

D24.7 Exploitation and IPR management strategy



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D24.7 Exploitation and IPR management strategy

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Executive Summary

D24.7 Exploitation and IPR management strategy (M9). It defines a plan for the MULTICARE project results to guide the consortium towards a viable exploitation strategy

The MULTICARE project aims to enhance the resilience of the built environment to extreme climate events by developing new decision-support frameworks and technological and digital solutions for economic, reliable, and sustainable resilience. In particular, it focuses on integrating low-carbon resilient technologies into modular and prefabricated constructions for next-generation smart buildings, prioritizing safety, energy efficiency, environmental sustainability, quality of life, circularity, and scalability. These technological and digital solutions will have a positive impact on the design, operation, and management of real estate assets. The project aligns with the resilience thinking embedded in EU policies, contributing to the definition of quantitative indicators for monitoring the resilience of the built environment and identifying existing vulnerabilities to mitigate.

This document establishes a strategy for the effective use of MULTICARE project results, guiding the consortium towards a viable exploitation strategy. This includes identifying, analyzing, and characterizing potential exploitable results, assessing risks, and formulating an intellectual property rights management strategy.

MULTICARE will assess the market adoption of project results, defining a final exploitation strategy, including an appropriate business plan and commercial agreements for post-project sustainability. The purpose of this task is to create a plan for the MULTICARE project's outcomes, guiding the consortium towards an effective strategy for utilizing these results. This plan will be developed concurrently with research and development activities and will serve as a framework for actions in phases T25.6 and T26.2. The methodology for identifying potential exploitation opportunities and managing Intellectual Property Rights will be established based on an initial analysis of the project's exploitable results. Steps for future commercial deployment of project outcomes will be detailed, starting with the identification, analysis, and characterization of potential exploitable results, followed by risk assessment and the formulation of an IPR management strategy. A dedicated workshop will be arranged to inform project partners about the objectives, guidelines, and effort necessary for both exploitation and IPR management strategy.

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GLOSSARY

ACRONYM	FULL NAME
EI	Expected Impacts
EO	Expected Outcomes
IPR	Intellectual Property Rights
KER	Knowledge Exploitation Route
KPRs	Key Project Results
KSO	Key Strategic Orientations
TRL	Technology Readiness Level

1. Introduction

1.1. MULTICARE project

The current state of the built environment is inadequate to handle the increasingly frequent and severe climate-related extreme events. Existing buildings lack the capability to adapt and recover from such events, leading to significant socio-economic losses and impacting people's health and well-being. While recent advancements in construction offer solutions for specific hazards like floods or earthquakes, they often come at high costs, lack eco-friendliness, and seldom address multiple hazards in one location. This is partly due to the absence of a clear framework to quantify the overall socio-economic-environmental impacts of natural disasters over a building's lifespan, as well as tools to assess buildings' holistic climate resilience. Consequently, selecting optimal solutions for real-world scenarios involving multiple hazards remains a major challenge.

The MULTICARE project aims to directly tackle this challenge by developing new decision-support frameworks and providing technological and digital solutions to enhance the resilience of the built environment economically, reliably, and sustainably. Technologically, this involves integrating multifunctional, low-carbon resilient technologies into modular and prefabricated constructions for next-generation smart buildings. These buildings will prioritize safety, energy efficiency, environmental sustainability, quality of life, circularity, and scalability across various natural events and end-user needs. The plug-and-play technologies will be applicable to both new multi-story buildings and existing structures through minimally invasive external interventions. Digitally, MULTICARE will introduce a suite of multidisciplinary digital services and tools for assessing, designing, operating, and managing resilience against multiple hazards at different scales—from materials and components to entire buildings, neighborhoods, and cities. These digital tools will enable stakeholders to make informed decisions about materials and solutions, including for heritage buildings, and support resilient supply chains.

To validate its solutions, MULTICARE will conduct large-scale pilots in three European countries (Italy, Netherlands, Romania), chosen for their diverse environmental, social, and economic conditions. The project will engage banks and institutional investors to understand the financial benefits of resilience and update "green finance" mechanisms accordingly. Additionally, a user-centered and participatory approach will ensure engagement with citizens and maximize the project's long-term impact. The Consortium, comprising 21 partners (Table 1) from six EU countries, brings together expertise in R&D, practical implementation, social sciences, user engagement, and training to ensure broad application and success of the project's innovations. Moreover, the Consortium will collaborate with other research projects to share knowledge and raise awareness about building resilience, implementing an international outreach strategy to address project challenges globally.

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Table 1. Consortium

Number	Role	Short Name	Legal Name	Country
1	CO	TU Delft	TECHNISCHE UNIVERSITEIT DELFT	NL
2	BEN	PFE	PRIEDEMANN FASSADENBERATUNG GMBH	DE
3	BEN	IES R&D	IES R&D	IE
4	BEN	INCDFP	INSTITUTUL NATIONAL DE CERCETARE-DEZVOLTARE PENTRU FIZICA PAMANTULUI	RO
5	BEN	UNIROMA1	UNIVERSITA DEGLI STUDI DI ROMA LA SAPIENZA	IT
6	BEN	XLD	X-LAM DOLOMITI SRL	IT
7	BEN	STRESS	SVILUPPO TECNOLOGIE E RICERCA PER L'EDILIZIA SISMICAMENTE SICURA ED ECOSOSTENIBILE SCARL	IT
7.1	AE	UNINA	UNIVERSITA DEGLI STUDI DI NAPOLI FEDERICO II	IT
8	BEN	AMS Institute	STICHTING AMSTERDAM INSTITUTE FORADVANCED METROPOLITAN SOLUTIONS(AMS)	NL
9	BEN	PMB	MUNICIPIUL BUCURESTI	RO
10	BEN	ASM	ASM - CENTRUM BADAN I ANALIZ RYNKUSPOLKA Z OGRANICZONA ODPOWIEDZIALNOSCIA	PL
11	BEN	RoGBC	ASOCIATIA ROMANIA GREEN BUILDING COUNCIL	RO
12	BEN	RINA-C	RINA CONSULTING SPA	IT
13	BEN	UTBV	UNIVERSITATEA TRANSILVANIA DIN BRASOV	RO
14	BEN	ACER	AGENZIA CAMPANA PER L EDILIZIA RESIDENZIALE	IT
15	BEN	Boom	BOOM BUILDS B.V.	NL
16	BEN	OMRT	OMRT BV	NL
17	BEN	ROTHO BLAAS SRL	ROTHO BLAAS SRL	IT
18	BEN	ARUP	ARUP BV	NL
19	BEN	Tecuci	MUNICIPIUL TECUCI	RO
20	BEN	Hölscher	DIPL.-ING. HPLSCHER GMBH & CO.KG	DE

