
Spoke 6	EDISON	7	4	8	4	8	4
Spoke 6	OI	7	4	7	4	7	4
Spoke 6	THALES	7	4	7	4	7	4
Subtotal Spoke 6		**147**	**58**	**147**	**55**	**149**	**57**
Total		**733**	**389**	**725**	**386**	**725**	**386**

An overall total of 680 persons is included (this differs from the global value in Table C1 since some persons are involved in more Spokes) with 278 women (41%) and 96 researchers having obtained their PhD less than ten years ago (14%).

The CVs contributing to the critical mass have been selected according to the following criteria: (i) <u>for the academy,</u> they have been chosen on scientific excellence on relevant topics to the individual spokes' objectives and commitment to the project; (ii) <u>for the non-academy,</u> they have been selected to balance high-tech expertise in sustainability issues with managerial background.

Gender balance and empowerment of excellent young researchers have also been considered, as detailed in Sections C4 and C5, respectively.

In each of the 4 universities acting as spokes (UNIMIB, UNIMI, POLIMI, UNIBOCCONI), the selection process has been initiated by an internal mapping of competences, which has been followed by an informal expression of interest by researchers and professors, a selection of the most prominent CVs to build working groups. A relevant criteria in the definition of the working groups is the valorization of the existing initiatives, favoring those activities and strategies more ready to be translated outside research.

C2. Governance and legal structure of the Ecosystem

The Hub will take the legal form of a limited liability consortium (*società consortile a responsabilità limitata*). A limited liability consortium is endowed with all the legal and administrative tools apt to administer large-scale projects and their budgets, and provides the advantage of being regulated by the same principles governing limited liability companies (*società a responsabilità limitata*), with reference to both the internal functioning of its internal bodies and the relationship with third parties, in terms of asset partitioning. The choice of a limited liability consortium fully meets the requirement of providing the hub with a stable and reliable structure as well as with a separate legal personality.

The limited liability consortium ensures the active participation of public and private Universities, territorial bodies and privates involved in the project (hub founding members) that were selected after a call of interest (https://www.unimib.it/ricerca/avvisi) issued by the University of Milan-Bicocca.

The limited liability consortium envisages four types of shareholders:
A. The 4 public and private Universities: Università degli Studi di Milano – Bicocca, Università degli Studi di Milano, Università Bocconi and Politecnico di Milano
B. Territorial Bodies: Regione Lombardia and Comune di Milano

C. Foundations: Fondazione Cariplo and Fondazione Riccagioia 5.0
D. Companies: Eni Spa, Edison Spa, A2A Spa, Thales Alenia Space Italia Spa
E. Public research bodies: Consiglio Nazionale delle Ricerche (National Research Council).

The Milan metropolitan area (MMA) is one of the major research hubs in Europe and the MUSA project targets it through an ambitious research programme for urban regeneration. The MUSA project aims at exerting a deep impact on Higher Education and specialization in the MMA, which will have social, scientific, and economic spillovers. From a scientific point of view, the research programme is going to have wide-reaching effects in terms of research quality, scientific relevance, research outcomes, the advancement of knowledge, strengthening human capital in R&I, and spreading the Open Science concept.

The research activities of the six Spokes are expected to have a significant scientific impact. Spoke 1 scientific impact consists in improving knowledge of the urban ecosystem dynamics and services; defining effective tools to promote environmental protection and biodiversity in the urban context and developing a predictive tool for recovery processes through an online technology platform. Spoke 2 scientific impact is ensured through the creation of a digital infrastructure for the swift exchange of data related to life sciences and medicine, which will make possible the production of advanced preclinical, clinical, and diagnostic research that will constitute a relevant knowledge tool to raise the awareness of all the territory stakeholders. Spoke 3 aims to favor the impact of academic and non-academic research by enhancing research dissemination, fostering knowledge transfer and supporting the implementation of living lab projects as an organized approach to open innovation consisting of experimentation in real life and active involvement of users through different methods that involve multiple stakeholders. Spoke 4 will contribute to advance the knowledge of behavioral dimensions in financial decision-making along with promoting the awareness and the diffusion of knowledge related to impact investing and sustainable finance. Spoke 5's main scientific impact consists in the production of extensive research for the development of sustainable practices and innovative technologies among the overall fashion/luxury value chain at a regional, national, and European level. Finally, Spoke 6 will contribute to advance the knowledge of the drivers of social sustainability along with the factors hampering and fostering inclusion and wellbeing. This spoke is supposed to have a particularly significant social impact by providing, for example, innovative models against social inequalities and organizing initiatives (public engagement, education) to raise awareness and disseminate best practices.

The MUSA project Hub will take the form of a limited liability consortium, envisaging the active participation of public and private universities, territorial bodies, and private entities. Upon reflecting on the need to maximise the scientific impact of the MUSA research programme, we hereby suggest including a major public research institution in Italy in the MUSA project Hub, notably the National Research Council (CNR). The CNR mission involves carrying out research, promoting the innovation and competitiveness of the national industrial system; promoting the internationalization of the national research system; providing technologies and solutions to emerging public and private needs; giving advice to government and other public bodies and upskilling human resources.

The involvement of the CNR in the MUSA project Hub would ensure that all relevant scientific inputs for each research field are taken on board and that the scientific outputs of the research programme have a wider visibility, far beyond the Milan metropolitan area and Lombardy context. In particular, the National Research Council (CNR) is expected to be involved in the Scientific Committee of the MUSA project Hub. The Scientific Committee is an advisory body and consists of experts with proven technical-scientific competence and experience in managing and coordinating research projects. The Scientific Committee contributes to the definition of the scientific research programme of the MUSA project, and it identifies its scientific guidelines. The CNR would chiefly have the advisory function of steering scientific research in the most appropriate and state-of-the-art research directions. As such, it would represent an advisory type of shareholder in the MUSA project Hub.

We believe that the nature and scale of the suggested research programme are particularly suited to the CNR remit of promoting innovation and competitiveness of the Italian industrial system, because the high TRL embedded in the research programme, generated by pulling together academic and non-academic researchers, will ensure the ready knowledge transfer of research produced. Moreover, one of the key aims of the MUSA project is to involve young researchers and upgrade education and training opportunities, which contributes to the CNR remit of upskilling the human capital in research. The innovation ecosystem fostered through the MUSA project is intended to pave the way to a model of innovation in which Higher Education Institutions and other Research Institutions, Territorial bodies, Foundations and Companies work together to provide technological and innovative solutions to emerging public and private needs, replicable to other metropolitan areas beyond the Italian context. In this way, the MUSA project would also contribute to the internationalization of the national research system. It is evident that the MUSA project would contribute to the CNR mission and, vice versa, the MUSA research programme would benefit from the guidance

provided by the CNR in the Scientific committee to steer research in the most relevant directions. For all these reasons we would be keen to involve the CNR in the MUSA project Hub. CNR will not be Spoke nor Affiliate to a Spoke.

The **management** structure of the limited liability consortium includes:

A. **General Assembly**: the General Assembly is composed of all shareholders. It has the task of supervising and approving the progress of the project and the methods of carrying out the research programme. All shareholders will hold voting rights;

B. **Board of directors**: the limited liability consortium is entrusted to a Board of directors consisting of 5 members, including non-shareholders. The 4 Universities and Regione Lombardia will have the exclusive right to appoint these 5 members.

C. **Board of statutory auditors**: made up of 3 standing members, 1 appointed by public and private universities, 1 appointed by territorial bodies, 1 appointed by privates and 2 alternates, 1 appointed by public and private universities, 1 appointed by privates, is in charge of the statutory audits.

D. **Scientific committee**: The Scientific Committee is an advisory body and consists of experts appointed by all founding shareholders with proven technical-scientific competence and experience imanaging and coordinating research projects. The Scientific Committee contributes to the definition of the scientific programme of the limited liability consortium; provides non binding advices to shareholders; identifies the scientific guidelines of the project. The Scientific Committee draws up an annual report on the activity carried out, submitted for approval to the Board of Directors, and attached, in its final form, to the annual report to the Assembly.

The administrative structure of the limited liability consortium includes the following operational units:

Management, Financial Accounting and reporting	- Ensuring timely implementation of the Research Programme as approved - Ensure traceability of expenses and avoidance of double funding of operations through a separate accounting system and information coding procedures - Producing, on a bimonthly basis, reports on the activities of the Hub, highlighting the achievement of intermediate and final milestones and target; reports of expenses incurred and report on realisation indicators. - Producing a final technical report detailing the implementation of the Research Programme and ensuring transmission of data relating to the lines of activity to allow for the preparation of annual reports - Ensuring the correctness, reliability and consistency of the financial, physical and procedural data of the operations and compliance with the relevant information system requirements - Providing any relevant documentation and information relating to implemented procedures and expenses incurred by the Research Program - Ensuring visibility of the Union funding, by providing coherent, effective and proportionate targeted information to multiple audiences
Monitoring and control	- Carrying out the managerial, administrative and financial controls of the operations as required by law - Facilitating verifications by the authorized bodies, including on-spot verifications, on the beneficiaries of the loans, including on the Hub, the Spokes and the affiliated entities - Guaranteeing a sound conservation of project documentation and of supporting documents relating to expenses incurred to ensure traceability of operations
Regulatory affairs	- Ensuring compliance of all activities with relevant EU and national legislation, including on state aid - Guaranteeing compliance with the "Do no significant harm" (DNSH) principle in the assessment and implementation of activities - Adopting measures to ensure compliance with the principle of sound financial management, in particular concerning the prevention of conflicts of interest, fraud, corruption and the recovery of unduly assigned funds - Ensuring compliance with any regulatory provisions, guidelines and technical instructions issued by relevant national and EU entities involved in the implementation of the Research Program
Service centre: Selection of Operations	- Selecting relevant activities and promptly starting them in order not to incur in implementation delays, providing a specific date for the start of the operational phase - Managing and mitigating the risks associated with the implementation of the Research Programme

and Risk Management	● Identifying any factors that may affect the timing of implementation and expenditure as defined in the time schedule

The organizational model envisaged for the limited liability consortium to carry out the management and coordination activities required by the Research Programme, includes a Board of Directors, which will recruit a Programme Research Manager and is responsible for implementing the planned activities. The Research Manager will be supported by the Hub operational units, each assigned with specific functions relating to the obligations of the promoting entity. The organizational model of the Hub, through its limited liability consortium, is represented in Figure 4.
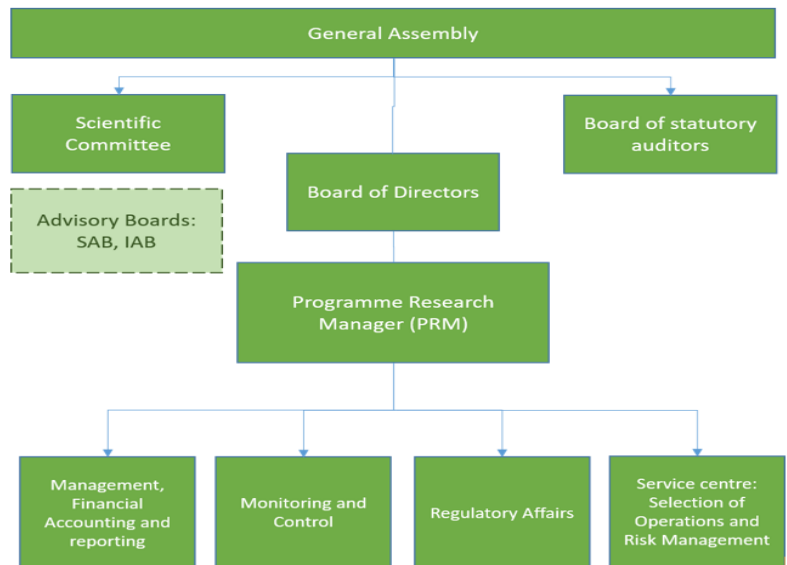

Figure 4. Proposed Governance Structure for the MUSA Hub.

C3. Feasibility

MUSA feasibility builds on combining several factors which ensure the achievement of the project targets:
● The outstanding scientific and technological reputation of all the players – academic and non academic- involved in the Ecosystem (see section B);
● The ecosistem builds on the vocation of academy, industry, citizens and public institutions operating in the territory (see section A);
● An efficient management structure for the Hub and Spoke model (Section C2), combined with the proven high-level managerial capacity of the members of the Hub;
● the high level of maturity of the technologies, processes and services employed in the activities and promoted for scale up and transfer to the local environment;
● balance of competencies and complementarity of expertise, at the level of each spoke, also favoring cross-fertilization and interdisciplinarity. Tables C2 to C13 summarize these aspects, where the macro-areas of knowledge and the role for each spoke and affiliated is outlined;
● an adequate investment balance between the existing (table C1) and future (section C3.3) human resources to be selected accordingly to the best practice international criteria.

A key element to ensure the project feasibility is a reliable and well-structured work plan, along with a set of indicators to effectively monitor and assess the progress of the whole project (Section C7). The planned intervention entails research, innovation and knowledge transfer efforts and relies on a large number of activities addressing a vast variety of identified critical aspects of the innovation ecosystem. Each spoke of our ambitious program is aimed at producing effective, scalable and transferable solutions. The modularity of the project provides high maneuverability and robust control; the overall project architecture will assure a high level of coordination and integration among modules. To guarantee the feasibility of the project and the achievement of expected results a detailed *Monitoring Strategy* has been outlined in Tables *C.3*, *C.5*, *C.7*, *C.9*, *C.11* and *C.13*, respectively listing *Targets* and *Milestones* for each Spoke activities at high granularity. This Strategy will serve the function of monitoring and controlling the planned activities, costs and timing of the overall project. The high number of professionals and academics involved, with previous experience in participating and managing projects, WPs and tasks is also guaranteeing a high level of capacity in the formulation and full completion of expected results. A preliminary risk assessment is provided in Table C.20.

The proposal is admittedly but intentionally complex, with activities structured in several Work Packages and Tasks within the 6 Spokes. The structure was conceived as such to reflect the breadth of the proposed activities, while at the same time maintaining the thematic classification offered by the spokes, which – although strictly interconnected within the ecosystem – tackle each one a different challenges of MUSA.

Spoke 1, **Spoke 2** and **Spoke 6** are connected by the common goal of the construction of neighborhoods and urban infrastructures for promoting the healthy and sustainable lifestyle and well-being and the social inclusion. This will be addressed by the different perspectives of urban regeneration planning, big data exploitation in Life Science, social inclusion and participatory approaches. The need to create new start up/spin off and companies able to promote the processes and products (e.g. new materials, new services, new forms of communications) of the MUSA ecosystem is well represented within **Spoke 3** and **Spoke 5**, which will be a flywheel for industrialization of developed solutions and findings, Tech Transfer, Economic Sustainability. With its specific focus on the aspects of design and enhancement of urban culture, **Spoke 5** – serving as an engine of creativity for city regeneration – exhibits a strong link with **Spoke 1**. The connections with **Spoke 4** concern the development of financial instruments for the realization of the urban ecological transition and the overall enhancement of the urban ecosystem services. Through the promotion of impact investing and sustainable finance, **Spoke4** will foster social tech entrepreneurship which will contribute to new business idea deal flow (**Spoke 3**) and development of new tools and strategies to boost and favor social inclusion and innovation (**Spoke 6**).

C3.1 Work Plan

As detailed in section B, MUSA is structured in work packages and associated tasks. The following Tables C2 to C13 complement the previous description, outlining - for each spoke - the participants' expertise (including the contribution of the industrial sector in the spoke's activity) and the targets and milestones foreseen within each WP. Each table lists for every affiliated the department involved, as well as the macroareas of expertise provided in the project.

Spoke1: Urban Regeneration - Cities of Tomorrow

Table C.2: Major competencies and responsibilities of participants to Spoke1.

Spoke/ affiliated	Departments / centers / operational units / headquarters	Macro-area of expertise / role in the project
UNIMIB	Departments of: - Biology and Biotechnology - Earth and Environmental Sciences - Materials Science - Sociology and Social - Business and Law - Informatics, Systems, and Communication	Environmental analysis and geothermic studies Biodiversity, industrial biotechnology and and molecular diagnostics Energy and circular economy Mobility and smart solution for urban regeneration.
POLIMI	Department: - of Architecture and Urban Studies; - ABC: architecture, building and construction; - of Electronics Information and Bioengineering; - of Design	Urban planning Urban architecture Urban Design
UNIMI	Departments of: - Environmental Science and Policy, - Veterinary Medicine and Animal Science - Biosciences, - Cultural Heritage and Environment - Languages, - Economics, Management and Quantitative Methods	Study of biodiversity and pest Study of ecosystem services Study of human behavior

UNIBOCCONI	SUR Lab (Sustainable Urban Regeneration Lab)	Urban regeneration Economic valuation Environmental Economy Policy assessment		
ENI	Various R&D (Research & Development Chemistry New feedstocks and energy vectors research center) *San Donato (Milan)*	Fuel production		
EDISON	Facility Solutions Portfolio Management Development & Technological Innovation	Energy production and Distribution		
PIRELLI	Smart Mobility *(Milan)*	Smart Cities and Sustainable Mobility		
THALES	Engineering and R&D Vimodrone and Gorgonzola (Milano)	Aerospace and Environmental monitoring		

Table C.3: Targets and Milestones for Spoke1 activities.