1.2. Exploitation and IPR management strategy

The exploitation and IPR management strategy (M9) outlines a plan for the MULTICARE project results, guiding the consortium towards a sustainable exploitation strategy.

Deliverable D24.7 is linked to task number 24.5, "Definition of Exploitation and IPR Management Strategy" (M1-M18). Both fall under the larger Work Stream 9 "Capacity Building, Communication & Dissemination, Exploitation," which has been divided into three successive work packages: WP24 "Definition of Exploitation and IPR Management Strategy" (M1-M18), WP25 "Capacity Building, Communication & Dissemination, Exploitation - Implementation" (M19-M30), WP26 "Capacity Building, Communication & Dissemination, Exploitation - Future Scalability" (M31-M48). Therefore, the output of WP24 will become the starting point for WP25, which in turn will become the starting point for WP26.

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The aim of this task is to establish a plan for the MULTICARE project results to guide the consortium towards a viable exploitation strategy. This task will be developed in parallel with the R&D activities and will serve as a guideline for the actions performed in tasks T25.6 and T26.2. At this stage, the overall methodology for identifying exploitation routes and managing Intellectual Property Rights will be defined, based on a preliminary analysis of the project's exploitable results and the definition of a Key Exploitable Results table to be share with the partners. The steps for the future commercial deployment of project outcomes will be outlined, starting with the identification, analysis, and characterization of potential project exploitable results, followed by risk assessment and the definition of the IPR management strategy. A dedicated workshop will be organized to share with the project partners the aims, guidelines, and effort required related to the exploitation and IPR management strategy.

2. Objectives and ambition

2.1 Context

Building a climate-resilient future by enhancing knowledge of climate impacts and adaptation solutions is central to the new European Strategy on Adaptation to Climate Change. The 2020 Strategic Foresight Report emphasizes “resilience” as a guiding principle for EU policies. The need for climate-resilient communities has become urgent due to the severe consequences of recent climate events causing systemic failures across various sectors in Europe. From 1980 to 2020, climate-related events resulted in €520 billion in economic losses within the European Economic Area, with only one-third of these losses being insured. Climate change impacts the economy, health, and well-being of Europeans, particularly affecting the most vulnerable, who suffer the worst effects of power outages, heat waves, and fatalities totaling 145,000 over the same period. These socio-economic impacts are exacerbated when the built environment is threatened by other disasters, such as earthquakes, which caused over 200,000 deaths and more than €250 billion in damage during the 20th century. Therefore, enhancing the resilience of the built environment is a key priority for the European Union.

Concurrently, the EU aims to decarbonize and reduce the environmental impact of the built environment, which is currently responsible for 40% of EU energy consumption, 36% of EU greenhouse gas emissions, and 35% of the EU's total waste generation. Over 220 million building units, representing 85% of the building stock, were constructed before 2001 with low or no energy standards, and about 40% were built before the 1960s, prior to the implementation of seismic codes. To prepare the built environment for the inevitable impacts of future events, proactive measures are needed now to build a climate-resilient future. As stated by Executive Vice-President for the European Green Deal, Frans Timmermans, if we act today, we can create a climate-resilient tomorrow.

Despite the growth of technical solutions, guidelines, and procedures for future-proof buildings, significant challenges remain that slow the transition towards a resilient Europe. Specifically, the frameworks for defining community resilience lack: (i) a clear definition of climate resilience and methods for quantifying resilience and social losses due to extreme climate events like heat waves; (ii) procedures to guide engineers and architects in designing resilient buildings and facades, facilitating the integration of innovative resilient technologies; (iii) building performance simulation tools that account for multiple context-related hazards to minimize risks and achieve reliable, optimal designs. Moreover, despite technological advances for new buildings and retrofitting interventions, there are: (i) very few integrated and tailored adaptation solutions with resilience capacity and high performance against multiple hazards; (ii) no resilience control methods for long-term monitoring and optimization of technological (multi) performance; (iii) no integrated technological solutions to improve resilience in a cost-effective, low-carbon manner.

MULTICARE aims to develop and deliver innovative plug-and-play low-carbon resilient technologies and multidisciplinary digital tools to enhance the multi-hazard resilience of the existing building stock in a cost-effective, timely, and environmentally sustainable way.

The MULTICARE strategy is founded on an integrated multi-hazard approach (focusing on earthquakes, floods, heat waves), multi-scale approach (material, components, building, urban), and multi-domain approach (technical, social, economic, environmental) to improve the multi-phase resilience (initial state, degraded state after disruptive event, and recovery phase) of our building stock.