Type	No.	Short description	Means of verification/KPI	Month
		WP1: Natural, Biological and Human resources for Urban regeneration		
Targets	T1.1	1-development of aggregate sensors for environmental and biological analyses	N. of prototypes made, levels of automation and digitization	12
	T1.2	SaaS solution for urban regenerations	Prototype platform running in a controlled environment	30
	T1.3	Economic evaluation method based on the ecosystem services approach to assess urban regeneration	platform release (versions, updates) presentation to users, companies	12/24
	T1.4	Building environment safety models	release of safety models, presentation to end users, private companies, institutions.	30
	T1.5	Legal engineering of a collaborative framework with multilateral approaches	Document release	6
Milestones	MS1.1	Sensors and sampling points positioning; calibration of tools and questionnaires	N. of sensors; trial test	12
	MS1.2	Scientific validation of simulations and Phygital platform (beta release 1)	Validation of the base case Model against known parameters and results	12
	MS1.3	Experimental pilots in a testing area; first simulation of information integration	Qualitative and quantitative performance.	12
		WP2: Redesigning industrial urban production processes		
Targets	T1.6	Recycle oriented characterization of the different wastes in different urban contests	report, database	12
	T1.7	Technical evaluation to address biomase to recycle/upcyle processes.	Report and SOP (standard Operating Procedures).	18
	T1.8	Innovative biomaterials, biofuels, robust microbial cell factories, novel enzymes	Report and possible development and protection of IP	24/30

	T1.9	Development of databases of the best performing microorganisms and enzymes	Databases	30
	T1.10	Executive courses to promote sustainable urban regeneration projects	n. of participants in the executive course	36
Milestones	MS1.4	Verification of characterization methods for the waste from the urban territory.	Internal audit on the comprehensiveness of the characterization	12
	MS1.5	Assessment of products that match industrial and commercial requirements	Open discussion with the external stakeholders	18/30
	MS1.6	Launch of living lab business model experimentation	n. of participants in the living lab; n. of experimented business models	30
WP3: Energy solutions for urban regeneration			

Targets	T1.11	Innovative solutions (technological and economic) for Energy Efficiency	n. of customers reached by the spin-off company	36
	T1.12	Indicators and assessment methodologies for positive energy buildings	Level of comprehension and adoption of of indicators	12
	T1.13	Test and evaluation of the pilots/prototypes for urban regeneration	number of prototypes tested and level of interest raised for scale adoption	36
Milestones	MS1.7	Set of concepts and nomenclature, based on the most updated energy Standards	Workshop with a simulated analysis of an efficiency/renewables/ economic tools	6
	MS1.8	Equipment Installation	Protocol to allow companies to access the photovoltaic testing infrastructure	12
	MS1.9	Calibration of tools and system	Hardware and Digital model ready to be used. Number of MoI and engagements	12
	MS1.10	Set of metering systems for assessing energy and comfort performance	Test of the support tools on plausible technologies and virtual use cases	20
	MS1.11	Scientific validation of the technical and digital innovations in the two areas	N. of companies involved	30
	MS1.12	Support tools tested on a set of pilot components installed in indoor and outdoor	Final Test of the support tools on real technologies and use cases	36
WP4: Safe, smart, intermodal and sustainable mobility			

Targets	T1.14	Development of demonstrators of accessibility enhancement street furniture	N. of stakeholders; number of innovative solutions tested	36
	T1.15	Wayfinding mobile app including tool for modal shift and mobility behavior change	Availability of the app in the stores	36
	T1.16	Experimentation on mobility credits and rewarding schemes in living labs	N. of citizens and companies involved in experiments; N. of mobility management plans integrated with mobility tradable credit and rewarding schemes	36
Milestones	MS1.13	Co-design of integration of sensors to selected urban design and lighting solutions	Report of urban furniture aimed at enhancing accessibility and mobility	18
	MS1.14	Wayfinding app to enhance the accessibility of the neighborhood	Reports on the software architecture, user interface and algorithms used by the app	18
	MS1.15	Co-design of the tokenization decentralized prototype for virtuous mobility behavior	Report on best practices about leveraging mechanisms and on software architecture	24

	MS1.16	Set up of experiments on mobility credits and rewarding schemes in living labs	Experiment is set up and ready to start	24

Spoke2 - Big Data-Open Data in Life Sciences

Table C.4: Major competencies and responsibilities of participants to Spoke2.

Spoke /affiliated	Departments / centers / operational units / headquarters	Macro-area of expertise / role in the project
UNIMI	Departments of: - Biosciences; - Pathophysiology and Transplantation; - Oncology and Hematology-Oncology; - Pharmaceutical Sciences; - Biomedical and Clinical Sciences; - Biomedical Sciences for Health; - Biomedical, Surgical and Dental Sciences; - Computer Science "Giovanni degli Antoni"; - Chemistry; - Physics; - Economics, Management and Quantitative Methods - Pharmacological and Biomolecular Sciences	Life Sciences; clinical and biomedical research; Big Data to develop and share new technologies in life sciences; Digital Technologies and Artificial Intelligence; Synthesis of target biomolecules; Production of artificial organs; Economical impact of a research infrastructure for the collection of big data in life science.
POLIMI	Departments of: - Electronics, Informatics and Bioengineering; - Design; - Chemistry, Materials and Chemical Engineering	Bioengineering, engineering technologies and methods; Artificial Intelligence Technologies; High Performance Computing, Smart Sensors and Big Data; Health Sciences and Technologies; Smart Cities and Smart Mobility; ICT; e-health; Biomechaniscs; technologies for diagnosis, therapy and rehabilitation. Chemistry, chemical engineering, materials science engineering and bioengineering: bio-inspired 3D printing; nanomedicine, nanomaterials and biomaterials. Service design: design of digital, physical and hybrid physical/digital services. Interaction design; UX/UI: design of interfaces; Design research: investigation of contexts and behaviors, mental model mapping, ethnography, digital ethnography
UNIMIB	Departments of: - Mathematics and applications; - Statistics; - Informatics, Systems and Communications; - Earth and Environmental Sciences;	Health and Life Sciences/Sports Medicine/Psychology: Development and implementation of population screening activities using cutting-edge services and digital technologies in order to promote people engagement in disease prevention and healthy lifestyle adoption. Creation of digital databases and application of AI and machine

	- Psychology; - Sociology and Social Research. School of Medicine and Surgery. Postgraduate School in Sports Medicine	learning techniques for the identification of risk predictors. Implementation of prevention services at school, at work and remotely Psychology/Computer Science/Informatics: Maximising the impact of interactive technologies and data collection on individual capabilities, work safety, and behavioral change
UNIBOCCONI	- Department of Social and Political Science - Centre for Research on Health and Social Care Management (CERGAS) - LIFT Lab (Life Sciences and Biotech) - B4i (Bocconi for Innovation) - ICE (Innovation and Corporate Entrepreneurship) - SDA Bocconi School of Management	Health and Life Science: Development of the digital transition for understanding the population's health needs. Introduction of medical technologies and biosciences applications (e.g., mhealth, tele-medicine, AI, ML, big data, 3D printing, MT&BA etc.) to quantitively measure the impact on people's health and wellbeing. Carrying out applied research and education programs.
ALMAVIVA	Head Office - Milan	Health and Life Sciences; Connectivity and Communication. Development of ICT Platforms for integrating big data; Development of Innovative E-Health Solutions
NOVARTIS	Head Office - Milan	Health and Life Sciences. Development of technological innovation in monitoring, early detection of diseases and health
TIM	Head Office - Milan	Health and Life Sciences; Connectivity and Communication. Development of novel artificial intelligence-based devices; Development of novel technologies for early detection of diseases; Development of wearable devices and technologies for telemedicine, data collection and health prevention;
BRACCO	Head Office - Milan	Health and Life Sciences/ Development of AI based predictive algorithms; Development of software for the diagnosis of diseases
ASTRAZENECA	Head Office - Milan	Health and Life Sciences. Development of AI based predictive algorithms; Development of software for the diagnosis of diseases
BIO4DREAMS	Head Office - Milan	Health and Life Sciences. Development of platforms for enhancing communication and interaction of big data

Table C.5: Targets and Milestones for Spoke2 activities.

Type	No.	Short description	Means of verification/KPI	Month
WP1: A holistic, innovative digital architecture for the storage and safe exchange of life sciences big data				
Targets	T2.1	Platform for the management of the lifecycle of biomedical data and information collected from the monitoring of human behaviours	N. Biomedical data uploaded on platform	12

	T2.2	Marketplace of services based on the emerging needs of the research community in life science	N. services available N. access to services	30
	MS2.1	Definition of protocols for the data management	N. protocols validated	12
WP2: Using Big Data for the development and sharing of new technologies in life sciences and medicine research				
Targets	T2.3	*Instrumentation technology Centre:* research structure	Analysis for selection of citizens	12
	T2.4	*3D models:* 3D models of human organs for surgical planning, training and lifelong learning	N. created models	18
	T2.5	On-demand system to synthetise molecules of interest	N. process discovery, synthesis and characterization	24/30
	T2.6	Flexible methodological framework to integrate mechanical models and data analysis driven by Artificial Intelligence	N. digital twins developed for specific applications; number of scientific publications	24/30
Milestones	MS2.2	Create an open source ontology as common base for data collected by sensors devices used at home	N. activation devices used at home	12
	MS2.3	Create ontology mappings to interpret free text communications between patients and clinicians	N. involved patients	18/30
	MS2.4	Create a data pipeline able to readily interact with data storage and data analysis systems	Tools to validate data storage	30
WP3: Big data and innovative approaches to improve global health and wellbeing				
Targets	T2.7	Structured platforms for multi-source data integration and real-time analysis	N. data uploaded	20
	T2.8	Opening a university service for cardiovascular, visual/defects eye diseases prevention and sport medicine	N. access to service	30
	T2.9	Definition of wearable technologies for monitoring subjects at work	N. workers to be involved	36
Milestones	MS2.5	Development of new strategies for diseases prevention	N. Guidelines to integrate prevention strategies	6
	MS2.6	Defining new scores and indicators for risk stratification of non-communicable diseases in the general population	N. defined indicators	12
	MS2.7	Definition of a comprehensive framework to assess the citizens' and professionals' antecedents, the managerial tools and co-production outcomes	N. cases for assessment	12
WP4: Development oftechnologies and customizable tools for continuous monitoring, wellbeing and health				
Targets	T2.10	Wearable and m-health solutions for data collection during common and/or specific activities	Performance evaluation of m-health solutions	12
	T2.11	Models for screening and stratification of the population on the bases of risk conditions	Performance evaluation of the developed predictive models; Evaluation of the clinical and biological relevance of the identified features	12

	T2.12	Development of serious games to support learning in schoolers and for early screening	Number of involved institutions and people in the territory	20
	MS2.8	Identification of specific use-cases	N. selected use-cases	6
WP5: Develop, implement and sustain technological innovation in health				
Targets	T2.13	Start-ups/project selection	Effective business development and acceleration measured in terms of number of innovative business ideas / start-up projects cared for	12
	T2.14	Key principles needed to guide manufacturers, policymakers, regulators and end-users of MT&BA in the assessment of the development phase	Level of readiness of organisations and institutions in adopting healthcare innovation	20
	T2.15	Development of key principles needed to establish, or to reform, current organisational processes and structures	Development of a general model aimed at supporting the planning process in the short-, medium- and long-run	20
	T2.16	Development of educational programmes	Improvement of competences in implementation science and change management	20
Milestones	MS2.9	Open call for start up selection	N. start ups included	30
	MS2.10	Development of key principles for guiding manifacturers, policymakers, regulators and end-users of MT&BA	N. guidelines for involving subjects	20
WP6: Economical Impact of a structured collection of big data in life sciences				
Targets	T2.17	Completion of the process	Identification of the nature of use and non-use benefits associated; relevant metrics; measurement of benefits; measurement of the net present value	30
	MS2.11	Social Assessment of cost-benefits analysis	Assessment and measure of the total costs associatated to the project	12

Spoke3 - Deep Tech: Entrepreneurship & Technology Transfer

Table C.6: Major competencies and responsibilities of participants to Spoke3.

Spoke / affiliated	Departments / centers / operational units / headquarters	Macro-area of expertise / role in the project
POLIMI	Dept. of: Aerospace Science and Technology; Architecture, Built Environment and Construction Engineering; Chemistry, Materials and Chemical Engineering; Civil and Environmental Engineering; Electronics, Information and Bioengineering; Energy; Management, Economics and Industrial Engineering; Mathematics; Mechanical Engineering; Physics;	Horizontal: summer/winter schools, MOOCs, TT, entrepreneurship, living lab and POC development; idea design and prototyping; citizen and company engagement; development of innovative start-ups; smart educational tools; cascade funding, incubation/acceleration; lightweight infrastructures; venture building service; STEM courses; business models; market engagement strategies, impact assessment. Vertical: photonics; batteries and energy storage; hydrogen; smart manufacturing, advanced and building materials; environmental remediation; aerospace; Medical devices and smart sensors, Digital Health, Life sciences and bioeconomy; technologies for sustainability.
UNIMIB	Dept. of: Economics, Statistic and Management; Business and Law;	Economics; TT; management of RI; nudge; Joint Labs on electronic devices; market and financial strategies;

	Physics; Materials Science; Biotechnology and Biosciences	development of platform for innovators; entrepreneurial education;		
UNIMI	Dept. of: Physics; Pharmaceutical Sciences; Chemistry	Medical technologies; smart devices; economic impact; TT; education.		
UNIBOCCONI	Dept. of: Management and Technology; Legal Studies; Finance	Entrepreneurial culture; finance and venture capital; business acceleration; networking and engagement.		
FPM	Head Office: Milano	Research Capitalisation, TT, support to new entrepreneurship, networking		
OI	Head Office: Milano	Innovation Management, Open Innovation, TT		
CAMOZZI	Units in Milano, Brescia and Polpenazze	Electronics, automation, energy saving		
HUMANITAS	Head Office: Milano	Health data, medical and ethical aspects		
A2A	Headquarters:Milano and Brescia	Energy		
HUAWEI	Unit: Segerate (Milano)	Technologies for communication, device characterization and modeling		
INFINEON	Development Center (Pavia)	Development of semiconductor-based devices, testboards, digital twin systems and machine learning		

Table C.7: Milestones and Targets for Spoke3 activities.

Type	No.	Short description	Means of verification/KPI	Month
WP1: Increase Qualified Deal Flow				
Targets	T3.1	Development of the best research projects and business ideas	Increased TRL; KPI: number of projects.	36
	T3.2	Training courses to promote a growth mindset, a propensity for risk and values aimed at creating a business	Courses made available to undergraduate and graduate students; KPI: number of participants.	30
	T3.3	MOOCs on innovation, technology transfer and entrepreneurship	MOCCs available; KPI: number of MOCCs and participants	30
	T3.4	Idea Contests/Challenges	Report on contests and participation; KPI: number of contests and ideas submitted	12,24
	MS3.1	Identification of best ideas	Output of the evaluation; KPI: number of selected ideas	6
	MS3.2	Scouting of entrepreneurial opportunities	KPI: Number of identified opportunities	12
WP2: Design and test Innovation: Proof of Concept, Pilot and Living Lab				
Targets	T3.5	POC Final Report	KPI: Number of approved reports	36
	T3.6	Living Lab - Urban natural resources	Impact assessment based on KPIs	30
	T3.7	Living Lab - Mobility	Impact assessment based on KPIs	30
	T3.8	Living Lab - Battery Recycling	Impact assessment based on KPIs	30
Milestones	MS3.3	POC Activity Progress Report	Stage evaluation; KPI: number of teams	12,22,32
	MS3.4	Pilot and Living Lab selection	Completion of selection procedure; KPI: number of Living Labs	6
WP3: Start up Incubation and Acceleration				
Targ	T3.9	Shared strategy for new entrepreneurship at the territorial level	Strategic development document; KPI: number of services	10

	T3.10	Co-design of pre-acceleration activities	KPI: number of fields, involvement of future female entrepreneur	10
	T3.11	Learning environment (portal) where start-ups and SMEs	Portal release and online test of educational tools; KPI: number of start-ups, SMEs and users	15
	T3.12	Startup Funding Lab creating a point of contact with investor	Events organized with VCs and investors; online tools available; KPI: number of participants and users	36
	T3.13	B4i Acceleration to bring startups from prototype stage to product-market fit	Grant applications received and evaluated; KPI: number of accelerated ideas	12
	T3.14	Contamination events with international TTOs and incubators	KPI: number of events and participants	10,20, 30
	T3.15	Lightweight infrastructures	Construction completed and user experience collected; KPI: number of users	30
	T3.16	Venture building service for women entrepreneurship	Design of venture service approved; KPI: number	24
	T3.17	B4i Pre-acceleration for entrepreneurs on an early stage business idea	Grant applications received and evaluated; KPI: number of pre-accelerated ideas	12
	T3.18	Legal clinics	Up and running; KPI: Number of startups using the legal clinics	18
Milestones	MS3.5	Call for ideas definition and launch	Call opened; KPI: number of participants	10
	MS3.6	Granting call for ideas	Evaluation complete; KPI: number of granted projects	14
	MS3.7	Hardware solution identification for identified technologies	Enabling hardware facilities identified; KPI: number and disciplines	10
	MS3.8	Hardware solution implementation	Prototype facilities made available to participants; KPI: number of activities	22
	MS3.9	Integration of hardware support and rapid prototyping in incubation activities	Deal flow supported and access to rapid prototyping granted; KPI: number	32
WP4: Innovation4SMEs and Companies				
Targets	T3.18	Joint Labs with industrial partners to develop and test new devices/materials	Labs operational; number of tested solutions; and SMEs involved	30
	T3.19	New business models and market engagement strategies for Research and Innovation Infrastructure (RII)	Report and business models/cases completed; KPI: number of RII engaged	24
	T3.20	Events and training offered to companies and RII managers	Educational materials; workshops organised; KPI: participants	24
Milestones	MS3.10	Design of Joint Labs	Design validated; KPI: number of Joint Labs and infrastructures	8
	MS3.11	Strategic review of TTO activities	Effective solutions identified in w.r.t. University and market needs; KPI: number of solutions and new R&I collaborative links with SMEs	12

Spoke4 - Economic impact and sustainable finance

Table C.8: Major competencies and responsibilities of participants to Spoke4.

Spoke/ affiliated	Departments / centers / operational units / headquarters	Macro-area of expertise / role in the project
UNIBOCCONI	1. The eSG Lab: excellence in Sustainability and Governance for SMEs 2. The sustainability Lab 3. The Real Estate Innovation Lab	1. Designing a strategic-organizational model for SMEs to manage ESG risks and fostering sustainability 2. Developing corporate innovation strategy 3. Exploring the relationship between ESG performance and financial indicators

	4. The Bocconi-Algorand Fintech Lab 5. Baffi Carefin (Centre for Applied Research on International Markets, Banking, Finance and Regulation) Departments of : - Economics - Finance - Management & Technology - Accounting	4. Blockchain-based solutions for adoption of the Sustainable Development Goals (SDGs) 5. Producing applied multi-disciplinary research on financial knowledge, financial and pension planning, insurance planning and risk management
POLIMI	1. Sustainability & Societal Challenge Research Group 2. Tiresia Research Centre 3. Fintech & Insurtech Observatory 4. Blockchain & Distributed Ledger Observatory 5. QFinLab 6. MIP Graduate School of Politecnico di Milano Departments of: - Management, Economics and Industrial Engineering - Mathematics - Electronics Information and Bioengineering	1. Intensive research activities on sustainable finance and ESG research 2. Competence center for social impact management and measurement 3. Collecting information on fintech and insurtech industry 4. Managing the Blockchain Innovation and Solutions Hub to promote innovative solutions among small and medium enterprises 5. Applying quantitative methods to ESG risk management and education activity 6. Higher education for sustainability science
UNIMI	1. The Centre of Excellence in Economics and Data Science (CEEDS) 2. The Data Science Research Centre (DSRC) Departments of : - Social and Political Sciences - Computer Science - Economics, Management and Quantitative methods (DEMM) - Law " Cesare Beccaria" - Environmental Science and Policy	1. Research center for better understanding social and technological transformations by empirical approach in economic, business and statistical areas 2. Coordinate research center to foster the centrality of Data Science as a common and unifying approach to cultural, scientific and social challenges
UNIMIB	1. BIB-Behavioral Insights Bicocca Lab Departments of: - Economics, Management and Statistics (DEMS) - Psychology - Business and Law	1. Specialized in behavioral economics studies of public policies and organizations
FBK	Fondazione Bruno Kessler (FBK) Head office (Trento)	- This research institute aims to achieve excellent results in the scientific and technological field with special focus on interdisciplinary approaches and the application dimension

RCS	International newspaper company (Milan)	- RCS MediaGroup is one of the leading multimedia publishing groups and it is active in all publishing sectors such as *Corriere della Sera, La Gazzetta dello Sport, El Mundo, Marca, Expansion, Oggi, and Amica*.

Table C.9: Milestones and Targets for Spoke 4 activities.

Type	No.	Short description	Means of verification/KPI	Month
WP1: Best practice in finance 4 sustainability				
Targets	T4.1	Developing a comparative handbook of impact investing for SMEs and social enterprise	Release of the document	12
	T4.2	Impact Investing Toolkit n.1	Release of the document	24
	T4.3	Toolkit Dissemination Event	Event	24
	T4.4	Impact Speed Date Lab Event n.1 to n.4	N. of SMEs and SEs that participated to the event	36
Milestones	MS4.1	Survey, review, and SWOT analysis of impact finance instruments	N. of instruments reviewed	12
	MS4.2	Survey of SMEs and SEs needs in terms of impact-oriented financing and assessment of their investment readiness	N. of SMEs and SEs surveyed; N. of case studies performed; N. of investment-readiness tests	12
	MS4.3	Design and development of Social-tech Toolkit	N. of investment-readiness assessments; N. of organizations that use the toolkit	24
	MS4.4	Design of an Impact Speed Date Lab to match the needs of impact-oriented enterprises	N. of pitches by social entrepreneurs; Amount of financial resources allocated to impact-oriented enterprises	36
WP2: Financial education				
Targets	T4.5	Educational videos and video interviews	N. of Views	18
	T4.6	Lab conference and creation of the website	N. of events; N. of users	6, 14
	T4.7	MOOC English and Italian versions	N. of views	20
	T4.8	Public Event (joint Unimi-FBK event)	N. of participants	30
Milestones	MS4.5	Opening the Bocconi Sustainable finance training lab for use in a distance format	Square meters for the Lab; N. of visitors	12
	MS4.6	Design, experiment and debiasing techniques to improve financial decision making	N. of projects to be implemented; N. of experiments carried out; N. of techniques developed	12/36
	MS4.7	Setup of an Edufin Lab	N. of beneficiaries	12
	MS4.8	Production of Massive Open Online Course (MOOC) and development of teaching material	N. of MOOCs produced; N. of organizations involved in training program	24
	MS4.9	Setup the website "Centre for the Evaluation of the Economic Impact of Public and Private Investments" and develop its learning content	One fully-fledged website; N. of newly posted materials on website	12/36
WP3: Impact analysis & sustainability measurement				
Targets	T4.9	Methodological Reports, Case studied, Papers	N. of reports reading; N. of case studied	12
	T4.10	Creation of the Spoke Website, the Lab Website and the testing platform	N. of users; Creation; N. of users of the platform	6

Milestones	T4.11	Spoke conferences and educational videos	N. of events; N. of participants; N. of views;	6, 12, 18, 24
	T4.12	4 PhD thesis on policy analysis issues	N. of Monographies	Post-end
	MS4.10	Development of a methodology for sustainability performance measurement and application of this methodology to sectors and to partner companies	N. of sustainability measurement; N. of sectors studied; N. of companies using the methodology	12/36
	MS4.11	Social and environmental impact data collection and development of ESG scoring algorithms	N. of datasets implemented; N. of ESG algorithms developed; N. of tools and instruments developed	12/36
	MS4.12	Set up of a novel industrial PhD in policy analysis with an interdisciplinary perspective	Definition of the full teaching program; N. of courses defined; N. of seminars by candidate PhD students	12/36
	MS4.13	Observatory of sustainable performance of Italian companies with a special focus on SMEs in the Milan area	N. of new data set collected; N. of different projects analyzed	36

WP4: Fintech & tech4fin

Targets	T4.13	Data analytics platform in order to collect publicly available data to produce sustainability and financial risk assessments	N. of stakeholders; number of innovative solutions tested	18
	T4.15	Definition of the business plan and early stage acceleration stage of the fintech venture startup	Production of a detailed business plan; Preparation of the website and software resources to launch the startup	9
	T4.16	Public event	N. of participations	27
Milestones	MS4.14	Reconstruction of existing map fintech business in the Milan area, evaluate sustainability and helping the interaction between fintech and financial incumbents	Construction of a database; Business plan of the fintech venture	12/36
	MS4.15	Understand the link between digital nudging and financial wellbeing in order to design, experiment and disseminate digital nudging techniques to help improve financial decision making	N. of projects to be developed; N. of experiments carried out; Output of the experiments on digital nudging	12/36
	MS4.16	Investigate the potential of fintech solutions for social impact, review potential application of blockchain, and promote the impact of sustainable fintech	N. of tolls developed; N. of fintech organizations using the tools; Qualitative evaluation of each tool;	12/36

Spoke5 - Sustainable Fashion, Luxury and Design

Table C.10: Major competencies and responsibilities of participants to Spoke5.

Spoke/ affiliated	Departments / centers / operational units / headquarters	Macro-area of expertise / role in the project
UNIBOCCONI	Departments of: - Marketing - Management and Technologies	Retail and distribution system; strategies of increasing competition.

	- Social and Political Sciences	Innovation management and marketing. Understanding and valorizing the political and social role of networks and relationships in creative, luxury and sustainable industries especially in leading to the implementation of new businesses and start-ups. Circular and integrated models of a creative and culture-driven economy referred to the field of marketing and management of luxury and fashion-related enterprises.
POLIMI	Departments of: - Management Engineering - Design	Luxury and Fashion Management; Supply chain management; Entrepreneurship; Design Management; Implementing marketing and branding strategies.
UNIMI	Departments of: - Historical Studies - Informatics - Literature and Philosophy - Law - Cultural Heritage	Cultural Heritage and research on the Made-in-Italy districts (fashion, interior design, accessories, etc.); Historical evolution of fashion and luxury industries and brands, the role of consumers, and sustainability; Fashion law: protection of fashion brands and patents, copyrights and legal issues related to the world of fashion, luxury and sustainability; Informatic expertise in semantic analysis and Big Data and creation of blockchains
UNIMIB	Departments of: - Environmental and Earth Sciences - Biotechnology and Bioscience - Medicine and Surgery - Statistics and Quantitative Methods - Physics - Human Sciences for Education	Research and production of new materials related to the field of sustainability; bioprospecting in cosmetics; Process of internationalization of new cultural, academic and economic paradigms related to luxury and sustainability; Occupational Medicine specialized in new processes of production and risks evaluation; Analysys of qualitative as well as statistic data related to customer satisfaction and interviews
LUMSON		Creating a circular system between packaging and product: working on the correlation between sustainability and luxury with different materials; Implementing the integration between product protection and new technologies; Develop different creative and design-related sensitivities in cosmetics and marketing

Table C.11: Milestones and Targets for Spoke5 activities.

Type	No.	Short description	Means of verification/KPI	Month
WP1: Applied research on sustainable practices and innovative technologies				
Targets	T5.1	Maturity model handbook	First version presented to selected stakeholders	18
	T5.2	Library of sustainable materials	Physical archive of materials; database	18
	T5.3	Prototyping lab on sustainable material	Impact assessment based on KPI	24
	T5.4	New sustainable materials, processes, and paradigms developed	Life Cycle Assessment (LCA) completed; KPI: minimum 6 new developments	24

	T5.5	Hackathon with students and professionals	KPI: nr of attendees; nr proposed solutions	36
Milestones	MS5.1	Maturity Model validation	Workshop with academics and industry experts	18
	MS5.2	Official launch and dissemination of the free libraries open to the public	Virtual and physical public "housewarming" events	18
	MS5.3	Definition of the circular economy process or paradigm to be adopted for materials production	Technical report	24
WP2: Achieving a Culture Driven Retail Model through innovative forms of collaboration, incubation, and acceleration				
Targets	T5.6	Incubator Setup (lab equipment for prototyping and production)	supply contracts	12
	T5.7	New sustainable and socially-inclusive ventures	KPI: 3 startups (production and/or retail)	18
	T5.8	Phygital Marketplaces (to connect startups and financial investors and retailers)	KPI: nr of attendees; nr of new contacts	36
Milestones	MS5.4	Smart SL-SMRP Platform Identification	Location contract	24
	MS5.5	Supply Chain Software	Software license subscription	12
	MS5.6	Definition of the business model for the incubator/ accelerator	Business plan	36
	MS5.7	Identification of innovative best practices in the sustainable operation of luxury resorts	Best practices policy brief	24
WP3: Company Training and Cultural Dissemination				
Targets	T5.9	Specialization courses for companies and luxury professionals (creation and delivery); designers; luxury resort staff	Syllabus of the courses; Feedback questionnaires	24
	T5.10	App for dissemination for consumers and the general public	KPI: nr downloads; nr users	36
	T5.11	Exposition for the public in hybrid (physical/digital) form	KPI: nr attendees	24
	T5.12	Interactive labs connecting craftsmanship to the final consumers	KPI: nr attendees; nr involved companies	24
Milestones	MS5.8	involvement of experts and luxury companies in the course programs	Provisional draft of the courses; nr of contacts with companies	36
	MS5.9	Beta-version of the App	Status report on the test results	36
	MS5.10	Implementation of CE creative network	Impact assessment based on KPI; roadmap	36

Spoke6 - Innovation for Sustainable and Inclusive Societies

Table C.12: Major competencies and responsibilities of participants to Spoke6.

Spoke/ affiliated	Departments / centers / operational units / headquarters	Macro-area of expertise / role in the project
UNIMIB	Departments of: - Psychology;	Participatory public engagement; civic engagement; sustainability practices; citizen science and RRI; innovative didactic methods; professionals training; children and youth

	- Human Sciences for Education *Riccardo Massa*; - Sociology and Social Research; - School of Law; - Economics, Management and Statistics; - Physics;	participation; gender equality; women's empowerment; prevention of violence against women; children in disadvantaged situations; prevention of early school leaving; collaborative and inclusive emerging technologies; digital wellbeing; law and pluralism; territorial welfare; outreach in astrophysics.
POLIMI	Departments of: - Architecture And Urban Studies (Dastu); - Architecture, Built Environment And Construction Engineering (Dabc); - Design (Design); - Electronics, Information And Bioengineering (Deib); - Management, Economics And Industrial Engineering (Dig)	Participatory public engagement; civic engagement; sustainability practices; citizen science and RRI; innovative didactic methods; professionals training; children and youth participation; gender equality; women's empowerment; collaborative and inclusive emerging technologies; digital wellbeing; territorial welfare; technologies for inclusion; Diversity, Equity & Inclusion; STEM promotion; Innovation and social quality in contrast to polarization in peripheral contexts
UNIMI	Departments of: -Italian and Supranational Public Law; - Economics, Management and Quantitative Methods; - Social and Political Sciences; - International, Legal, Historical and Political Studies; - Foreign Languages and Literatures; - Law "Cesare Beccaria"; - Private Law and Legal History; -Biomedical Sciences for Health; - Department of Health Sciences; - Environmental Science and Policy; - Agricultural and Environmental Sciences - Production, Landscape, Agroenergy; - Computer Sciences.	STEM disciplines and gender equality; strengthening of professional and technological competences in tertiary education; Improvement of the relationships between academia and the economic environment; Artificial intelligence and human rights; Artificial intelligence and discriminations; Multi-Stakeholder collaboration and collaborative governance for social innovation; Safeguard of women's humans rights and their empowerment; Rights of persons with disabilities; Integration and safeguard of fundamental rights of foreign people; Promotion of gender equality and gender balance compositions in public bodies; Tackling and regulation of hate speech online; Safeguard of the right to identity; Violence against women and domestic violence; Inclusive language and sign language; Non-discrimination; Intersectionality studies.
UNIBOCCONI	Departments of: - Social and Political Sciences - Economics - Law, - Accounting - Management and Technology Research centres - CERGAS - Dondena - Leap	Policy Evaluation, Surveys and survey experiments, qualitative methods. Labour economics, Gender economics, Sociology and family sociology, public management, criminal law, international and European law, accounting, organizational behaviour and information systems. Collaborative education technology, educational poverty, school-to-labour market transitions, labour market discrimination, social inclusion dynamics, access to rights, welfare services, local government cooperation, diversity in firm practices.
EDISON	Ex Manifatture-Tabacchi (Bicocca district, Milano)	Focuses on quality education, social inclusion, reduction of inequalities, and promotion of sustainable communities. Contributes to the realization of the Cultural District and to promote children and youth participation in civic engagement.

		Develops a set of actions, co-designed with the Audio-visual Hub and other specialised external partners of Ex-Manifattura Tabacchi. Produces and disseminates audio-visual tools contributing to fight educational poverty and to promote social inclusion, also through civic schools engagement. Tests the social inclusion index on child and youth participation.
THALES	Lombardy headquarter (Gorgonzola-MI)	Provides cost-effective solutions for telecommunication, navigation, Earth observation, environmental management. Contributes to the Cultural District and citizen science activities (cosmological observations). Contributes to STEM disciplines diffusion.
OI	Headquarters and Operational Unit: Milan	Deloitte Officine Innovazione provides services of public engagement across the entire Spoke, develops applied research activities with interactions with private companies and the voluntary sector involved in the Spoke and undertakes set of tasks in strong connection with the following activities: the Inclusion Index, the Metropolitan City Of Milan Higher Education Observatory (Mcm-Heo), boosting gender balance in organizational bodies and Human Rights HUB.

Table C.13: Milestones and Targets for Spoke6 activities.

Type	No.	Short description	Means of verification/KPI	Month
WP1: Accelerating Participatory Processes Through Digital Technologies and data management			
Targets	T6.1	Cultural District in the Bicocca neighborhood (for participatory public engagement and RRI activities)	Open-air labs / installations / events realized	36
	T6.2	Metropolitan City of Milan Higher Education Observatory (higher education and lifelong learning)	Impact assessment based on KPI	36
	T6.3	Collaboration and Educational Technology hub	Impact assessment based on KPI	36
	T6.4	Technological solutions for inclusiveness	KPI: nr analysed technologies; ne designed solutions	36
	T6.5	Digital Documentation Centre on Sustainability practices	Digitization of best local practices documentation on sustainability	24
	T6.6	Multi-user VR digital platform for the study of the human factors affecting technology-mediated interactions	Usage of platform as learning instrument in educational and companies environments	28
	T6.7	Industrial PhD programme on human rights and social inclusion	KPI: nr Phd students enrolled; nr private and public companied involved in the PhD programme	36
	T6.8	Human Rights Hub (in Città Studi area for advocacy activities, public engagement and social interaction)	KPI: nr activities launched; nr participants to initiatives	36
	T6.9	Inclusion index	Inclusive capacity of institutions certified with quantitative indicators	36
Milestones	MS6.1	Roadmap for the Cultural District and Digital Documentation Center	Strategic development document	12
	MS6.2	Roadmap for the MCM-HEO and the Human Rights Hub	Strategic development document	12
	MS6.3	First citizen science activity on cosmological observation realized	KPI: nr citizens involved; nr projects with secondary schools	12

	MS6.4	Pilot version of the inclusion index available	Set of quantitative indicators tested	26
WP2: Empowering Individuals, Communities, and Organizations				
Targets	T6.9	Raising Aspiration and Fostering Opportunities HUB (school to work transition; employability; diversity)	Impact assessment based on KPI	36
	T6.10	University+ Firms Initiative for a more inclusive work environment	Empowerment goals transferred into firm practices	24
	T6.11	Think tank on women empowerment (gender dynamics; gender equality)	Produced and analyzed databases; identified actions to mitigate gender gaps	30
	T6.12	Digital Transformation and Wellbeing Lab	Digital skills courses delivered; products/services ready to be transferred to the market.	36
	T6.13	MOOC for companies and HRs on diversity and gender identity	KPI: nr users involved; level of attendance; learning quality	30
Milestones	MS6.5	Roadmap for Raising Aspiration and Fostering Opportunities Hub	Strategic development document	10
	MS6.6	Launching of experimental activities to mitigate the gender gaps	Selection of the most effective activities to be promoted for scaleup	18
	MS6.7	Roadmap for Digital Wellbeing Lab	Strategic development document	18
WP3: Innovative Models against Social Inequalities				
Targets	T6.14	Innovation and social integration through ICT in peripheral contexts hubs (e.g. POLIMI off campus	New services and programs for local, neighborhood and welfare development designed	36
	T6.15	Legal clinics in suburbs (access to basic rights to vulnerable individuals)	Impact assessment based on KPI	36
	T6.16	Law and Pluralism Observatory (good practices management; religious, ethnic and cultural pluralism)	KPI: nr treated courts cases; nr produced best practice policy briefs	24
	T6.17	Algorithms and AI tools for the right to identity	KPI: nr created tools; nr access to the platform	24
	T6.18	Local welfare platforms (network of local governments for social inclusion initiatives via a platform software)	Creation of the platform software	24
Milestones	MS6.8	Pilot project on Innovation and social integration through ICT launched	Impact assessment based on KPI	18
	MS6.9	Opportunities for legal clinics intervention assessed	Reports and case models	12

C3.2 Timeline

The activities within each task will be staged in different phases, marked by the achievement of the relevant milestone. The expected delivery time for each scientific/technical output and milestone is given in the above tables of the Work Plan. Figure 5 outlines a representation of the timeline concerning the milestones.
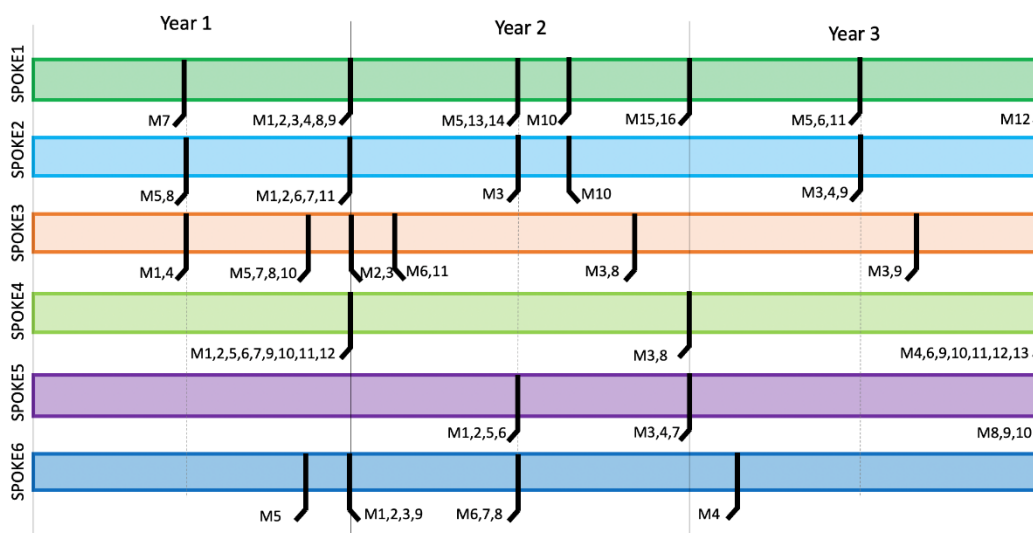
Figure 5. Gantt Chart for the milestones.