2.2 Objectives

MULTICARE aims to foster a resilient Europe by offering adaptive technological solutions, focusing on residential buildings and social housing, along with integrated approaches and tools essential for assessing, enhancing, and addressing future climate threats. Specifically, MULTICARE will provide multi-layer modules composed of low-carbon modular components with standardized plug-and-play connections to enhance building resilience against multiple hazards, while also supporting sustainable development and improving quality of life. These solutions enable efficient construction and deconstruction, substantial cost and time savings, and resilient supply chains tailored to local conditions. The technologies are scalable and can be customized for both new and existing buildings across Europe. Moreover, MULTICARE will create innovative decision-support frameworks and a suite of digital services to aid in the assessment, design, and management of multi-hazard resilience throughout the building lifecycle and across various scales, from materials to urban environments. This resilient and sustainable approach will inform design decisions and enhance real-time control, simulation, and operation of buildings and urban areas.

MULTICARE addresses the entire disaster management lifecycle, from identifying development plans to minimizing potential losses during disasters, and analyzing response and recovery efforts post-disaster. The project integrates multiple resilience domains—technical, social, economic, and environmental—that guide its development and support the selection of impact criteria. By evaluating the expected resilience improvements in each domain and their combinations, specific objectives are set to achieve the project's ambitious goals.

2.3 Alignment with Relevant EU Directives

The EU is currently embedding resilience thinking into policymaking by developing a theoretical background and defining key resilience concepts (JRC conceptual framework). The 2020 Strategic Foresight Report introduced resilience as a new compass for EU policies and proposed developing prototype resilience dashboards for monitoring social, economic, green, digital, and geopolitical resilience. MULTICARE aligns with this holistic resilience-based framework and will help define quantitative indicators for resilience monitoring of the built environment. This will help identify existing vulnerabilities to be mitigated, facilitating the transition towards a resilient, green, and digital transformation.

In June 2021, EU environment ministers approved the new EU strategy on adaptation to climate change, presenting a long-term vision for Europe to become a climate-resilient society. This is in line with the proposed European Climate Law, recognizing adaptation as a key component of the long-term response to climate change. The new EU Adaptation

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Strategy also ties directly to recent global agreements, such as the Paris Agreement, the Sendai Framework for Disaster Risk Reduction, and the Sustainable Development Agenda, as well as the EU's implementation of these goals. Within this strategy, actions are planned to support the transition towards a climate-resilient society, such as improving knowledge and managing uncertainty, adopting nature-based solutions, and local adaptation actions. MULTICARE aligns with these actions by (i) supporting the enhancement of climate change knowledge through robust risk assessments and quantified climate loss data (social, economic, environmental) for better-informed decision-making, (ii) providing low-carbon resilient solutions for new builds and retrofit interventions, and (iii) promoting local planning at multiple scales to accelerate multi-hazard adaptation. Additionally, MULTICARE aligns with the revision of the European Energy Performance of Buildings Directive (2018) and policies encouraging building renovations for improved resource and energy efficiency (European Green Deal, Renovation Wave, “Fit for 55” package). MULTICARE will contribute to these targets by delivering smart technologies for enhanced energy efficiency and well-being. Furthermore, MULTICARE aligns with the New European Bauhaus initiative, connecting the European Green Deal to the creation of beautiful, sustainable, inclusive places. As part of technology development, MULTICARE follows the European framework for sustainable buildings Level(s), thereby pursuing circular economy principles in the built environment.

3. Key Exploitable Results and preliminary Exploitation routes

3.1 MULTICARE's pathways towards impact

The project will develop innovative methods, technologies, and products to enhance the multi-hazard resilience of systems, buildings, and urban areas. These technological and digital solutions will positively impact the design, operation, and management of building assets. **Key Project Results (KPRs)** will support the achievement of the EU's policy goals by contributing to the Expected Outcomes (EO), Key Strategic Orientations (KSO), and Expected Impacts (EI) of the work programme in the long term, extending beyond the immediate scope and duration of the project. The KPRs will benefit various target groups, including stakeholders from the research community, industry players, potential end-users, investors, and civil society.

Table 2. Key Project Results (KPRs)

Key Project Result (KPR)	Description	Type of result	Owner
Digital tools for multi-hazard resilient-based and sustainability design and assessment			
KPR1	Digital library of resilient and sustainable systems (Materials, Components)	Tool	OMRT, BOOM, PFE
KPR2	Software and plug-ins for resilience-based 3D-Planning in open-BIM (Materials to Building)	Tool and models	PFE, SUR
KPR3	Algorithms for climate risk analysis and loss assessment (Building)	Models	TUD, ARUP
KPR4	Indoor climate and energy retrofit parametric tool for heritage (Building)	Tool	AMS

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KPR5	Tools for performance analysis and geometry generative design (Building)	Software	OMRT
KPR6	Integral design tool to streamline design processes (Building, Urban)	Software	OMRT
KPR7	Spatial Decision Support System for resilience urban planning (Urban)	Software	IES
Digital interoperability and services for data management and monitoring			
KPR8	Services for digital twin, optimization, control (Materials, Components)	Service and models	PFE, TUD
KPR9	Service for earthquake monitoring and dynamic modelling (Building)	Service and models	INFP
KPR10	Heat waves prediction and early warning & IEQ optimization (Building)	Service and tool	IES, RINA
KPR11	System for earthquake early warning and rapid loss estimation (Urban)	Service and models	INFP
KPR12	System for forecasting and monitoring of river discharge (Urban)	Service and models	TUB
KPR13	GIS tool for time-dependent estimation of travel times, isolated areas (Urban)	Tool	INFP, TUD
Structural/Non-structural technologies for improving building resilience			
KPR14	Prototypes of sensor-integrated constructions (Components)	Prototype	HOLSCH, PFE
KPR15	Prototypes of optimized envelope with energy generation (Façade)	Prototype	HOLSCH, PFE
KPR16	Prototypes of high-performance low damage low-carbon systems (Structure)	Prototype	XLD, RTB
KPR17	Prototypes of low-carbon resilient exoskeletons (Façade, Structure)	Prototype	XLD, RTB
Database, models and knowledge to facilitate resilience design and renovation			
KPR18	Methods for multi-hazard resilience design and	Skills and knowledge	PFE, TUD, ARUP

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	assessment at multiple scales (Materials-Urban)		
KPR19	Database of resilient packages, including LCA & microclimate data (Materials-Urban)	Data and models	OMRT, ASM
KPR20	Database of raw and pre-determined dynamic parameters (Building)	Data	INFP
KPR21	Standardization & roadmaps for circular resilient buildings, supply chains	Pre-standards, roadmaps	TUD, AMS
KPR22	Social models and tools for human-centred technologies and innovations	Models	ASM, TUD
KPR23	Financial tools for facilitating the adoption of green and resilient buildings	Models	RoGBC
KPR24	Innovative business models and tools for improving economic benefits	Models	RINA

3.2 Exploitation activities

Aligned and coordinated with communication and dissemination activities, exploitation efforts will aim to prepare the groundwork for utilizing the developed technological solutions. To ensure the long-term sustainability of MULTICARE results, an Exploitation Strategy (D24.6 “Training Content Creation Plan”) and Plan (D26.2 “Cooperation with sister projects and initiatives report”) will be developed within tasks T24.5, T25.6, and T26.2, forming a living document throughout the project. The final exploitation plan will offer a comprehensive and practical pathway for commercial and operational success beyond the project’s end.

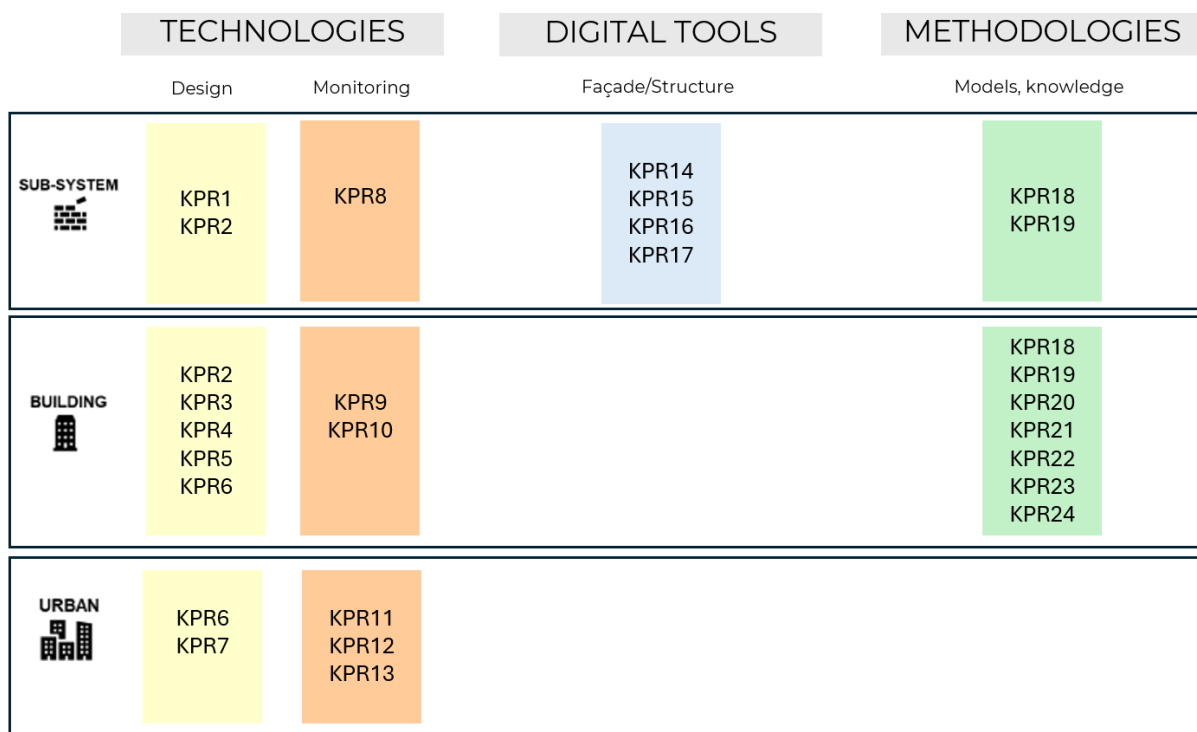
The MULTICARE project aims to enhance resilience and climate adaptability at various scales (urban, building, sub-system) by focusing on three main outcome categories: (i) Multi-criteria digital services and tools for resilience-based and sustainable design, assessment, data management, and resilience monitoring, (ii) Structural/non-structural low-carbon resilient technological modules, and (iii) Databases, models, and knowledge to support resilience design and renovation. Additionally, correlated results will emerge from the expertise and know-how developed during the project.

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The market uptake of MULTICARE results will be assessed throughout the project (T25.7, T26.2), with the final exploitation route defined in the project's last year, including a suitable business plan and commercial agreements for post-project sustainability. The table below summarizes the individual Intellectual Property Rights (IPR) and exploitation strategy (e.g., licensing, patents) for each Key Project Result (KPR).

The MULTICARE Key Project Results (KPRs) are each defined as potential stand-alone marketable solutions. However, there are interconnections between these KPRs, considering their typology, scale of implementation, and the target market groups they address. The further development of many solutions at each scale can rely on other KPRs from different categories or target areas. For example, in the digital tools for multi-hazard resilient-based design, KPR1 and KPR2 relate to materials and components on which the development of KPR5 and KPR6 depend. Similarly, KPR6 and KPR7 are tools for resilience planning at the urban level, and their results are based on analyses performed at the building scale by KPR3 and KPR5, in ongoing bilateral relationships. Considering the potential connections between the KPRs, some primary joint exploitable results have been identified.

Figure 1. KPRs connections



3.3 Project Results Characterization Methodology

The following template will be shared with each partner responsible for project results to collect specific information and validate the list of Key Exploitable Results (KERs).