C3.3 Budget

The project costs are shown in the table below arranged by legal entity and activity. The activities include Industrial Research (IR), Experimental Development (ED), Feasibility Studies (FS), and Education (E). The costs also include *open calls* (cascade funding) managed by the public Spokes, which can recruit fixed-term researchers, grants, and tenders. Note that since UNIBOCCONI is a private University, the call for proposal (Article 5) does not allow Spoke 4 to allocate budget to open calls. The threefold goal of the open calls is to complement the participants' expertise where necessary, support external innovation projects and activities, and expand the network and impact of MUSA. In particular, open calls are foreseen in the Southern Regions of Italy. In this way, MUSA will: i) avail of industrial and academic excellences from outside its reference territory; ii) facilitate the uptake and the scalability of the MUSA holistic approach through the involvement of territories characterized by different "starting points" but sharing the need of a transition towards sustainability; iii) enlarge the number of possible test sites, case studies, and tailored solutions; iv) in the longer term, demonstrate the possible adoption of MUSA's approach at the national and international scale through a successful implementation in different socio-economic and environmental frameworks, not limited to the Lombardy Region; v) contribute to the overall priorities of the NRRP, and more precisely to the reduction of the gap between the North and the South of the country, through the allocation of 15 millions € to enterprises and research organisations active in the Southern Regions;. Lastly, operating costs for the Hub (Innovation Cluster) are foreseen, including the recruitment of the Programme Research Manager.

Table C.14: Overall project budget

Spoke	Total cost* (€)	Personnel costs (€)	Open calls (€)
1	16.520.375	8.830.409	3.200.000
2	20.699.470	9.143.067	5.000.000
3	28.710.748	16.912.149	4.850.000
4	11.206.260	6.176.420	0
5	7.532.437	5.560.402	150.000
6	14.299.562	10.689.938	1.800.000
Total	98.968.852	57.312.385	15.000.000
Hub			2.000.000
Grand total			**115.968.852**

*except Open calls

Table C.15: Budget for Spoke 1

Spoke 1 Urban regeneration (City of tomorrow)				
Subject	Activity type	Total cost* (€)	Personnel costs (€)	Open calls (€)
UNIMIB	IR/ED/E	8.964.933	4.037.750	3.200.000
POLIMI	IR/ED/E	1.396.180	738.125	
UNIMI	IR/ED/E	2.234.756	1.413.375	
UNIBOCCONI	IR/ED/E	1.620.250	918.865	

Subject	Activity type	Total cost* (€)	Personnel costs (€)	Open calls (€)
ENI	IR/ED	698.250	600.000	
EDISON	IR/ED	369.250	317.294	
PIRELLI	IR/ED	1.000.000	550.000	
THALES	IR/ED	931.000	255.000	
Total	-	**16.520.375**	**8.830.409**	**3.200.000**

*except Open calls

Table C.16: Budget for Spoke 2

Spoke 2 Big Data-Open Data in Life Sciences				
Subject	Activity type	Total cost* (€)	Personnel costs (€)	Open calls (€)
UNIMI	IR	10.966.649	4.520.875	5.000.000
POLIMI	IR/ED/E	1.398.333	929.750	
UNIMIB	IR/ED	3.027.787	2.069.750	
UNIBOCCONI	IR/ED/E	931.000	704.875	
ALMAVIVA	IR	1.815.450	1.520.625	
TIM	IR	325.850	183.375	
NOVARTIS	IR	465.500	183.375	
BRACCO	IR	209.475	88.313	
BIO4DREAMS	IR	209.475	88.312	
ASTRAZENECA	IR	1.349.950	139.312	
Total	-	**20.699.470**	**9.143.067**	**5.000.000**

*except Open calls

Table C.17: Budget for Spoke 3

Spoke 3 Deep Tech: Entrepreneurship & Technology Transfer				
Subject	Activity type	Total cost* (€)	Personnel costs (€)	Open calls (€)
POLIMI	IR/ED/E	11.246.990	6.285.000	4.850.000
UNIMI	IR	1.862.000	1.343.250	
UNIMIB	IR/ED/E	4.956.353	3.087.000	
UNIBOCCONI	IR/ED/E	1.862.002	1.385.399	
FONDAZIONE POLIMI	IR/ED/E	4.934.300	1.862.200	
OI	IR/ED/E	558.600	480.000	
CAMOZZI	IR/ED	567.328	319.500	
HUAWEI	IR	581.875	500.000	
A2A	IR/ED	744.800	500.000	
INFINEON	IR	698.250	600.000	
HUMANITAS	IR/ED	698.250	550.000	
Total	-	**28.710.748**	**16.912.149**	**4.850.000**

*except Open calls

Table C.18: Budget for Spoke 4

Spoke 4 Economic impact and sustainable finance				
Subject	Activity type	Total cost (€)	Personnel costs (€)	Open calls (€)
UNIBOCCONI	IR/ED/E	5.544.544	2.250.382	
POLIMI	IR/ED/E	1.397.257	1.154.250	
UNIMI	ED/E	2.454.439	1.608.125	
UNIMIB	IR/ED/E	1.091.377	722.625	
FBK	E	304.768	163.688	
RCS	ED	403.857	277.350	
Total	-	**11.206.260**	**6.176.420**	

Table C.19: Budget for Spoke 5

Spoke 5 Sustainable Fashion, Luxury and Design				
Subject	Activity type	Total cost* (€)	Personnel costs (€)	Open calls (€)

POLIMI	IR/ED/E	1.256.406	1.008.513	150.000
UNIMI	IR/ED/E	932.818	567.438	
UNIMIB	IR/ED/E	2.736.413	2.151.375	
UNIBOCCONI	IR/ED/E	2.327.450	1.553.076	
LUMSON	IR/ED	279.300	200.000	
Total	**-**	**7.532.437**	**5.560.402**	**150.000**

*except Open calls

Table C.20: Budget for Spoke 6

Spoke 6 Innovation for Sustainable and Inclusive Societies				
Subject	Activity type	Total cost* (€)	Personnel costs (€)	Open calls (€)
UNIMIB	IR/ED/FS	4.289.683	3.340.500	1.800.000
POLIMI	IR/ED/E	2.793.000	2.075.687	
UNIMI	IR/ED/E	4.584.826	3.386.500	
UNIBOCCONI	ED/E	1.722.350	1.329.624	
EDISON	IR/ED/FS/E	272.754	234.375	
THALES	IR/E	194.724	181.750	
OI	IR	442.225	141.375	
Total	**-**	**14.299.562**	**10.689.938**	**1.800.000**

C4. Promoting gender equality and international attractiveness

MUSA partners are strongly committed to fostering equal opportunities in research, notably concerning gender and inter-generational issues, and creating an Ecosystem with the potential to attract the best-talented researchers from the international context, thus contributing to the international excellence of the Milan area in R&I.

The rationale is twofold: to ensure representativeness and balance the unique opportunity provided by the participation in the Innovation Ecosystem, notably for career development perspectives.

Concerning promoting gender equality, it is emphasized that the four partner Universities have adopted or are completing their Gender Equality Plans in line with recommendations from the European Commission.

In line with the transversal priorities of the NRRP, the relevant legislation, and the recently published Guidelines, MUSA policy will foresee measures to target the recruitment of 50% of female researchers and PhD students, well above the formal requirement of 40% that will be anyway guaranteed, with specific reference to STEM disciplines still suffering from female underrepresentation. To such an end, the Ecosystem will exploit all the legislative means allowed to ensure the implementation of the target as mentioned above through the adoption of targeted "gender targeted calls", if in line with the national legislation.

The critical mass overall is composed by 41% of female researchers/professionals. Furthermore, the attribution of responsibility roles will be balanced to overcome the mere numerical balance; for example, the Scientific Coordinators of two Spokes (out of six) will be female researchers.

Gender balance in the team and in responsibility roles will be monitored throughout the project and short reports will be made publicly available.

Regarding the international vocation of the Ecosystem, the four universities also put in place institutional strategies to increase international attractiveness, specifically for students and young researchers. These include mobility and exchanges for Master and PhD students as well as international programmes (e.g., MSCA Doctoral Networks and Erasmus+ actions); international offices and vademecum for newly enrolled international students and researchers; degrees/classes in English; support to excellent Postdoctoral Scholars willing to participate in the distinguished MSCA Postdoctoral Fellowships; exploitation of the National laws and regulations allowing to recruit winners of highly competitive and prestigious grants, such as ERC and Rita Levi Montalcini grants.

C5. Involving young researchers

The main aim of the Ecosystem is to create an environment for the growth of human capital and research that leverages the best skills and young people. This objective will be guaranteed both by the specific commitment of the various universities to recruit new research staff and, as specified in the previous paragraph, through active networks and partnerships that will be activated at the European level.

In particular, an appropriate modality of disclosure of the opportunities offered in the context of the ecosystem activities will be organized to attract researchers from other countries, both by enhancing existing international

relations (see part B) and by aiming at direct dissemination actions in partnership with leading universities in Europe and in the world working on specific topics

By way of example, the following are mentioned: the enhance initiative https://www.polimi.it/il-politecnico/network-internazionali/enhance/., the collaborations activated with young researchers within the Marie Curie program, the participation of universities in the academic "job market" to recruit young researchers who have obtained a doctorate in the main national and international universities.

MUSA will represent an excellent career boosting opportunity for young researchers, who – committed to the various research tasks – will largely profit from the exceptionally fertile environment provided by the ecosystem. The strong intersectoral flavor, with continuous interactions among the academic and the non-academic environments, the 'training-by-doing' approach, in which young researchers will be given responsibilities of execution of different tasks, together with the dedicated MUSA training opportunities for the academics will equip young researchers with a novel set of technical and soft skills (e.g. communication, management, entrepreneurship, teaching), highly valuable for their career evolution, being it in or outside academia.

Beside the research tasks, MUSA young researchers will play a prominent role in all the activities characterized by a high degree of knowledge transfer to society, like the conception and realization of Fab Labs, public engagement initiatives, social and educational interventions for civic society, and services provision. These activities will provide an important training ground and will offer a unique opportunity to learn from the interaction with a variety of actors involved in the ecosystem - research centers, large firms, SMEs, startups, public agencies and policy makers.

Early stage researchers (RTDa) recruited for the purposes of the project will carry out teaching activities at all levels of the university education system.

Specific contests will also be organized to select the best research projects presented by young researchers on issues related to the Ecosystem as a whole for their direct involvement in the activities of the Spokes.

Furthermore, moments of knowledge sharing at a national and international level will be organised to improve the impact of the activities and create valuable networks.

Particular attention will be paid to the selection and enhancement of young talents within the working groups by promoting their visibility in dissemination and networking activities and having them as leaders of dedicated tasks.

A total of about 100 young researchers, after less than ten years from their Ph.D., are already involved in the critical mass of the Spoke, corresponding to 14% of the total force of researchers. Additional early-stage researchers will be recruited, including RTDa (fixed-term researchers) yet to be hired to reinforce the academic staff of the MUSA ecosystem.

Finally, many Ph.D.s will be enrolled and engaged in close collaboration with the industrial sector to open up a variety of career opportunities and realign highly skilled human capital with market needs. In the selection process for Postdoc and researchers, age may also be considered a preferential criterion to facilitate the participation of scientifically young researchers. Doctoral students will receive specific training on topics that are relevant to this project.

Attractiveness at the international level will be fostered through:
• Publication of vacancies on the Euraxess portal
• Informative material published in English
• Competitive remuneration for Postdoctoral researchers
• Fully digital application process and, whenever possible, remote interviews
• Informal networking through the many already established collaborations
• Engagement in the Ecosystem of companies with international dimensions or networks

C6. Involvement of companies and SMEs

MUSA has proven to attract leading successfully and locally well-rooted companies to the project. Four large companies are both hub shareholders and spoke affiliates, and they all operate in strategic sectors of the Ecosystem: Eni S.P.A, Edison S.P.A., A2A SPA, Thales Alenia Space Italia S.P.A.

Eighteen companies act as Spokes affiliates; four of them operate in the ICT sector, five belong to the pharmaceutical and life sciences sector, two lead the energy sector, two are in consulting, and the remaining nine are active in manufacturing, automotive, engineering, automation, aerospace, and publishing industries. These companies directly participate in research, transfer, and training activities through their existing research departments. They will contribute to the configuration and implementation of the Spoke's activities in the sectors in which they operate. Significant will be their contribution in the operational planning and implementation of the activities of involvement of companies and citizens (see the section "Feasibility of the work plan" for the actions of Spoke, Part C3). The above goals are achieved through innovative forms of interaction, for example, in the context of Joint Labs.

At the same time, large companies' participation will ensure the involvement of the SMEs connected to them in terms of supply chain and component chains. SMEs represent a strategic component for the competitiveness of the production chain to which they belong and contribute to the territorial economy.

Moreover, SMEs will be involved in the cascade notices, directly as recipients of support aimed at strengthening production chains through the transfer of innovation. The training is offered to their staff (managers, executives, employees, workers), and finally through the participation of their associations in territorial dissemination and promotion, which will be operated with innovative methods within the Joint Labs.

Finally, the SMEs will benefit from the activities implemented by the Spokes (with particular reference to those intended for the enhancement of entrepreneurship through the transfer of research and technological innovation and development of innovative services) with the goal of increased technology transfer from Academia to businesses, develop start-up acceleration and TT strategies.

Territorial public entities that will participate in the constitution of the Hub, the Lombardy Region, and the Municipality of Milan also followed the preparation phases of the project proposal and contributed to defining the scenario of its sustainability over time. Their involvement included the financial support of the Ecosystem activities after implementing the M4C2 1.5 investment of the NRRP, and, above all, the enhancement of the partnership context established by the Ecosystem to define the regional strategic lines of development and specialization.

Local scientific and cultural institutions participating in the Hub will also promote the transfer of knowledge to the benefit of SMEs. Finally, civil society organizations will play a central role in activities aimed at citizenship, characterized by digital sharing drivers, both in the operational definition and in the evaluation of the outcome of the activities.

C7. Activity monitoring and ex-post evaluation

In analogy with the general approach of the NRRP, the progress of activities will be verified through the timely monitoring of milestones and outputs provided for each WP within each Spoke (Section C2).

To ensure the regular progress of activities and their reporting to the MUR, the HUB will be equipped with a monitoring system based on procedural, physical, and financial progress indicators that will allow the constant exchange of information. In particular, the HUB will receive the outputs foreseen at the level of the single Spoke at the overall level. It will return the information in the project progress reports submitted to the MUR. The Spoke, in turn, will receive the knowledge acquired by the individual affiliates. Through a monitoring dashboard, this system will also make it possible to identify in advance any deviations from what was planned in the executive design and to report any critical issues. Given the timeframe for the completion of research and innovation activities, particular attention will be paid to monitoring intermediate milestones. Therefore, possible alert mechanisms will make it possible to identify in good time any criticalities with respect to the deadlines prescribed by the NRRP.

Concerning the ex-post evaluation, the output indicators will be associated with impact indicators that will be monitored through and after the end of the research and innovation activities foreseen in the NRRP. Output and impact indicators are defined, according to NRRP guidelines, based on significance, measurability, relevance, and verifiability.

Specifically, the monitoring of the project will be inspired by methodologies of iterative evaluation processes, as detailed in the strategy described below. It will allow staging and quantifying the progress of all the WPs and provide continuous insight into them, with the opportunity for prompt intervention and/or correction, should the need occur (e.g., underperforming wrt plans, delays in the schedule, etc).

Moreover, a complete identification, assessment, and prioritization of risks will be performed at the start of the project. In addition, during the whole project, communications, information, and findings will be shared among Spokes and Spoke's affiliates and other subjects involved, through the production of interim progress reports. At this stage, a preliminary list of identified risks is provided in Table C.21, together with the assessment that includes:

- **Qualitative risk evaluation** in terms of likelihood (probability of occurrence) and severity (significance of adverse effects);
- Definition of **mitigation measures** to be implemented prior to a risk's materialisation to reduce its likelihood and/or severity;
- Definition of **contingency plans**, to be followed in the case a risk actually materialises.

Risks have been grouped into two categories: management and scientific/technical risks. In the implementation phase of MUSA, under the guidance of the Hub and with the contribution of researchers from the Spokes, the risk register will be updated and integrated based on continuous monitoring, and the mitigation and contingency measures actuated as necessary.

Table C.21. Preliminary risk assessment. Legend: Mg=management, S/T=scientific/technical, lh=likelihood, sv=severity, L=low, M=medium, H=high.