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Table 3. Key Exploitable Results (KER Table)

PROJECT RESULT GENERAL DESCRIPTION	Exploitable Result # / Title				
	Short description of the project result/Description of the service provided	<i>Short description of the project result and of the related service provided</i>			
	Innovation content/Competitive advantage/Benefits	<i>Added value of the project result/service provided from the end-user point of view</i>			
	Legal, normative or ethical requirements connected to the development of the project result	<i>Any legal, normative or ethical requirements that shall be taken into account during the development of the project result and potentially after the end of the project (e.g., any legal constraints for the exploitation?)</i>			
	TRL	Before the project	After the project		
MARKET	Targeted Market and Sector(s) of application	<i>Example of application or scenario for the project result/service, including the target sector and alternative one(s)</i>			
	Time to market	<i>When the result developed is expected to reach the market</i>			
	Potential customers	<i>End-users/customers that could be interested to purchase/use the result developed</i>			
	Potential competitors	<i>Other companies potentially involved in the development of similar results</i>			
IPR	Owner(s) of Result				
	Other Partners involved				
	Joint ownership	<i>Is there any need of agreement about the ownership of the result before the end of the project? Yes/No</i>			
	Status of IPR: Background (B)	<i>List of partners providing existing knowledge to the development of the result. B = if you provide your background and existing knowledge (already available at your company before the project start) for the development of the result.</i>			
	Status of IPR: Foreground (F)	<i>List of partners involved, and role effectively covered by them in the development of the final result. F = if you are strictly involved in the development of the result and so your knowledge acquired during the project is essential to reach the final result.</i>			
	Status of IPR: Exploitation forms (partners)	M = Making the product	U = Using the result	L = License the result	O = Other means of exploitation

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	interested in the exploitation of the result after the end of the project)					
	Protection measures	Patent	Trademark	Copyright	Industrial Design	Other
		Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
<i>If not yet, is it expected to protect the result in the future?</i>						
EXPLOITATION STRATEGY	Exploitation claim	Consulting activity	License to third parties	Making and selling the product	Providing a service	Internal use (e.g., R&D, projects)
		Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
	Revenue streams associated to the above exploitation claim	€	€	€	€	€
	Estimated effort to bring the project result to the market	Activities foreseen		Cost		Time

4. Assessment of Exploitable Results Technology Readiness Level (TRL)

Table 3 outlines the Intellectual Property Rights (IPR) strategy and exploitation plan for key results (KPRs) developed within the MULTICARE project. Each row of table 3 specifies a unique KPR, detailing the associated IPR strategy and the main target users for each outcome. The table 3 is divided into four main categories, each focusing on different aspects of resilience and climate adaptability:

- Digital tools for multi-hazard resilient-based and sustainability design and assessment: This category includes various KPRs that involve licensing and consultancy services aimed at AEC firms, urban planners, designers, and other related stakeholders.
- Digital interoperability and services for data management and monitoring: This section covers KPRs focusing on consultancy services and licensing for stakeholders involved in data management and monitoring at urban and building scales.
- Structural/Non-structural technologies for improving building resilience: Here, the KPRs are related to patented technologies and consultancy services designed to enhance building resilience, targeting contractors, AEC firms, and other relevant professionals.
- Database, models and knowledge to facilitate resilience design and renovation: This category includes KPRs offering consultancy services to a wide range of users, including AEC firms, urban planners, facility managers, and investors.

Table 4. TRL Roadmap

Level 1	Basic Research: basic principles are observed and reported	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development. Examples might include fundamental investigations and paper studies
Level 2	Applied Research: technology concept and/or application formulated	Once basic principles are observed, practical applications can be formulated. Examples are limited to analytic studies and experimentation.
Level 3	Critical function, proof of concept established	Active research and development are initiated. Laboratory studies aim to validate analytical predictions of separate components of the technology. Examples include components that are not yet integrated or representative.
Level 4	Laboratory testing of prototype component or process	Design, development, and lab testing of technological components are performed. Here, basic technological components are integrated to establish that they will work together. This is a relatively "low fidelity" prototype in comparison with the eventual system.