Type	Risk	Spoke	lh	sv	Mitigation	Contingency

Mg	Key person leaves MUSA	All	L	L	Thanks to its large and diverse critical mass, the strength of the Ecosystem does not rely solely on individuals.	All participating organizations have the workforce to substitute a person if and when needed.
Mg	Difficulties in recruiting highly skilled researchers	All	L	H	The attractiveness of the participating Universities and the Milan territory along with a relatively large supply of local PhD programs moderate this risk. High level profile positions will offer very attractive conditions including salaries and career perspective aligned to European standards and competitive at international level	Several recruitment windows are foreseen and resources can be moved to a subsequent window as needed.
Mg	Delays in planned activities	All	M	L	The overall work plan allows for parallel advancement, thus reducing the severity of this risk. Continuous monitoring also allows for prompt corrective actions. A detailed monitoring strategy for internal use has been refined and will be continuously updated to capture any deviation from planned timing, deliverables and costs.	Closely interact with the Ministry of University and Research to facilitate the programme flexibility and rescheduling of activities if needed.
Mg	Insufficient response to Open Calls	All but 4	L	H	The Lombardy landscape is a large pool of excellent R&I organizations and companies. The attractiveness of the Open Calls will also be directed to top class providers forming a large pool of potential service suppliers and research partners.	Reallocate resources to the next Open Call window, potentiate communication campaign.
Mg	Lack of coordination among different Spokes' activities	All	L	M	The role of the Hub and the presence of four major Universities in each Spoke minimizes the likelihood of coordination problems. High profile managers with robust and consolidated experience in the management of complex scientific and industrial projects will be sought	High frequency of formal communications (meetings and internal reports).

					through a professional recruiting campaign.	
S/T	Specificities of the first test sites for urban regeneration limiting the potential for full urban scale-up	1	L	M	The differences among the involved Campuses provide a broad spectrum of open laboratories and the support provided by local government bodies involved in the Hub will help define appropriate strategies and reduce the barriers to urban scale-up.	Interact with external actions and actors (e.g. the "100 Climate-Neutral and Smart Cities" EU Mission, for which Milan was recently selected) to tailor the developed solutions to a plurality of contexts.
S/T	Ineffective integration of different datasets for AI-based analysis	2	L	M	Cross-disciplinary and cross-sectoral teams devote effort to integration.	Proceed on homogeneous datasets while providing feedback for redesigning the integration architecture
S/T	Internally selected ideas and/or external startups unable to further develop technologies	3	M	L	Ideas and startup pre-screening; large number of selected ideas. Incubators, accelerators, Joint Labs, Fab Labs etc. will be designed to boost ideas and innovation, and support development	Strengthen mentoring and support to critical projects. Accepting the risk that not every idea will be successful does not affect the overall ecosystem empowerment.
S/T	Insufficient data to assess economic impact/ sustainability/ financial risks	4	L	L	Publicly available data and needs for data to be collected have been already identified. Highly skilled data scientists and computer scientists are already in the critical mass of the hub; the recruitment of additional personnel will guarantee that the best skills in the field are available to mitigate this risks	Repeat extensive surveys and/ or case studies. Extend geographical coverage while maintaining the focus on Lombardy.
S/T	Failure in developing new materials, tools or applications for the fashion, luxury and design sectors	5	L	L	Exploiting digital technologies (e.g. 3D prototyping) increases success probability.	Focus on processes and business models for sustainability in the sectors.
S/T	Insufficient engagement of external stakeholders	6	L	M	Activities engaging external stakeholders benefit from successful previous collaborative experiences and existing networks.	Potentiate communication and dissemination campaigns related to next activities, also through channels and contacts of other Spokes' affiliates and Hub members.
S/T	Ineffectiveness of (some) of the developed technical solutions	All	M	M	All partners involved have extensive experience in the development of systems and management of projects;	Technical coordination and continuous assessment will be kept as a paramount priority

					accurate feasibility assessment has been already undertaken before the definition of the project proposal; continuous monitoring and feasibility assessment will be undertaken to provide prompt corrective technical and scientific solutions.	

The project evaluation strategy foresees the following steps: the elaboration of a Monitoring and Evaluation Plan, where indicators and evaluation metrics will be defined. For each planned action, several qualitative and quantitative indicators are envisaged; appointment of a technical monitoring task force, whose members will periodically meet to verify the progress of the activities and apply any necessary corrective actions; creation of specific tools for the evaluation of the critical activities, such as questionnaires to evaluate the training programmes, such as level of adequacy and satisfaction for the events. The following quantitative indicators will be applied: the number of target reached (students, professionals, citizens, etc.); the number of services provided; the number of tools delivered; the number of stakeholders involved; the number of publications; the number of dissemination events and activities performed; the number of training courses realized. Qualitative indicators consist of: Local Knowledge indicators, Key Competencies Assessment and self-assessment, perceived participants' satisfaction with the events and the activities, Usability Test for Virtual Environments, learning improvements assessment.

In addition, to ensure compliance with the DNSH principles from the start of the activities, both for the expected impact of the innovation life cycle, monitoring activities will be carried out for compliance with these DNSH principles, consistent with the checklists attached to the MEF Guidelines on DNSH for self-assessment. Finally, considering the transversal objectives of the NRRP, the monitoring of specific indicators of gender equality will be ensured regarding the new fixed-term recruitment of female researchers and young researchers. This is to return to the MUR valuable data and information for monitoring the results and impacts of Measure 1.5 of M4C2 as a whole.

PART D: ANALYSIS OF THE POTENTIAL IMPACTS OF THE PROGRAM RESULTS

D1. Impact on economic, societal and cultural system

MUSA will foster the transformation of the urban economy and society through research, technology transfer, training, and the creation of new businesses. The core objective will be to spread the culture of innovation, environmental and social sustainability by promoting the active participation of citizens, businesses, schools, associations, and the local public institutions. Building on rigorous scientific methods, we will undertake actions and suggest evidence-based policies closely aligned with local development strategies, most notably Lombardy's "S3 - SMART SPECIALIZATION STRATEGY 2021-2027".

The engine of this innovation process are SMEs which in Italy represent 92% of active companies and employ 82% of workers. The issue of sustainability is central to the economic recovery and 73% of SMEs see advantages linked to the issues of the ecological and digital transition both in terms of marketing and product strategies (increase in the quality of products and their value, better competitive positioning; Source: Banca Intesa). In fact, 37.8% of Italian companies have already started investments in environmental sustainability (Source: il sole 24 ore). In order to support this transition, MUSA has provided 6 spokes that address key issues for SMEs, medium and large companies. Specifically, each spoke intends to produce concrete impacts and fill organizational, technological and economic-financial gaps with four partial actions:

- Promote research and innovation actions from the laboratory context to the operational environment (TRL 3-5) thanks to the development of at least 10 joint labs and fab labs (developed in each spoke). This area of R&I is a very risky and challenging segment of technology transfer that small businesses cannot develop independently due to the high costs and the lack of technologies and research skills.
- Develop tools to promote technology transfer, industrial contamination, and the birth of new businesses (Spoke 3 actions). Spin-offs and start-ups currently have a high failure rate within 5 years of their establishment, mainly due to financial, infrastructural and commercialization problems. In this context, Spoke 3 will provide effective tools for creating new business initiatives and supporting their access to market and growth . MUSA also invests in the training of qualified personnel (PhD) and in services and technological platforms to support young companies, strengthen SMEs and promote contamination and mutual support. This action will be carried out in synergy with the Lombardy Region business support programs (https://www.regione.lombardia.it/wps/portal/istituzionale/HP/coronavirus/misure-per-le-imprese).
- Promote sustainable finance strategies and financial education actions. A survey carried out by 'Il sole 24 ore' shows that less than 30% of SMEs have access to adequate financing tools to promote ecological and digital transformation. In this context, the activities of Spoke 4, in synergy with Spoke 3, will increase the opportunities for SMEs and will ensure greater effectiveness for public-private investments.
- Implement efficient tools to reduce management, energy and production costs. According to the results contained in the "Eurobarometer" report published by the European Commission in September 2020, only 17% of Italian SMEs were in fact committed to reducing the consumption of natural resources and only 31% (compared to 52% of the EU average) were dealing with energy saving or switching to sustainable energy sources. Energy cannot be considered simply as a cost to be reduced, but it should be viewed as a source of data and information which - if properly and interpreted - can be transformed into knowledge of user behaviour. In this context, the activities of Spoke 1 will yield br product innovations adaptable to different SMEs and territorial contexts.

The MUSA project is also aligned with the development goals of the European Union and, more specifically, with the objectives of Pillar 2 (Global Challenges and European Industrial Competitiveness) of Horizon Europe. The project aims to achieve a significant and measurable social and economic impact in areas related to the following clusters: Climate, Energy &Mobility; Digital, Industry & Space; Culture, Creativity & Inclusive Society; Health. MUSA is also in line with the UN's Sustainable Development Goals, most notably: "Ensure healthy lives and promote wellbeing for all at all ages" (SDG 3), "Make cities and human settlements inclusive, safe, resilient and sustainable" (SDG 11) and "Ensure sustainable consumption and production patterns" (SDG 12).

The project will mobilize the resources of Milan Metropolitan Area (MMA), a central scientific research Hub and a center of industrial excellence at the international level, to foster the digital and sustainable transformation of the urban environment and economy. Moreover, the project aims to trigger innovation and propose evidence-based actions to policymakers to deal with social and environmental risk factors and promote citizens' quality of life and wellbeing.

Leveraging on MMA's multidisciplinary scientific, technological and industrial expertise, the project aims to:

- Enhance awareness and understanding of critical issues that companies, citizens, and public bodies have to face to support the digital and green transitions;

- Put forth a vision centered on citizens that leads to a higher quality of environmental and social life from a one-health perspective;

- Develop shared and accessible data platforms to support the decision-making of researchers, businesses, citizens, and public bodies alike;

- Design innovative, evidence-based actions and solutions by involving citizens, public bodies, and companies from an RRI perspective;

- Implement initiatives with a high social and economic impact that are sustainable beyond the three-year life span of the project and have the ambition to serve as a model for other urban contexts at the national and international level,

The evaluation of the impact of each Spoke, as discussed below regarding each WP, unfolds along three main dimensions: **social**, **scientific,** and **economical**, as also indicated in the Key Impact Pathways of the Horizon Europe Work Programme.

As far as the social dimension is concerned, the evaluation of the potential impact of the project takes into account a qualitative and quantitative assessment. The **social impact** on local communities (i.e., MMA and the Lombardy region) will be monitored in the short, medium, and long term. The following main dimensions will be taken into account:

- Social added value generated

- Social changes produced by the activities

- Sustainability of social action

- Fostering innovation in society

The evaluation of the potential **scientific impact** takes into account a qualitative and quantitative assessment of the following critical dimensions of the activities carried out and of the scientific results obtained:

- Research quality

- Scientific significance of the research objectives

- Impact of research outcomes on the advancement of knowledge

- Strengthening human capital in R&I

- Spreading Open Science and Responsible Research and Innovation

As far as the economic dimension is concerned, the analysis of the potential **economic impact** of the project actions relies on the evaluation of the following key elements:

- Economic development ensured by technology transfer actions

- Potential impact of the research outcomes on the growth of the overall local economy

- Impact of the innovation generated on the dynamic efficiency of the local economic system

- Support to the sustainable growth of SMEs in the MMA and the Region

- Creation of more and higher quality jobs

- Leveraging private investments in R&I

By the very definition of its primary specialization area, i.e. Climate, Energy and Mobility, the MUSA ecosystem as a whole has been designed to have a significant **environmental impact**, starting from the framework of the Milan Metropolitan Area but providing scalable and adaptable solutions and methodologies for the benefits of other areas:

- Technological solutions for improving biodiversity, local energy production, circularity, sustainable mobility at the urban level

- New paradigms for the green transition of relevant industrial sectors in the territory, notably the fashion, luxury and design industries
- Involvement of all actors - producers, consumers, technology providers, regulators - in the green transition
- Consideration of environmental sustainability as a key pillar in the development of novel financial, medical, and Deep Tech methods and technologies and more generally in the digital transition

The assessment of the real-world impact of the proposed action has been designed and will be updated according to the SMART criteria. As a result, the proposed metrics need to be (will be):

- **Specific:** targeted to assess a particular area of impact

- **Measurable:** the numeric record needs to provide an adequate proxy for the level of impact and, whenever possible, need to be linked to progress in reaching the aimed target

- **Assignable**: able to identify the circumscribed impact of a singular action or the combined effect of a specified set of actions

- **Realistic**: the target level of impact assessed by the measure needs to be coherent with the environment targeted by the actions and the allocated resources

- **Time-related**: the short-term objective needs to be linked explicitly to the execution of related WP activities, and the result and progression need to evaluate accordingly

The key areas of analysis, as defined above, have the aim of maximizing the impact of the project on the entire regional territory and, at the same time, supporting its development and image as a national and European pole of excellence. In addition, the identified Spoke is aimed at effectively supporting SMEs, providing that distinctive contribution in terms of technologies and applied research, which the set of proposing universities can ensure.

Spoke 1 - Urban Regeneration - Cities of Tomorrow

General assessment:

The general impact that this Spoke aims to generate on the urban and regional territory is about the definition of solutions and intervention models for the ecological transition at the urban and regional scale, based on an integrated approach (Phygital) in terms of citizen wellbeing and environmental sustainability, with particular reference to those of advanced services, mobility, and energy distribution. This goal will be pursued by research and innovation labs, technology transfer, and training activities.

Furthermore, research and innovation will also promote efficient and sustainable use of natural resources by increasing biodiversity and improving climate conditions.

Therefore, the subject of the assessment will be both the intervention models and the results of their experimental application within the Milan area. Furthermore, a significant role in the evaluation will be assigned to citizens, a sample of whom will be involved in the assessment activities (See Part C) and the local institutions (the municipality of Milan and the regional government as partners).

The evaluation methodologies are illustrated below, concerning the expected impacts of each WP.

WP1 – Natural, Biological and Human resources for Urban regeneration

Assessment of potential impact:

Social: A twofold positive impact on the community is foreseen for WP1. More in detail, the first is strictly related to the outcome of the WP, which can be summarized in the improvement of living conditions, thanks to innovative methods for the environmental assessment of natural (e.g., soil, water, air, animals, plants) and built factors (e.g., zero impact buildings, NBS, heat islands mitigation). The second concerns the process leading to the project outcome: the direct participation of citizens through living labs and dedicated events, and the public availability of some collected data it is expected to reduce the gap between population's needs and institutions, favoring social cohesion, sense of agency and inclusion. These impacts are expected to be achieved with an environmental justice approach, consistent with SDGs 3 (Ensure healthy lives and promote wellbeing for all at all ages) and 11 (Make cities and human settlements inclusive, safe, resilient, and sustainable).

Scientific: The main scientific goals of WP1 are improving knowledge of ecosystem dynamics and urban ecosystem services; defining effective tools to promote environmental protection and biodiversity in the urban context and

relationship with the urban evolution of the city in connection with the creation of high-quality new knowledge. The knowledge of the ecosystem before the interventions will help envision, and measure and share the impact of urban regeneration outcomes on people, the environment, and the economy.

Economic: The expected economic impact of WP1 is twofold. First, a large number of relevant stakeholders (private and public sectors) interested in the project that can contribute to the various actions of this WP will benefit from the results during the 3-year project life. Second, after the project completion large companies as well as SMEs involved in the development and experimentation of new solutions could participate in the follow-up actions from a go-to-market perspective.

Environmental: In the short-to-medium term, the main expected impact will be the recognition of the key role of ecosystem services in different sectors and nature-based solutions for urban regeneration and circular economy; in the longer term uptake of solutions, not only in the Milan Area, allowing for improved quality of biodiversity, soil, water and air at the urban scale.

Table D1: Relevant KPIs for Spoke 1, WP1.

Social KPIs	Scientific KPIs
- Number of co-creation events where citizens contribute to the design of urban regeneration interventions (minimum 3, one for each campus); - Number of citizens involved in the co-creation events - Number of city users experiencing benefits in the area	- Presentation of the project and its outcomes in national and international scientific conferences belonging to different domains - Number of peer-reviewed scientific publications
Economic KPIs	Environmental KPIs
- During the project development - number of companies involved during the project development and collected feedback - Number of innovative products and services - Number of intellectual Property Rights - After the project completion: - number of interested companies that will actually contribute to the further implementation of the platform beyond the PNRR project	- Number of solutions exploiting ecosystem services or NBS applied beyond test sites - Natural ecosystem metrics at urban level: - relative percentage increase in biodiversity - relative percentage reduction in air, soil and water pollution

WP2 – Redesigning industrial urban production processes

Assessment of potential impact:

Social: The new lab dedicated to recycle/upcycle will be an open facility where local companies (both already formed and newly funded) will have the opportunity to test new technologies and share ideas. The facility will also be open to schools and higher education institutions, thus helping promote a culture of sustainability, waste reduction and recycling. In addition, the structure will host students for graduate and post-graduate dissertations and stages, thus complementing the curricula of students having a chemical/biochemical/materials science background.

Scientific: The primary scientific goal of WP2 is to apply scientific knowledge to the traceability of processes and products and the development of a predictive tool for recovery processes through an online technology platform with the aim of contributing to the decoupling of economic & human activities from the consumption of finite resources & GHG emissions. Ultimately, the WP2 is expected to contribute to the improvement of sustainability and circularity of industrial production, natural ecosystems, the management and valorization of local resources.

Economic: The WP2 aims at changing the current economic paradigm of the chemical commodity and waste management platforms industries. Companies in such sectors are generally very large and aim to cut costs by concentrating production activity in a small number of large plants. As a result, both raw materials and goods have to be shipped, with a substantial impact on logistics, energy consumption, and greenhouse gas emissions. Asset upcycling reverts this perspective by favoring the creation of small companies directly located in the territory where the waste is produced and dedicated to the conversion to specific platform chemicals and products that are required within the area. Aside from the advantage in waste reduction, the new paradigm is also highly advantageous in terms

of energy-saving and reduction of emission. The redesign of urban services with a circular integrated approach (in the energy, water, waste sectors) and the use of digital solutions will increase their efficiency and sustainability of the production system, with positive impact on the companies in the sectors, final users, as well as the environment.

Environmental: The goals of WP2 include new processes that will have a transformative impact on the urban production paradigms, with a shift toward circularity, thus guaranteeing: i) energy savings; ii) waste reduction; iii) reduction of critical raw-materials consumption; iv) reduction of transport-related environmental costs. Transversal to all these aspects, WP2 will contribute to the widespread adoption of environmental and energy footprint evaluations.

Table D2: Relevant KPIs for Spoke 1, WP2.