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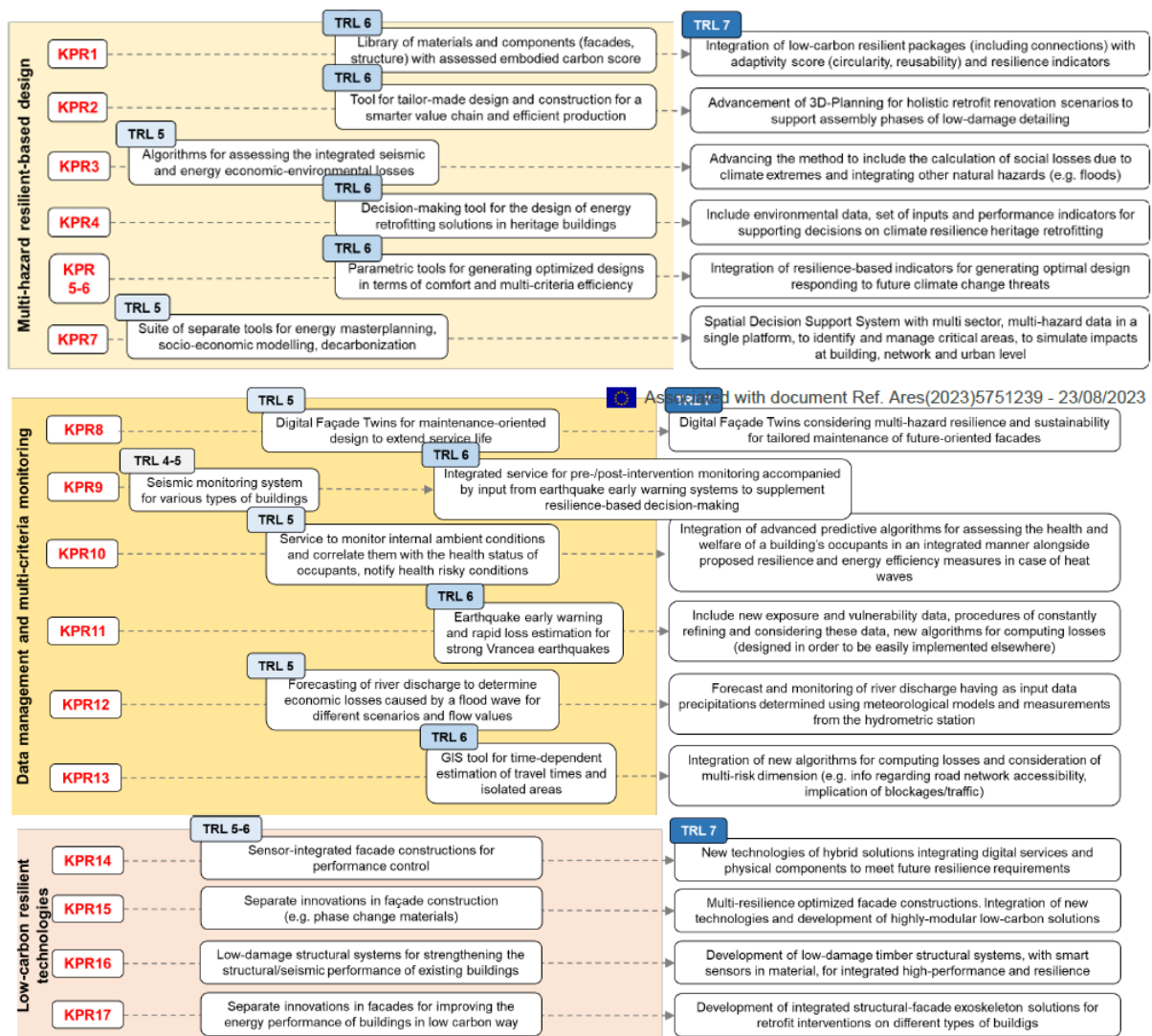
Level 5	Laboratory testing of integrated system	The basic technological components are integrated together with realistic supporting elements to be tested in a simulated environment. This is a “high fidelity” prototype compared to the eventual system.
Level 6	Prototype system verified	The prototype, which is well beyond that of level 5, is tested in a relevant environment. The system or process demonstration is carried out in an operational environment.
Level 7	Integrated pilot system demonstrated	Prototype is near, or at, planned operational system level. The final design is virtually complete. The goal of this stage is to remove engineering and manufacturing risk.
Level 8	System incorporated in commercial design	Technology has been proven to work in its final form under the expected conditions. In most of the cases, this level represents the end of true system development.
Level 9	System ready for full scale deployment	Here, the technology in its final form is ready for commercial deployment.
Beyond 9	Market introduction	The product, process or service is launched commercially, marketed to and adopted by a group of customers (including public authorities). ¹

4.1 Research & Innovation maturity

The technologies developed in MULTICARE will advance from TRL 5-6 to TRL 7 (with one progressing from TRL 4-5 to TRL 6), as illustrated in the figure below, which relates to the Key Project Results (KPRs) outlined in §2.1. These solutions will reach TRL 7 through validation in actual buildings and urban environments.

¹ <https://acqnotes.com/acqnote/tasks/technology-readiness-level>

Figure 2. KPR and TRL roadmap (source: from GA 101123467)



4.2 Exploitation routes for the results

The following table **Error! Reference source not found.** presents the Intellectual Property Rights (IPR) strategy and the planned exploitation approach for the Key Project Results (KPRs) developed within the MULTICARE project. Each row specifies a unique KPR, detailing the associated IPR strategy and the main target users for each outcome. The table is organized into four main categories, each focusing on different aspects of resilience and climate adaptability.

This table provides a clear and structured overview of the exploitation strategy for each KPR, ensuring that the developed technological solutions effectively reach their intended audience and achieve commercial and operational success beyond the project's completion.

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Table 5. IPR Exploitation

ID	IPR Strategy & Foreseen Exploitation	Main Target Users
Digital tools for multi-hazard resilient-based and sustainability design and assessment		
KPR1, KPR2	Licensing, consultancy services	AEC firms, urban planners, designers, product manufacturers and suppliers
KPR3	Copyright, consultancy services	AEC firms, urban planners, designers, research community, Facility and building managers, insurances and banking
KPR4-KPR6	Licensing, consultancy services	AEC firms, urban planners, designers, Facility and building managers, product manufacturers and suppliers
KPR7	Licensing, consultancy services	Governments, AEC firms, urban planners, designers, Facility and building managers, research community, insurances
Digital interoperability and services for data management and monitoring		
KPR8-KPR10	Consultancy services	AEC firms, urban planners, designers, Facility and building managers, building owners, product manufacturers and suppliers, research community, governments
KPR11-KPR13	Licensing, consultancy services	Building occupants and owners, citizens, Civil Protection, AEC firms, urban planners, designers, product manufacturers and suppliers, research community
Structural/Non-structural technologies for improving building resilience		
KPR14-KPR17	Patent, consultancy services	Contractors, AEC firms, designers, Facility and building managers, product manufacturers and suppliers, research community
Database, models and knowledge to facilitate resilience design and renovation		
KPR18-KPR24	Consultancy services	AEC firms, urban planners, Facility/building managers, designers, product manufacturers and suppliers, research community, investors

The table below outlines the joint exploitation strategies for Key Project Results (KPRs) developed within the MULTICARE project. Each KPR entry includes the collaborative agreements between various stakeholders and the main target users for each outcome. The aim is to ensure that the developed solutions are effectively utilized by their intended audience, thereby enhancing urban resilience and sustainability.

This table provides a clear overview of how different technological solutions developed within the MULTICARE project will be brought to market through strategic commercial agreements, ensuring their effective deployment and long-term sustainability. Each KPR is associated with specific target users, ranging from city councils and urban planners to building managers and contractors, thus addressing the needs of various stakeholders involved in urban and building resilience.

Table 6. KPR Exploitation

KPR	Joint Exploitation Strategy	Main Target Users
KPR7: Spatial Decision Support System for resilience urban planning [KPR3+KPR5+KPR6]	Commercial agreements between main software developers IES (KPR7), OMRT (KPR5, KPR6) and models providers TUD and ARUP (KPR3) for delivering MULTICARE SDSS for resilient-based design and assessment.	Urban scale: City councils, municipality managers, utilities, real estate managers, etc. Building scale: AEC firms, Facility and building managers, Energy Managers, etc.
KPR13: GIS tool for time-dependent estimation of travel times and isolated areas [KPR9+KPR11+KPR12]	Commercial agreements between main tool and model developers INFP (KPR13, KPR9 and KPR11), TUD (KPR13) and TUB (KPR12) for delivering the MULTICARE digital tool for data management/monitoring at urban scale.	Building users, residents, citizens Civil Protection, etc.
KPR17: Prototypes of low-carbon resilient exoskeletons [KPR14+KPR15+KPR16]	Commercial agreements between XLD and RTB (main responsible of KPR17 and KPR16) and other technology providers HOLSCH and PFE (KPR14 and KPR15) for selling MULTICARE technology modules for low-carbon resilient buildings.	Contractors, AEC firms, designers, etc.

4.3 Prioritization of the Key Exploitable Result

Prioritizing exploitable results allowed for a focused assessment of selected outcomes, including risk evaluation related to exploitation, external market entry barriers, and the creation of a dedicated Exploitation and Intellectual Property Rights (IPR) Protection Plan. In future versions of the deliverable, results will be ranked based on final scores from the prioritization activity. RINA-C will emphasize results close to market readiness, with a

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Technology Readiness Level (TRL) of 6 or higher, as the central achievements of the project. Additionally, this evaluation will be based on upcoming activities and discussions among project partners.

4.4 Risk Assessment

Consider the analysis of potential risks that could threaten the exploitation of the selected results. A risk is any uncertainty that poses a potential threat to the project. To mitigate these risks, it is essential to identify them, assess their likelihood, and estimate their potential impact. Proactive measures should be implemented to prevent or minimize events that could hinder the successful exploitation of the project's results.

The risk management process involves:

1. Risk Identification: Identify risks directly related to the project results, agreed upon by the entire consortium. Focus on uncertainties in delivering results rather than constant issues.
2. Risk Evaluation: Evaluate the impact and probability of each risk, possibly using a High/Medium/Low scale. Consider risk prioritization and mitigation actions.
3. Risk Monitoring: Regularly review the project's overall exposure to risk and take necessary actions to mitigate risks. Revise the project business case or assumptions as needed.

The final exploitation plan will include a risk assessment of all prioritized exploitable results, particularly those with a Technology Readiness Level (TRL) closest to market readiness. This assessment will rely on information from project partners and utilize Knowledge Exploitation Route (KER) tables.

Additionally, a workshop focused on exploitation will be organized in Month 36 to facilitate the risk assessment process, building on the assumptions outlined.

Table 7. Exploitable Result and associated risks

Exploitable Result #						
Risk Identification	IMPACT (I)	LIKELIHOOD (L)	RISK RANK (IxL)	Scope and type of potential intervention	Feasibility/ Success of intervention (1 low – 10 high)	Priority Level
TECHNOLOGICAL RISK FACTORS						
PARTNERSHIP RISK FACTORS						
MARKET RISK FACTORS						
LEGAL RISK FACTORS						
MANAGEMENT RISK FACTORS						
ENVIRONMENTAL RISK FACTORS						

5. MULTICARE Draft Exploitation Strategy

5.1 Exploitation Strategy at Partner Level

By definition, exploitation encompasses the use of project results in research activities within the project's scope, as well as the development, creation, and commercialization of products, processes, and services. Following the conclusion of the MULTICARE project, the consortium and foreground can adopt five operational modes:

1. **Further Research Activities:** Partners aim to continue analyzing and utilizing project results in subsequent research projects to enhance and refine outcomes.
2. **Commercial Exploitation:** Partners seek to commercialize products or services developed during the project, leveraging newly created information for competitive advantage across various sectors.
3. **Licensing Agreements:** Partners may license their intellectual property (IP) to other entities in exchange for royalties, facilitating broader use and dissemination of innovations.
4. **Academic Exploitation:** Academic partners plan to apply project knowledge in training, courses, and research activities, exploring new academic directions and educational opportunities.
5. **Consultancy Services:** Partners intend to offer consultancy services based on project knowledge and expertise.

Detailed exploitation plans for each partner, based on the characterization of Exploitable Results (ERs) and partner engagement, will be assessed and included in upcoming deliverables. These plans will outline how partners intend to exploit the foreground generated during the project, reflecting their specific contributions and activities undertaken.

5.2 Exploitation Strategy at Consortium level

The MULTICARE project consortium is strategically structured to drive innovative solutions and maximize European impact, aligning with outlined advancements in the excellence section. Partners were selected based on extensive experience in Research, Development, and Innovation (RD&I) from national and previous EU-funded projects. Criteria included innovation level in their sectors, complementarity, and diverse competencies.

The consortium enables diverse exploitation strategies, catering to the interests of all parties involved:

- **Industrial Exploitation:** Direct or indirect commercial use of developed foreground, such as internal use or licensing by technology producers.
- **Academic Exploitation:** Utilization of results in additional research activities beyond the project, fostering new research directions or academic courses by universities and research centers.