Social KPIs	Scientific KPIs
● Number of institutions involved in active citizenship/traning iniziatives	● Number and usefulness of developed databases and technological platforms ● Calculation and comparison of carbon footprint of existing and proposed processes of production, for the specific case studies developed
Economic KPIs	Environmental KPIs
● Comparative cost evaluation of standard products and chemicals produced in large facilities and shipped on site with respect to equivalent products obtained locally by recycle/upcycle of the local waste ● Number of services redesigned with a circular integrated approach ● Number of inbound users (i.e. bio waste producers) reached by new services	● Comparative evaluation of energetic and environmental savings of recycle/upcycle solutions with respect to standard adopted models ● Reduction of GHG emission related to urban production processes ● Reduction of usage of environment-impacting raw materials through recycle and upcycle

WP3 – Energy solutions for urban regeneration

Assessment of potential impact:

Social: The main social goal of WP3 consists in the dissemination of knowledge to the general public to create and promote awareness of the potential of renewable energy solutions needed to fulfil the energy demand and, at the same time, reduce the levels of air pollution in large metropolitan, thus mitigating climate change effects. The ultimate goal is to improve the quality of life of citizens via a district/urban regeneration process.

Economic: To enhance the impact of WP3, the awareness generated needs to be supported by actions to foster the development, on the territory, of an adequate level of human capital required by companies and public administrations involved in deep buildings retrofit and adoption of systems for renewable energy production integration. The action aims to ensure the capabilities needed to develop, design and correctly install renewable energy solutions in the short term and to maintain the new solutions in the medium-long term . The knowledge transfer will foster the birth of new companies and reduce the average cost of electricity for local companies. An expected side effect is the increase of public & private investments in urban regeneration projects linked to renewable energy.

Environmental: The main expected impact of WP3 related to the environment consists in fostering the adoption of renewable energy sources, available at the local level, thus reducing the GHG emissions produced by fossil fuels.

Table D3: Relevant KPIs for Spoke 1, WP3.

Social KPIs	Economic KPIs

● Number of adult citizens involved in disseminations events
● Number of young citizen involved in ad hoc events in:
   o Primary school
   o Secondary school
	● Number of companies and public administration involved
	● Number of consultant service delivered through the spin-off company and through the testing labs
	● Total KWh of power installed in related impacted project
	● Number of companies involved during the project development and collected feedback

Environmental KPIs
● Number of renewable-energy solutions developed/validated in the framework of MUSA adopted in medium-scale plants ● Increase (%) of power consumption from local renewable energy sources ● Decrease in GHG emissions related to urban power consumption

WP4 – Safe, smart, intermodal, and sustainable mobility

Assessment of potential impact:

Social: By the design and development of demonstrators for smart urban design and innovative accessibility enhancement-oriented street furniture, the main expected impact of WP4 is to increase the accessibility of the neighbourhoods through the diffusion of a wayfinding mobile app. The ultimate social goal is to enhance sustainable, active, and micro-mobility at a neighbourhood level through research, educational, technological, and infrastructural interventions. The action taken will foster the diffusion of a new mobility management culture able to improve the citizens' quality of life in the medium term.

Economic: The developed wayfinding and MaaS solutions combined with the increase in the networking activities and relations between local stakeholders will maximize the economic impact of citizens' consumption choices that will be better connected with the surrounding economic environment.

Environmental: The promotion of sustainable and active mobility is expected, once transferred beyond the testing environment, to significantly reduce the negative impact of fuel-based and private transport systems on the urban (pollution) and overall (GHG, energy waste) environment.

Table D4: Relevant KPIs for Spoke 1, WP4.

Social KPIs	Economic KPIs	Environmental KPIs
● Number of downloads among the target population ● Number of citizens' involvement in testing new solutions ● Number of citizens taking part in the experiments ● Number of local stakeholders sharing co-designed mobility management solutions	● Number of companies' involved in testing new solutions ● Number of companies taking part in the networking activities	● Reduction of transport-related pollution (e.g., PM10) ● Reduction of GHG emissions related to urban mobility (%)

Spoke 2 - Big Data-Open Data in Life Sciences

General assessment:

Overall, Spoke 2 aims to significantly increase social sustainability, foster social inclusion, fill inequalities, and enhance health levels. In addition, environmental sustainability could also be impacted as people will be stimulated to improve their healthy habits, for instance, eating more vegetables and fruits and limiting meat.

The future sustainability of healthcare, and, more in general, of the welfare system, depends indeed not only on the introduction of innovative technologies and modes of service delivery but also on the engagement and accountability of all stakeholders in achieving the desired outcomes.

WP1 – A holistic, innovative digital architecture for the storage and safe exchange of life sciences big data

Assessment of potential impact:

Scientific: The creation of the digital infrastructure for the swift exchange of data related to life sciences and medicine, which is the primary goal of WP1, will ensure the needed infrastructure for supporting the on the edge research in the field of life science by leveraging the most advanced digital technologies (e.g., artificial intelligence) supported by an adequate infrastructure. The data here collected will ensure the sufficient set of knowledge needed to support the development of new generations of physicians, bioinformaticians and health data scientists able, in the medium term, to support innovative applied research.

Economic: The data set related to life sciences and medicine collected will allow public and private actors to invest in research applied to life sciences with positive repercussions for regional development.

Table D5: Relevant KPIs for Spoke 2, WP1.

Scientific KPIs	Economic KPIs
● Number of field of research covered ● Number collected database ● Number of databases with complete information ● Number of scientific publications linked to the use of databases	● Number of contracts concluded with private entities for the use of databases ● Number of patents registered linked to the use of the resource

WP2 – Using big data for the development and sharing of new technologies in life sciences and medicine research

Assessment of potential impact:

Scientific: The main impact of WP2 will be linked to turning into advanced research the data collection initiatives carried out in WP1 with expected impacts in the fields of preclinical, clinical, and diagnostic research. The research thus produced will make it possible to train new health personnel with cutting-edge knowledge. The research will also be focused on the development of sustainable processes for the production of chemical products thanks to the enhancement of a state-of-the-art infrastructure for the development of 3D printing and virtual reality technologies.

Economic: The application of the research conducted here will have significant economic impacts allowing to provide an immediate response to the demand for alternative, efficient, economically sustainable, safe, patentable, and industrially applicable preparations of pharmaceutical products or key intermediates, including antiviral compounds whose availability and market availability is becoming a crucial issue.

The ultimate expected result is to support the development of the pharmaceutical sector at the regional, national, and European levels with essential repercussions on the productive fabric**.** Furthermore, the impact of this WP is intended to support the positioning of the Lombardy region as an advanced research pole in close connection with businesses, especially SMEs.

Table D6: Relevant KPIs for Spoke 2, WP2.

Scientific KPIs	Economic KPIs

● Scientific impact of the supported research asses by:
    o Number of citations
    o Bibliometric index
    o Econometric index
    o Number of patents
● Number of young scholars involved in linked activities
	● Number of collaborations with SMEs
	● Number of contracts concluded with private entities for the use of patents
	● Number of industrial patents registered linked to the research
	● Number of new molecules produced linked to the research activities
	● Additional turnover generated

WP3 – Big data and innovative approaches to improve global health and well being

Assessment of potential impact:

Social: The main social goal of WP2 is to enhance the citizens' quality of life by supporting the job-related risk assessment with a set of standardized tools and protocols. The developed automated procedure will classify the risk level and suggest the most effective interventions in terms of workplace design and worker training to minimize the risk of damage to the health of employees. The developed wearable technologies will support the occupational medicine specialist in the assessment of physical demand to be matched with the individual working capacity. Data gathered in this WP will contribute to a more precise and objective exposure assessment for epidemiological studies aimed at understanding the job-exposure response to set up evidence-based occupational threshold limit values. This scientific contribution could be a basis for future regulation on the safety of workers with specific health conditions.

Environmental: Through the promotion of sustainable life-styles for health and well-being, WP3 results will foster the adoption of habits (sports, mobility, diets) with less negative impacts on the environment, both at the local and global scales.

Table D7: Relevant KPIs for Spoke 2, WP3.

Social KPIs	Environmental KPIs
● Number of companies participating in dissemination activities or events	● Increase the fraction of the population adopting healthy lifestyles concerning sport and mobility, thus reducing polluting activities

● Number of protocols identified for the identification of risk situations ● Number of worker conditions, evaluated ● Number of access to the task web-site.	● Increase in population fraction adopting healthy dietary habits with benefits for the environment (e.g., reduction in meat consumption; local high-quality products)

WP4 – Development of technologies and customizable tools for continuous monitoring, wellbeing, and health

Assessment of potential impact:

Social: The main social goal of WP3 is to increase awareness of the population about some specific health problems, including safety at work; provide tools for screening and management of specific pathologies. Additionally, an m-health tool will be developed for the primary schools' kindergarten for management of learning and prevention of learning disabilities. The WP will also contribute to helping people in adopting healthy lifestyles and in creating a network of stakeholders (citizens, clinics, schools, companies) that aim to improve the health level of the population. The impact of the developed tools is expected to overcome the project's regional dimension.

Environmental: As in WP3, the adoption of healthy lifestyles may positively affect the environment. In addition, the introduction of continuous monitoring tools is expected, in the medium term, to promote their usage not only for health reasons, but for activity monitoring (sport, mobility): this will indeed boost sustainable habits.

Table D8: Relevant KPIs for Spoke 2, WP4.

Social KPIs	Environmental KPIs
● Number of people involved in the different activities ● Number of people/company/stakeholder involved in the dissemination events ● Number of school offices or regions contacted; ● Number of companies contacted for the technological translation of the platform.	● Population fraction measuring their sustainable habits through individual monitoring ● Number of companies promoting healthy practices

WP5 – Develop, implement, and sustain technological innovation in health

Assessment of potential impact:

Social: The future sustainability of the healthcare system is threatened by demographic and epidemiological trends. Given the "demographic winter" and population aging, it will not be possible to keep sustaining the healthcare system in its current form unless disruptive innovations come to rescue it. To do so, the MT&BA innovations and the collection and use of big data need to be the new norm. The WP5 has the ambition to sustain the development and deployment of these new technologies and at the same time aims at instilling in the entire population a profound sense of responsiveness versus the adoption of correct lifestyles whose impact can benefit not only their health but also the others' health fostering a paradigm shift and mindset that will refocus the attention from curing to caring. The expected final impact of the proposed actions is, in the short term, focused on the regional territory to improve the efficiency of the health system and improve the quality of life of patients. However, in the medium term and beyond the financing period, the expected impact is linked to the experiences and knowledge developed within the project, which can be easily extended at the national and European level as a model for improving the quality of life.

Economic: The objectives of WP5 are aimed at supporting the development of new startups with high technological content and at fostering the implementation on the territory of the technologies thus developed. In addition to the evident economic return for the territory within which these new entrepreneurial activities are located, the expected impact of this WP is multiplied by the possibility offered by these technologies to reorganize healthcare spending while increasing the quality of the services offered to citizens. The expected long-term economic impact is twofold: on the one hand, the development of a new industrial district is expected, linked to the technologies developed in the design phase, on the other, the experiences gathered, and the dissemination of the ideas developed will guarantee a general improvement in the management of the health expenditure at national and European level.

Table D9: Relevant KPIs for Spoke 2, WP5.

Social KPIs	Economic KPIs
- Coverage (%) of screening programs - Improvement in healthy habits in the target population measured as: - Increase in physical activity and BMI index - Reduction in smoking and alcohol consumption - For chronic patients, relevant indicators are: - Number ofaccess to Emergency Departments, - Number of hospitalisations, - Number of patients managed by the community centres	- Number of mentored start-up projects - Number of accelerated start-up - Rate of start-up that achieve independence and economic sustainability - Number of change initiative enabled via the recommendations provided

WP6 – Economic impact of a structured collection of big data in life science

Assessment of potential impact:

Scientific: The main scientific goal of WP6 is to produce research that will constitute a relevant knowledge tool to raise the awareness of all the territory stakeholders, both in the private and public realm, on the potential impact of the project carried out and the variety of the generated benefits. A series of dedicated public events will foster the impact of the research.

Table D10: Relevant KPIs for Spoke 2, WP6.

Scientific KPIs
- Number of people involved in the events   - Number of research initiative linked to the dissemination activities   - Number of peer-reviewed scientific publications linked

Spoke 3 - Deep Tech: Entrepreneurship & Technology Transfer

General assessment:

Spoke 3, is expected to impact on economic and social dimension through the contribution that research makes to the economy, society, environment, and culture.

Referring to the impact on the economic system, the actives that will be carried out by the Spoke, aim at: 1) enhancing the territorial vocation as cradle of innovation; 2) supporting entrepreneurship based on technological innovation; 3) providing local businesses and SMEs with services for R&D; increase technology transfer from Academia to businesses. In particular, these main goals will lead to the following specific impact:

- creation of living labs and / or Use cases and / or lab flagships and / or development platforms spread out throughout the territory.

- investment in equipment for the construction of centers and laboratories necessary for researching innovative products / services.

- supporting the creation of Start-ups / Spin-offs made up of researchers.

- development of start-up acceleration and TT strategies.

From the social point of view, the Spoke activities are aimed at developing meaningful solutions to strengthening technological innovation by encouraging entrepreneurship and technology transfer. The focus is, in particular, on how technologies can contribute to sustainable development within all industry sectors (from the health industry to eco-industry, to advanced manufacturing, to the luxury industry, fashion, design), on how they can promote inclusion processes (by promoting female entrepreneurship and tutoring programmers and entrepreneurial education) and they can contribute to urban regeneration and digital transformation.

Connection with other actions:

The development of deal flow and the technology transfer on deep tech issues complements the activities carried out in other projects of Component 2 of Mission 4. In general, all the research that will be carried out, for example in the national sample centers on Key enabling technologies or in extended partnerships, will find support and tutorship

throughout the whole transformation process into a company, taking advantage of all features developed in the context of this Spoke. Tutoring processes for the construction of a business will be replicable, indeed, in the future also in different technological fields.

At the same time, the innovation infrastructures can be shaped up (as well as the pre-existing Competence centers) as development support infrastructures.

WP1 – Increase Qualified Deal Flow

Assessment of potential impact:

Scientific: The primary scientific goal of WP1 and more in general of the Spoke 3 is to foster the creation of academic and non-academic impact via the contribution that research makes to the economy, society, environment, or culture, in and beyond the pure contribution it can deliver to academic research. The dissemination of the knowledge via MOOCs events will maximize the expected dissemination impact. The measurement and assessment of impact of the research endeavors will be the basis for analyzing the activities effectiveness.

Economic: Smart specialization is at the heart of the EU's current industrial development strategy, i.e., a vision of regional growth trajectories built around existing local capacities. The objective of this WP is to develop industrial research which, by referring to national priorities and to the regional research and innovation strategy, encourages "place-based competitiveness". The expected economic impact of this WP is to support the development of the most promising research and activities with the highest added value able to build for a competitive advantage for the Lombardy Region and Italy.

Table D11: Relevant KPIs for Spoke 3, WP1.

Scientific KPIs	Economic KPIs

● Number of publications
● Scientific impact of the supported research asses by:
   ○ Number of citations
   ○ Bibliometric index
   ○ Econometric index
● Public understanding and acceptance measured as:
   ○ Number of people involved in MOOCs initiatives
   ○ Number of policies
	● Increase (%) in the number of active spin-out companies or non linked businesses that leveraging the shared knowledge to pursued activities linked to the Lombardy Region S3
	● Active contribution to the general target stated by the PNRR
	● Increase (%) in the number of closed deal linked to applied research

WP2 – Design and test Innovation: Proof of Concept, Pilot and Living Lab

Assessment of potential impact:

Scientific: This WP will support the implementation of living lab projects as an organized approach to open innovation consisting of experimentation in real life and active involvement of users through different methods that involve multiple stakeholders. The proposed Living Labs will strive to support companies' innovation processes by offering a neutral arena in which different stakeholders can meet and co-develop innovations. The ultimate expected scientific impact of this WP is to enhance the research dissemination and simplify the knowledge transfer to reduce, in the short and medium-term, the time that elapses between the generation of the innovative idea and its large-scale implementation.

Economic: The aim of this WP is to study and test innovative ideas selected within universities, in a multidisciplinary context and with all the actors involved. The most promising ideas will be selected from the deal-flow and supported in the realization phases. The WP aims at facilitating the exploration of the commercial and social innovation potential of industrial research and allow partners to spend sufficient time testing and demonstrating the relevance of the approach chosen to evaluate the social, environmental, and economic impact of a project.

Environmental: All the selected ideas will be invited to address the environmental impact, several of them being expected in fields and disciplines with a strong potential for developing green-by-design solutions and technologies.

Table D12: Relevant KPIs for Spoke 3, WP2.

Scientific KPIs	Economic KPIs	Environmental KPIs
● Evaluation of the potential "end users" of the expected research innovation by: ○ Number of Proof of Concept developed ○ Number of active Pilot and livings lab development	● Definition of a clear IPR protection or knowledge transfer strategy ● Number of partners involved in the initiative (industrial, social and cultural organizations as well as policy makers) ● Number of selected ideas linked to PNRR and Lombardy S3	● Number of selected ideas directly addressing environmental issues ● Assessment of the reduction of environmental pressure by proposed ideas/solutions

WP3 – Start-up Incubation and Acceleration

Assessment of potential impact:

Economic: Evidence suggests that many startups struggle to go from starting to scaling, resulting in a 'scaleup' gap in Europe. As a result, the type of support offered by incubators and accelerators appears to be crucial to enhance the potential economic impact of the overall program. The objectives of WP3 are aimed at supporting the development and growth of startups via the definition of a concrete value generation strategy and the provisioning of adequate tools and techniques. Ambitious, innovative startups are recognized as key sources of employment, productivity growth, and innovation at the local and, in the medium term, at the national and European levels. All WP activities will be keen both to promote female entrepreneurship and increase the international scope of the entire ecosystem, thanks to the relations, for instance, with the DeepTech Alliance or with European Research Infrastructures (ESFRI).

Environmental: The entire Incubation and Acceleration programme will be designed to promote a culture of social and environmental sustainability, thus including the "green" dimension transversally in its activities.

Table D13: Relevant KPIs for Spoke 3, WP3.