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- **Exploitation by End-Users:** Adoption of innovative solutions by end-users interested in purchasing and utilizing them.

Future documents will delve deeper into these exploitation routes, focusing on leveraging consortium knowledge and fostering market conditions for commercial system deployment. The well-balanced consortium comprises 26 partners from 12 European countries, classified as detailed in the table below.

Table 8. Partners

Type of company	Short Name
Universities	TU Delft, UNIROMA1, UNINA, UTBV
SMEs	PFE, XLD, STRESS, RoGBC, Boom, OMRT, ROTHO BLAAS SRL, Hölscher
Research organizations	IES R&D, INCDFP, AMS Institute, ASM
Public entities	PMB, ACER, Tecuci
Large companies	ARUP, RINA-C

We have formed a Consortium comprising 21 partners from 6 EU countries, including leading universities (TU Delft, UNIROMA1, UNINA, UTBV), research centers (IES R&D, INCDFP, AMS Institute), and industry players encompassing engineering firms (ARUP, RINA-C), consultancies (PMB, ACER, Tecuci), construction companies (PFE, XLD, STRESS, Boom, OMRT, ROTHO BLAAS SRL, Hölscher), and industry associations (RoGBC, ASM). This diverse mix of expertise spans the AEC sector, smart buildings, products, and ICT, aligning perfectly with the ambitious goals of the MULTICARE project and ensuring its successful execution.

6. IPR management

6.1 General overview and IPR background

The aim of this chapter is to provide a comprehensive overview of the main provisions related to intellectual property rights. However, it is strongly recommended to consistently refer to the guidelines specified in the Consortium Agreement (CA) and Grant Agreement (GA) when drafting exploitation agreements.

The list of MULTICARE Key Exploitable Results (KERs) is detailed in the following section, in accordance with the information outlined in the GA to ensure its relevance concerning the novelty of proposed inventions, the intention to pursue IP protection, and the responsibilities of each partner in achieving project outcomes.

Before the project begins, it is crucial to ensure that all necessary information for the smooth operation of the project is accessible to all partners. As a result, issues related to access rights have already been addressed in the MULTICARE Consortium Agreement.

6.2 BFMULO analysis

The BFMULO analysis is utilized as a method for understanding the exploitation intentions of Consortium partners and assessing their participation in the project and Key Exploitable Results. Each letter in the acronym signifies a specific purpose:

- (B) Background
- (F) Foreground
- (M) Making
- (U) Using
- (L) Licensing
- (O) Other

Background (B) refers to any data, know-how, or information, regardless of its form or nature, including intellectual property rights, held by the beneficiaries before they joined the Agreement. This encompasses existing intellectual property, know-how, knowledge, and any additional data necessary for the project that each partner contributes. The Grant Agreement (GA) specifies that if background is subject to third-party rights, the beneficiary must ensure compliance with their obligations under the Agreement.

Foreground (F), also referred to as Results, refers to "any tangible or intangible outcome of the action, such as data, know-how, or information, in any form or nature, whether or not it can be protected, along with any rights associated with it, including intellectual property rights." Importantly, under the grant agreement, the granting authority does not acquire ownership of the results generated as part of the action.

The methods of exploitation are summarized in the following four cases, which indicate the partner's intentions to exploit the results by:

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- **Making (M):** Producing, manufacturing, selling, or directly implementing through their own facilities and expertise.
- **Using (U):** Employing the results with their own knowledge to develop new product ranges or enhanced processes. This also includes using the foreground in further research activities beyond those covered by the project, or for creating, developing, and commercializing a product or process, or providing a service.
- **Licensing (L):** Licensing the results, thereby generating revenue through negotiations with third parties outside the Consortium.
- **Other (O):** Any other means of exploitation, such as consultancy services, etc.

The BFMULO matrix will be included in the Characterization Table tool that will be shared with all the partners developing a result within MULTICARE. In the related section, partners will ask to claim their background, foreground, and result's exploitation intention. Moreover, all participants in the Consortium will be asked to declare their intentions in reference to each Key Exploitable Results of the project, by completing a specific BFMULO matrix.

RINA-C will require the above-mentioned BFMULO Matrixes to all the partners involved in the MULTICARE project. The updated matrix will be presented within the last version of the present deliverable.

7. Conclusions

The deliverable D24.7 outlines the Exploitation and IPR management strategy for the MULTICARE project, aiming to guide the consortium towards a viable exploitation strategy. It defines a plan for the project results, focusing on enhancing the resilience of the built environment to extreme climate events through new decision-support frameworks and technological and digital solutions. The document emphasizes the importance of integrating low-carbon resilient technologies into modular and prefabricated constructions for next-generation smart buildings, prioritizing safety, energy efficiency, environmental sustainability, quality of life, circularity, and scalability.

MULTICARE aims to improve the resilience of the built environment against climate-related extreme events by developing multifunctional, low-carbon resilient technologies and digital solutions. These solutions will impact the design, operation, and management of real estate assets, aligning with EU policies on resilience and contributing to the definition of quantitative indicators for monitoring resilience. The project will assess market adoption of its results and define a final exploitation strategy, including a business plan and commercial agreements for post-project sustainability.

The document details the methodology for identifying potential exploitation opportunities and managing Intellectual Property Rights (IPR), based on an initial analysis of the project's exploitable results. It outlines steps for future commercial deployment of project outcomes, starting with the identification, analysis, and characterization of potential exploitable results, followed by risk assessment and the formulation of an IPR management strategy.

The Consortium comprises 21 partners from six EU countries, bringing together expertise in R&D, practical implementation, social sciences, user engagement, and training. The project's solutions will be validated through large-scale pilots in Italy, the Netherlands, and Romania, engaging banks and institutional investors to update "green finance" mechanisms and employing a user-centered approach for maximum impact.