Economic KPIs	Environmental KPIs
● Number of services and innovative strategies designed ● Number of high-quality jobs generated ● Venture capital collected by start-up in relation to the WP ● Number of new start up ● Startup growth measured as: ○ Number of employed people ○ Number of patent/product ○ Turnover ● Number of enterprise education initiatives	● Fraction of selected start-ups dealing with environmental or climate problems ● Number of technologies, solutions or services provided addressing environmental dimensions

WP4 – Innovation4SMEs and Company

Assessment of potential impact:

Economic: As technology transfer has become increasingly recognized for its role in the knowledge-based economy, it has also become more integrated into many universities. Along with that change, the technology transfer office's role has also evolved. Collaboration among colleges and community partners creates synergistic opportunities and increases the success rate of commercializing these discoveries. Over the past 20 years, academic technology transfer has supported the creation of nearly 4 million jobs, one of the most active growth sectors of the global economy. Additionally, technology transfer provides companies with a rich source of intellectual properties to incent investment in early-stage technologies. The right commercial partner can help advance research and guide new products through the legal approval process. Achieving innovation is a fundamental challenge for any company in a competitive market. The most successful companies are those that have a culture of innovation, turning ideas into results, also through collaboration with universities. The main purpose of this WP is to actively support the technology transfer processes described above to effectively enable local, national and European SMEs to access the most advanced technologies and knowledge. The ultimate aim is to support sustainable and integrated economic growth.

Table D14: Relevant KPIs for Spoke 3, WP4.

Economic KPIs
● Number of TT services delivered
● Number of innovative strategies designed

● Number of active collaboration with:
   ○ Regional SMEs
   ○ National SMEs
   ○ European SMEs
   ○ Large enterprise

● Number of enterprise education initiatives

Spoke 4 - Economic Impact and Sustainable Finance

General impact assessment:

The Spoke 4 promises a huge impact on the local territory (Milan and Lombardy): helping financial institutions to improve their direct sustainability, and most of all to better direct their financial assets (quantity and cost to clients), is an investment with a high economical return. At the same time, training financial institutions to more effectively design contracts that effectively provide changes in their clients' behaviour regarding sustainability highly impacts society, in the medium and long term. Similarly, helping individuals to better understand the meaning of sustainability and most of all the practical implications of their action is the best way to diffuse knowledge and change behaviour. Rather than simply thinking of "technology transfer" Spoke 4 proposes the idea of "knowledge transfer" that definitely includes technology, but also involves all the actions that are relevant to increase the other relevant sources of capital, among which especially human capital and social capital. The ultimate goal is the change in behaviour of citizen and economic organizations. The main tool to reach the target is an increased level of knowledge and better education about the impacts of our actions.

Research (and recent pandemic developments) have highlighted the importance of social capital and cultural capital for economic growth. We know that education is crucial for improving awareness of the relevant issues that affect society at large, and that better social, political, and economic decisions can be made by all people and organizations when the key elements are well-known and openly debated. Spoke 4 will represent a key mechanism for the City of Milan and the Lombardy Region to develop analyses, quantify the impacts of alternative private and public plans, in a context of enhanced understanding of society at large.

It will promote among public and private actors a culture of evidence-based policymaking, as well as a culture of a participatory evaluation and learning process. The goal is the improvement of the decision-making processes and the effectiveness of private and public interventions. Several types of social and environmental impact indicators will be considered ranging from the preservation of the natural resources to commitment to human and societal wellbeing. The social impact will be maximized through social network connection and dissemination of the results reached by the Spoke. The Observatory of sustainable performance set up within the Spoke network will collect data to compute a wide range of sustainable indicators such as social equity, economic growth, institutional capacity, and environmental protection. These indicators will be updated regularly, monitored over time, aggregated at provincial level, and published widely through a user-friendly and flexible interface developed by the Spoke. These indicators can be also used to measure the social impact of the Industrial PhD program promoted by the Spoke. As a further step, the Spoke impact is further maximized by the collaboration with the Active Citizenship school organized by Save the Children Italia Onlus.

The so-called Economics of Knowledge missed some of its objectives, in terms of social justice, equitable distribution of opportunities and inclusion. High density of knowledge and wealth have concentrated in selected areas and segments of society. For this reason, it is crucial to inaugurate a new generation of place-based, inclusive innovation-driven development policies that are inspired to a more inclusive idea of growth. We contend that the so-called sustainable finance, impact-economy and social entrepreneurship can play an increasingly pivotal role in mending these failures. Our argument is that a new entrepreneurial impact- and purpose-oriented entrepreneurial model, coupled with appropriate financial tools may offer Italy and Europe a huge opportunity to reconcile and balance growth and social justice.

We believe that the knowledge that we intend to develop in this Spoke can crucially contribute to unleashing the potential of sustainable finance and tech-intensive social entrepreneurship by leveraging on the hidden virtues of finance, education, and social innovation.

WP1 – Best practice in finance 4 sustainability

Potential impact assessment:

Economic: The creation of a virtuous cooperation ecosystem that brings together impact-oriented enterprises and financial operators contributes to the social and economic development of the local and regional territory (Milan and Lombardy). The ecosystem would considerably improve the understanding of sustainability and impact finance and help diffuse knowledge that combines technological innovation with capital sourcing, encouraging tech-driven impact scaling processes. Moreover, the ecosystem would enable financial institutions to improve their direct sustainability and offer impact-oriented financial instruments through which local SMEs and social enterprises can advance their capacity building, investment readiness, and scaling their processes.

Table D15: Relevant KPIs for Spoke 4, WP1.

Economic KPIs
● Number of new impact-oriented financial instruments offered to local SMEs and SEs.
● Number of new social-tech enterprises transformed and scaled in Lombardy region thanks to the improvement financial instrument offering.
● Improvement in capacity building and investment readiness of SMEs and SEs (through experiments and extended surveys

WP2 – Financial education

Potential impact assessment:

Social: The expected impact of this WP boils down to the positive effects that the diffusion of an adequate socio-economic culture represents within a community. The Statale's "Centre for the Evaluation of the Economic Impact of Public and Private Investments" aims to enable public institutions to assess the economic impacts of public and private investments as a crucial element to guide the allocation of scarce resources. Careful impact evaluation can reveal the relative cost-effectiveness of different interventions, identify both their direct and indirect, possibly unintended, consequences, and shed light on the mechanisms behind them. It will empower public and private actors to develop a culture of evidence-based decision-making and learn the techniques for both ex-ante and ex-post analysis, with an increasing variety of data sources. Citizens and civil society organizations can also be empowered by the evidence of the impact of interventions and, through it, become better equipped to keep public and private investors accountable for their choices and more supportive of valuable investments.

Economic. SDA Bocconi ESG Labs will allow students to receive a strong background in financial education and sustainability. High schools particularly in the Milan area will be able to visit the Lab with their teachers, especially after taking the online courses developed by the Lab. Executive courses developed by the SDA Bocconi School of Management will also benefit from the Lab, and corporate and financial institutions managers and clients will benefit from the materials. Students from other Universities, particularly science and humanities, will be able to use the content to improve their financial decision-making process. These activities overall will contribute to the formation of human capital in sustainable finance which will benefit both large companies and SMEs

Table D16: Relevant KPIs for Spoke 4, WP2.

Social KPIs
● Number of participants to the activities of the Centre
● Number of public and private institutions involved in the Center activities
● Number of joint impact assessment projects developed

WP3 – Impact analysis & sustainability measurement

Assessment of potential impact:

Economic: The development and diffusion of methodology will interact with various stakeholders through the website and face-to-face interactions. Companies will actively co-design and fine-tune the methodology. The results of the company sustainability performances and of the impact-weighted accounting results (namely the value generated for stakeholders) will be diffused together with suggestions for their use. The developed methodology will

also impact the public and private sector decision-makers in evaluating the impact of their interventions with a positive result in terms of efficiency and relevance of the activities carried out.

The Center will cover a wide range of sectors; a strong focus will be placed on sustainability, both in terms of investments explicitly targeted to the UN's Sustainable Development Goals and in terms of the direct and indirect consequences of any public and private investment on the sustainability of the social and economic system.

Environmental: the integration of the environmental sustainability measurement - notably linked to the UN SDGs 6, 7, 11, 12, 13, 14 and 15 - will foster the self-evaluation of a variety of actors, and the long-term introduction of mechanisms regulating the allocation of financial resources compliant with best environmental practices.

Table D17: Relevant KPIs for Spoke 4, WP3.

Economic KPIs	Environmental KPIs
● Number of partner companies participating to the roundtable ● Number of companies visiting the website ● Number of companies taking and applying the methodology ● Number of events jointly organized with local stakeholders	● Number of companies applying the methodology for self-evaluating their environmental sustainability ● Increased fraction of financial institutions adopting environmental sustainability screening prior to allocation of financial resources

WP4 – Fintech&tech4fin

Assessment of potential impact:

Economic: The WP is expected to produce risk and sustainability assessments and foster the growth of a sustainable Milan Fintech ecosystem integrating centralized and decentralized financial infrastructures.

Environmental: WP4 will include the environmental sustainability dimension in all its activities: this will in turn contribute to the generation of tools and products characterized by environmental responsibility, as well as their widespread adoption.

Table D18: Relevant KPIs for Spoke 4, WP4.

Economic KPIs	Environmental KPIs
● Publicly available risk and sustainability assessments ● Public dissemination of a sustainable fintech business model that integrates centralized and decentralized financial infrastructures	● Assessment of environmental impact of technologies applied to financial instruments ● Number of new sustainable technologies applied to financial products in the Milan hub

Spoke 5 Sustainable Fashion, Luxury and Design

General impact assessment:

The expected impacts on the economy of the territory in the fashion, luxury and design value chains will be:

- Adoption of innovative solutions by existing companies
- Development of entrepreneurship and building of human capital
- Reduction of offshoring and relaunch of physical activities within the city of Milan and Lombardy region.

The beneficial impacts of the Spoke 5 activities on society at large is based on the following pillars:

- Limiting negative effects of the concerned industries on the environment
- Development of consumers' awareness and enhancement of their involvement in the different stages of the value chain

It is expected that the best practices developed for these industries will enhance the positioning of the Lombardy Region, and specifically of the City of Milan, as a forerunner in the design and production of eco-sustainable fashion products at the national and international level. Therefore, in a broader perspective it should be considered the role model played by the Innovation Ecosystem and the indirect impact brought by replicability.

The foreseen activities will also contribute to the horizontal priorities of the NRRP. The support to entrepreneurship (including services for startups) and the focus on the exploitation of digital technologies make the young generations best suited to engage in new activities reaping the benefits of an Ecosystem providing them with tools and opportunities.

We believe that the above activities will also have a relevant impact in terms of gender equality and social inclusion through the planned actions targeted at supporting women and diverse entrepreneurship.

WP1 – Applied research on sustainable practices and innovative technologies

Assessment of potential impact:

Scientific: The WP aims to produce extensive research capable of supporting the development of sustainable practice and innovative technologies among the overall fashion/luxury value chain at a regional, national, and European level. The research output, as well as its expected impact, affects 3 main areas: 1) the definition of a maturity model to assess the level of adoption of sustainable practices; 2) An extensive literature research on sustainable materials and industrial processes; 3) the development and prototyping of new materials and industrial processes.

Economic: The WP, leveraging the support provided to businesses in the assessment of their maturity level in the domain of sustainability and in fostering the transition to more sustainable materials, processes, and paradigms, is expected to impact the overall fashion/luxury value chain profoundly. The support in the technology transfer process and knowledge sharing will allow fashion/luxury SMEs and larger firms to intercept emerging demand trends effectively. The use of eco-sustainable materials is indeed emerging as new luxury paradigms capable of generating value in the dual aspect of reducing the impact of economic activity and allowing experiments with new materials and techniques with further opportunities for scalability beyond the luxury goods industry.

Environmental: WP1 is expected to have a positive impact on the environment by: i) the adoption by SMEs and companies active in the fashion, luxury and design industries of the maturity model allowing to assess their positioning with respect to sustainable practices over the whole production and value chains; ii) scale-up of a series of product (materials) and process innovations to increase the overall sustainability of the sector.

Table D19: Relevant KPIs for Spoke 5, WP1.

Scientific KPIs	Economic KPIs	Environmental KPIs
- Number of response collected to the survey (Maturity model development) - Number of company analysis - Number of supply-chain-wide analysis - Number of existing material/processes/patent/model mapped - Number of existing material/processes/patent/model developed	- Number of startups generating new materials actually adopted by small or larger brands - Added value generated by companies through new processes and products exploiting re-use	- Number of SMEs implementing the maturity model and defining a roadmap for a sustainable/digital transition - Number of SMEs adopting innovative sustainable business models - Increase in sustainable-by-design products and processes available in the fashion/luxury/design markets - Overall decrease in consumption of critical and/or polluting resources and processes by the fashion/luxury/design sectors in the Milan area and in the entire supply chain

WP2 – Achieving a Culture Driven Retail Model through Innovative forms of collaboration, incubation and acceleration of startups

Assessment of potential impact:

Social: Operating incubators and accelerators (further supported by awards and marketplaces) specifically targeted towards supporting sustainable and socially inclusive ventures will expand the number of young and female entrepreneurs active in this industry and the number of new firms started and successfully operating.

Economic: The Sustainable Luxury Smart Manufacturing and Retailing Platform (SL-SMRP) developed within the WP2 will enable fashion and luxury SMEs and startups on the territory to participate in product development and commercial projects and contracts that they would otherwise not be able to access. The SL-SMRP will thus enhance commercial opportunities and growth of SMEs and startups, enrich their knowledge and capabilities by connecting

them to a network, and avoid or reduce past trends towards offshoring production in this industry. Additionally Incubating and accelerating "Innovative and Sustainable Culture-Driven Retail and Service Models" will: (a) provide sustainable SMEs and startups an accessible commercial outlet, coherent with their business model; it will also offer providers of luxury services a portfolio of innovative and sustainable best practices to enhance their business models; (b) actively contrast "retail apocalypse" phenomena (the closing of retail stores, especially suburban shopping malls) while simultaneously recovering and enhancing urban building and areas; (c) preserve and enhance the local cultural and historical heritage in fashion and luxury, by recording, organizing, and making available currently sparse elements of this legacy as part of innovative retail and service models (e.g., in shopping areas and luxury resorts).

Table D20: Relevant KPIs for Spoke 5, WP2.

Social KPIs	Economic KPIs
● Number of awards given. ● Number of jobs created ● Percentage of start-ups that have at least 50% of women among the founders	● Number of SMEs and startups actively connected to the platform ● Number of signed contracts ● Number of participants in the marketplaces ● Amount of revenues generated for partners connected to the platform ● Number of square meters of urban buildings and areas enhanced through innovative retail models ● Number of square meters of former industrial buildings, warehouses, railway yards reclaimed and enhanced

WP3 – Company Training and Cultural Dissemination

Assessment of potential impact:

Social: Enhancing expertise and awareness in companies and experts working in the supply chains of the luxury field on updated theoretical and practical knowledge on sustainability issues, legal issues in brand/technology protection, circular economy. Connecting all society stakeholders, starting from consumers, to engage them in the dissemination activities, and actively involving them in designing a complete and coherent set of courses and activities. Dissemination of issues related to innovation and sustainability via digital means to enhance the awareness of the general public; bottom-up interactions with consumers.

Environmental: Contribute to increase the share of professionals, companies and consumers aware of sustainability issues and solutions in the concerned industrial sectors, also through the promotion of adequate certification schemes.

Table D21: Relevant KPIs for Spoke 5, WP3.

Social KPIs	Environmental KPIs
● External recognition of the potential economic and cultural impact of the training activities; number of courses delivered ● Qualitative and quantitative indicators: number of cultural dissemination initiatives organized (MOOCs, digital applications, expositions and experiential labs) ● Number of participants involved in dissemination initiatives ● Number of links and citations (publications, web, social media	● Share of consumers reached by the Spoke's activities considering sustainability among the criteria when selecting fashion, design and luxury products and/or producers ● Number of firms in the sector requiring/obtaining an eco-sustainability label after involvement and/or through the services enabled by the Spoke

Spoke 6 – Innovation for Sustainable and Inclusive Societies

General assessment:

Social inclusion and diversity are keystones of a prosperous, modern economy that provides sustainable and inclusive growth. The Lombardy region can work as an example of innovative policies, which can be applied in other contexts. The Milan Metropolitan Area is characterized by a high level of creativity and innovation, with strong connections between the industrial and cultural sectors. Spoke 6 will develop a synergy among the industrial sector, the cultural sector, and the universities as centers of scientific research and training, making innovation a resource for the

development of society. While it is hard to quantify the economic impact directly, all these actions target individual human capital, local welfare infrastructures, and firm productivity, which positively impact the economy.

Through communication initiatives, public engagement actions, and education programmes, Spoke 6 aims to boost the ecosystem's social impact and its R&I findings. It contributes to shaping a society more adapted and ready to support the transformation of Milan, a creative and complex metropolis, into a model of sustainability (WP1). Societal transformation occurs only through its human capital, which must be strengthened by specific actions of empowerment both of individuals and communities (WP2), even reaching those sectors of populations that are more vulnerable in order to turn them into additional assets for the society (WP3).

Assessment of potential impacts for all WPs:

Economic:

- Strengthen the development of Milan and of its local communities, by the exploitation of the project achievements;
- Exploit the connections among the universities, the industrial sector, including the cultural one, the welfare system and the citizens, in order to strengthen the local territories throughout the Milan district
- Foster equality and have a significant social impact, particularly in terms of social and environmental sustainability and wellbeing

Social:

- Strengthen and develop infrastructures for education and training at the service of the whole municipality, capitalizing on the research and innovation achievements of the whole project
- Shape a community-based "stewardship ecosystems", in which all citizens have the opportunity to take responsibility for local (economic, environmental, and social) needs
- Promote diversity as a fundamental value of modern society
- Promote new models of living together, by fostering local area development, with targeted investment in strategies for educating the human capital, starting with the younger generations
- Promote good practices to enhance degrees and vocational paths with a particular attention to STEM, non-academic tertiary education (ITS), industrial PhD programs, vocational degrees and the lifelong learning process

Environmental:

- Since social sustainability is one of the three pillars of sustainability, the outcomes of the Spoke 6 activities will boost the overall environmental impact of the programme: indeed, the social dimension is essential for an effective, participated and long-lasting green transition
- Conversely, the environmental and climatic crisis affect differently frail categories of our society: recognizing the link between environmental and social sustainability is a prerequisite for a fair twin transition
- The development and the use of digital technologies for remote educational and participatory processes will reduce the resource consumption and the pollution related to transportation for in-person venues
- Among the topics of educational activities of this Spoke, environmental issues will play a key role in educating young generations in a way consistent with a broader awareness of environmental global issues

WP1 – Accelerating Participatory Processes Through Digital Technologies and data management

Assessment of potential impact:

Economic:

- Promote collaborative practices in professional environments via the use of technology, which becomes an enabling factor rather than a barrier

- Guarantee an easier transition into the labour market

Social:

- Increased levels of trust, mutual recognition, and working together on common problems, at different levels of interaction (e.g., citizen and scientists; citizen and artists; citizen science teams and municipal authorities; educational institutions and industry…)
- Reduced physical barriers and technological obstacles that prevent people to fully express their potential
- Improved developmental outcomes and wellbeing in persons with disabilities and their caregivers
- Increased attractiveness of the Metropolitan City of Milan in relation to higher value-added segments of the productive system, international students, professionals, and tourists from the cultural landscape
- Promote cultural participation as a path to fight cultural and social poverty (considering educational and social poverty composite indexes to monitor that path)

Table D22: Relevant KPIs for Spoke 6, WP1.

Social KPIs	

- For Open air labs:
  o Number of realized installations
  o Number of young artists and scientists reached (by an open context)
  o Number of students involved in participatory educational activity with artists/scientists
- For telescope activities:
  o Number of students/year involved in the deployment of the telescope for inquiry-based unit in higher education
  o Number of projects with high schools (night observations, training, data analysis)
  o Number of visits/conferences for primary/secondary schools/year (daytime)
  o Number of nighttime observations and public conferences
  o Number of universities reached through remote learning materials
	- MCM Higher Education Observatory:
	  o Number of participants to the observatory webinars and seminars
	  o Number of download of reports
	  o Bounce rate of website
	  o Number of supported initiatives focused on the Metropolitan City of Milan higher education system
	  o Growth of the number of female students in STEM
	  o Decrease in high education dropout in the territory
	- Human Rights Hub:
	  o Number of people involved/participants
	  o Number of accesses to the digital Hub
	  o Number of Hub activities
	  o Other web engagement metrics (e.g., up/downloads)

Environmental KPIs	
- Increased use of effective digital tools for educational/participatory actions - Reduction of emissions/pollution due to the organization and public participation to on-line activities - Development of initiatives (public engagement, education) aimed at raising awareness and disseminating policies and best practices	

WP2 – Empowering Individuals, Communities and Organizations

Assessment of potential impact:

Economic:

- Increase school participation and performance in school
- Support the development of local welfare schemes which meet the need of the population
- Promote gender diversity as a firm practice, with positive repercussions on firm productivity (improvements in gender equality would lead to an additional 10.5 million jobs in 2050, which would benefit both women and men)
- Empowering people and organizations in order to develop a more equal and sustainable environment of work and life in general

Social:

- Increased human, social, and political capital, through strong educational, empowering and transfer of knowledge activities
- Responding to the needs of the citizens, with a specific focus on selected vulnerable groups of people (e.g., women victims of violence, people with disabilities and their caregivers, migrants, foreign people)

Table D23: Relevant KPIs for Spoke 6, WP2.

Social KPIs	

● Hub:
   o Number of initiatives covered and launched
   o Number of researchers/students involved
   o Number of schools
   o Number of workers/citizens
● Think tank:
   o Number of databases created
   o Number of best practices and actions identified
   o Increase in gender balance in the fields of intervention
   o Number of private/public subjects and employees reached
   o Number of gender-balance certifications released
	● Lab:
	   o Number of digital-skills training provided
	   o Number of citizen/families/schools reached by educational activities
	   o Number of digital-wellbeing reports published
	   o Number of products and services ready for market
	   o Number of companies/trade unions participating in meetings
	   o Number of articles/interviews in media/press
	● MOOC:
	   o Number of users, level of attendance
	   o Quality of learning

Environmental KPIs	
● Number of activities (Hubs/Labs/MOOCs/Think tanks) including and addressing environmental issues ● Number of end-users involved in educational activities focused on environmental sustainability	

WP3 – Innovative Models against Social Inequalities

Potential impact assessment:

Economic:

- Strengthen the employability and the qualification of vulnerable individuals
- Empower people and organizations in order to develop a more equal and sustainable environment of work and life in general

Social:

- Reduced physical barriers and technological obstacles that prevent people to fully express their potential
- Support the development of local welfare schemes which meet the need of the population
- Respond to the needs of the citizens, with a specific focus on selected vulnerable groups of people (e.g., women victims of violence, people with disabilities and their caregivers, migrants, foreign people)
- Support child development and caregiver wellbeing and skills in families of children with disabilities
- Improved developmental outcomes and wellbeing in persons with disabilities and their caregivers
- Facilitated access to basic rights for vulnerable individuals and groups, with universities playing a pivotal role on sectors of society usually excluded by higher education
- Promote cultural participation as a path to fight cultural and social poverty (considering educational and social poverty composite indexes to monitor that path)

Table D24: Relevant KPIs for Spoke 6, WP3.

Social KPIs	

● Legal clinics:
   o Number and type of events promoted and attendees
   o Number and variety of vulnerable categories assisted by the clinic
   o Number and variety of support in favour of vulnerable groups
   o Number and variety of students and institutions involved
   o Number of inmates in Bollate prison addressing the desk
	● Welfare platform:
	   o Figures about local government social inclusion targets
	   o Development of social indicators
	   o Number and capacity of social initiatives involved
	   o Number of socially excluded people reached through the platform
	   o Initial figures about participation (frequency, length, intensity) in social inclusion initiatives

o Number of relations with consulates established	o Number of frail people accessing social and health services o Number of platform users and volume of activity

Environmental KPIs
● Number of reports/initiatives addressing the differential impact of environmental crisis on vulnerable individuals and categories

D2. Synergy with programs funded on other investments envisaged by the PNRR (M4C2)

The MUSA ecosystem has scientific and technical synergies with several M4C2 investments. Specifically, MUSA could exploit the knowledge and skills deriving from three National Centers (NC):

- the NC for Simulations, Calculation and Data Analysis represents a fundamental starting point for MUSA, because: i) it supports the frontier research necessary for the digital transition ii) it provides models and systems for the management of big data (central topic of the MUSA Spoke 2); it provides key simulations of various research fields consistent with MUSA topics such as environmental, health and technological innovation.
- the NC for Biodiversity offers several opportunities to develop the research actions on urban regeneration of MUSA Spoke 1, especially the NC research on urban biodiversity and the strategies to mitigate climate change. An entire spoke of the NC for Biodiversity is centered on the scientific and cultural valorization biodiversity, including advanced training activities such as new doctoral courses. The actions of MUSA Spoke 1 are synergistic with both the measures dedicated to PhD students and the activities devoted to young people and the training of new researchers in M4C2.
- the NC for Sustainable Mobility could offer useful insights about process and product innovations in the field of urban mobility, which are also the object of Spoke 1. In this context, MUSA could provide tools to bring some NC solutions to the operational environment such as Milano-Bicocca University campus .

Regarding M4C2 'Extended Partnerships', MUSA there exist potential complementary and synergies with several project, covering the following themes:

- Partnership 2. Future Energy Scenarios deals with a topic of great interest and potential synergy with MUSA; it could provide critical knowledge inputs in various fields, from green energies to exploitation of CO_2 for energy purposes (a topic that is extremely relevant to various ecosystem partners such as ENI and EDISON);
- Partnership 3. Environmental, natural and anthropogenic risks. Potentially important synergies with MUSA concern the analysis dedicated to territorial planning and risk prevention in urban environments;
- Partnership 6. Diagnostics and innovative therapies in medicine, along with partnership 8 and 12 on the social and medical challenges of aging and neurodegenerative diseases, are of great interest to MUSA Spoke 2. This spoke deals with innovations in the multifactorial disease prevention sector through accessible platforms and medical actions targeting citizens' lifestyle;
- Partnership 9. Economic and financial sustainability of systems and territories. This partnership focuses on the evolution of the economic and social conditions of the Italian territories and the national economic system as a whole. This theme is crucially important for MUSA Spoke 4, dedicated to sustainable economy and finance. It is also important for adapting MUSA's design actions in different urban and peri-urban[s2] contexts of the Italian territory;
- Partnership 11. Circular and sustainable Made in Italy. This partnership has a high degree of synergy with MUSA Spoke 5 and will be able to offer many ideas for innovation, especially to address the issue of circularity and sustainability of production processes in sectors such as fashion, design and luxury.

A key action of M4C2 concerns the introduction of innovative doctorates that respond to the innovation needs of companies and promote the recruitment of researchers by industries. In this context, MUSA envisages the following actions: i) industrial PhD courses to bring research and business closer; ii) the development of joint labs and fab labs to encourage the training of interdisciplinary researchers oriented to problem solving; iii) the organization of training and technology transfer actions to foster the recruitment of highly skilled persons in the industrial context.

Finally, regarding the possible connections with the NRRP infrastructure initiatives, MUSA intends to exploit different ESFRI infrastructures. ESFRI Research Infrastructures are facilities, resources or services identified by

European research communities to conduct and support top-level research activities in particular scientific domains. ESFRI selects proposals of RIs in strategic areas of research and with an adequate level of maturity to become ESFRI Projects, and identifies successfully implemented RIs to become ESFRI Landmarks. The University of Milano-Bicocca hosts the following ESFRI RIs, that provide access to services in the scientific domains of Environment, Health & Food, and Social & Cultural Innovation, categorized at European level:

- LifeWatch
- BBMRI
- ECRIN
- Elixir
- IBISBA
- ISBE
- MIRRI
- CESSDA-ERIC.

NRRP programmes will help improve these infrastructures, with positive effects on the MUSA Ecosystem as well. Envisaged interactions will occur, at minimum, between LifeWatch, Elixir and CESSDA-ERIC.

Concerning the thematic synergies described above, the MUSA Ecosystem will put in place actions that are "complementary by design" with other investments funded under the Mission 4, Component 2 of the NRRP. Indeed, the focus of the Innovation Ecosystem differs from the ones of other investments, regardless of the direct participation of MUSA partners in those programmes, on the following grounds:

- MUSA integrates themes and topics that are key to some of the Extended Partnerships (Investment 1.3 of Mission 4, Component 2 of the NRRP), but the latter are focused on *basic research*, which is characterised by low TRLs. MUSA will instead address *industrial research, experimental development, feasibility studies* and *technology transfer* with the vision of building and reinforcing the local innovation landscape. The planned activities thus require an initial higher TRL with respect to Extended Partnerships. Therefore, the technological advancements and the impact strategy adopted by MUSA do not replicate, nor overlap with, the pathways pursued by Extended Partnerships.
- The reinforcement and creation of Research Infrastructures and Technology Infrastructures for Innovation (Investment 3.1 of Mission 4, Component 2 of the NRRP) consist of large infrastructural interventions that are instead not foreseen by the MUSA Ecosystem. In addition, the models for services, impacts, and involvement of private economic actors on the territory defined by MUSA differs intrinsically from the ones identified by the call for proposal for Investment 1.3.
- As detailed above, some of the National Centers (Investment 1.4 of Mission 4, Component 2 of the NRRP) are devoted to technologies that can be relevant for the MUSA Ecosystem as well. However, the National Centers are tailored to the needs of the overall national research and innovation landscape with a focus on the TRL increase of specific key enabling technologies. MUSA has instead been designed to respond to the challenges of our territory embracing the different dimensions of sustainability at the urban level with the aim of filling a gap between applied academic research, companies, and society at large. This vision is thus going beyond the development of individual enabling technologies, and aims at fostering innovation through the integration of all relevant actors in the process, also empowering and providing with suitable instrument external actors, and building a bridge towards real-world application. Thus, MUSA occupies a different position in the innovation process as compared to National Centers, which guarantees that efforts and activities will not be duplicated.
- Finally, it should be noted that ten additional Innovation Ecosystems are funded under this call for proposals. The outcomes of the evaluation phase show that eight of them will concentrate primarily on specialization areas different from the one identified by MUSA, namely *Health*, *Humanistic culture, creativity, social transformations, society of inclusion*, and *Digital, Industry, Aerospace*. Two other Ecosystems, instead, share with MUSA the specialization area of *Climate, Energy and Sustainable Mobility*. However, these are located in other Italian Regions (Emilia Romagna and Calabria), which are characterised by different innovation needs and potentials as compared to the specificities of the Lombardy Territory and of the Milan Area described in Section A2. This holds true also for the actions of MUSA related to its secondary specialization areas. To summarize, the large investment and strong commitment of MUSA to develop opportunities for and with its reference territory - testified also by the presence of local government bodies in the Hub - makes it an original experiment in the national landscape of Innovation Ecosystems.

D3. Complementarity with other national, regional and local programme frameworks

The Italian NRRP presents complementarities with other major regional development programmes, notably the National and Regional Operational Plans for Cohesion policy and the complementary Cohesion and Action plan, with their related funding instruments, the European Regional Development funds and the Italian Fondo per lo Sviluppo e la Coesione.

Regarding the complementarity with the national programming framework, the Partnership Agreement (PA) establishing the framework for Cohesion Policy in 21-27, specifically addressed the theme of the connection between the funds covered by the Partnership Agreement and the other investments envisaged in the Recovery and Resilience Plan. Similarly the Fondo per lo Sviluppo e la Coesione set out the aim of ensuring the complementarity and additionality of its resources with both the PA and the NRRP. All these instruments taken together contribute to the achievement of economic, social and territorial cohesion objectives, as well as Cohesion policy funds.

Innovation, digitalization and the transition to a "green" economy are crucially important challenges for both the NRPP and the National and Regional Operational Plans for Cohesion. In this setting, the most relevant policy objective for MUSA is policy objective 1, which aims to encourage collaborative research and knowledge exchange between companies, universities and research organizations. The aim is to create or promote places and opportunities for meeting between different agents of the innovation process, notably among those working on technology transfer and the transformation of new ideas into products and services, and those offering advanced services in response to the research and innovation needs of businesses, with the contribution of universities and research organizations. This is a key reference point for what this Innovation Ecosystem intends to achieve.

The government envisages to evaluate any specific potential financial, strategic and operational integration and synergy mechanisms, for the lines of action complementary or supplementary to the investments planned under the NRPP, with appropriate declinations and differentiations in terms of target and scale of the intervention, with particular attention to system actions which will be financed under Policy Objective 1. Thus, the government set out the framework for the mechanisms which will be implemented to maintain the supervision on the demarcation with the NRRP in the context of the future "National Research, Innovation and Competitiveness Plan for the green and digital transition 2021- 2027 "(PNR&I&C).

With reference to the complementarity with the current regional programming framework, in line with what is described in other sections of the proposal in which the synergies with the S3 and with the Lombardy Region ERDF OP have been identified, the presence of the Regional government (Regione Lombardia) in the HUB ensures the complementarity with its territorial strategy, the additionality of the research and innovation activities carried out by MUSA with the regional ERDF OP measures, Axis 1 strategic partnerships initiatives in particular, and the systematization of MUSA results and ERDF OP initiatives.

In particular, the integration of regional and European resources will guarantee the sustainability of the investment in the long term. This is important to ensure the continuation of activities beyond the period of operation of the NRRP. MUSA proposal aims at ensuring the consistency of the project with the Lombardy strategy for boosting research and innovation and will be undertaken in synergy with Lombardy Region through the stages of the project. This will also guarantee the absence of double-financing of the project, in accordance with the provisions of the Ministry of Economy and Finance (Circolare n.33 of 31/12/2021).

Similarly, with reference to local planning, the presence in the HUB of the Municipality of Milan will allow the research activities to contribute to a broader "bottom-up" local development strategy. Related to this, the Programma strategico triennale (PST) 21-23 points to possible mechanisms for ensuring the coherence of the S3 and the strategic priorities of research innovation in Lombardy with the NRRP and with the preparatory documents of the Regional Program ERDF 21-27 of the Lombardy Region.

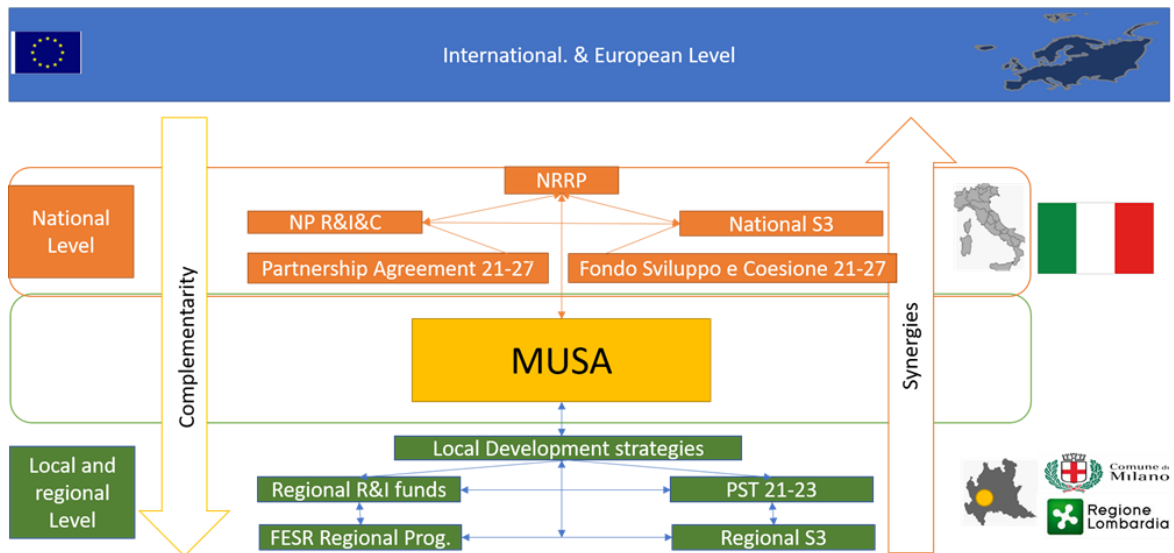Complementarities and Sinergies between National, Regional and Local Programmes

Figure 6. Connections between MUSA and the strategies and plans at the local, regional and national level.

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Milano, data della firma digitale

Prof.ssa Giovanna Iannantuoni
Rettrice dell'Università di Milano-Bicocca
(f.to digitalmente ex art. 24, D.Lgs. 82/05)

Attachments:

a)   Curriculum Vitae in European format of each resource engaged in the implementation of the research program of the NC, drawn up in English and containing the authorization to process personal data (According to law 679/2016 of the Regulation of the European Parliament of 27th April 2016, I hereby express my consent to process and use my data provided in this CV)