Digital, autonomous, Intelligent and Synchronous system for Continuous identification, Optimization and Value Extraction of Resources from the end-of-use built environment

DISCOVER

D8.2 Exploitation and Business Plan

WP 8. Dissemination, Exploitation and Communication

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Abbreviations

Abbreviation	Description
DC Plan	Dissemination & Communication Plan
DE&C	Dissemination, Exploitation and Communication
EoL	End-of-life
IPR	Intellectual Property Rights
KERs	Key Exploitable Results
KPIs	Key Performance Indicators
MOOCs	Massive Open Online Courses
TRLs	Technology readiness levels

Partners

1. UNIVERSITAT POLITECNICA DE CATALUNYA (UPC), Spain – Coordinator
2. C5LAB - Sustainable Construction Materials Association (C5Lab), Portugal
3. DIGITALTWIN TECHNOLOGY GMBH (DTT), Germany
4. FUNDACION TECNALIA RESEARCH & INNOVATION (TECNALIA), Spain
5. HERCAL ZERO SL (H-ZERO), Spain
6. HOLCIM INNOVATION CENTER SAS (HIC), France
7. INSTITUTO SUPERIOR TECNICO (IST), Portugal
8. INSTITUT MINES-TELECOM (IMT), France
9. PANELLINIA ENOSI DIPLOMATOUCHON MICHANIKON ERGOLIPTON DIMOSION ERGON (PEDMEDE), Greece
10. TECHNISCHE UNIVERSITEIT DELFT (TU Delft), the Netherlands
11. TREE CAPITAL SP.Z.O.O. (TREE), Poland
12. TRACIMAT vzw (TRACIMAT vzw), Belgium
13. UPC Technology Center (CIT UPC), Spain
14. VLAAMSE INSTELLING VOOR TECHNOLOGISCH ONDERZOEK N.V. (VITO), Belgium

Executive summary

The present document constitutes Deliverable D8.2 "Exploitation and Business Plan" in the framework of Work Package 8 "Dissemination, Exploitation and Communication". This report is the first version of the DISCOVER Exploitation and Business Plan developed within the framework of Task 8.2: IPR Management Plan.

This document presents a preliminary exploitation and business plan encompassing several important components. First, it provides a detailed characterization of the Key Exploitable Results (KERs), elucidates their significance, and explores potential avenues for exploitation. Additionally, it outlines Intellectual Property Rights (IPR) concepts and strategies, shedding light on the approach to open-source strategies. This ensures the effective safeguarding and utilization of intellectual assets. Furthermore, the document focuses on partner motivations for exploitation, examining the context and collaborative efforts to achieve the exploitation objectives.

Introduction

The primary purpose of this document is to outline the exploitation and business plan and strategy for the DISCOVER project. This plan serves as a roadmap, guiding the project towards achieving its objectives and maximizing the impact of its results. It is designed to ensure that the project outcomes are not just theoretical advancements, but also practical solutions that can be implemented in real world scenarios. It also serves as a tool for managing the project's intellectual property rights (IPRs). It outlines the project's IPR strategy, ensuring that the rights to the project results are clearly defined and protected, which is crucial for enabling the project results to be effectively used and commercialized.

Thus, the Exploitation and Business Plan aims to establish a foundation for the development of common exploitation plans in the project, including IPR considerations and open-source strategies. It covers the following aspects:

1. Identification of the Key Exploitable Results (KERs)/assets of the project;
2. Protection of the Intellectual Property Rights (IPRs) of the Consortium's members and introduction to the open-source principles, with an overview of the various open-source licenses, as well as the project's approach to intellectual property rights and exploitation routes;
3. Identification of the key stakeholders and initiatives that are crucial for the success of the project;
4. Provision of a market overview through an initial business model.

Moreover, as the Exploitation and Business Plan is a living document and it evolves throughout the project execution, reflecting changes in the project's objectives, results, and context, the last chapter of the document is dedicated to the conclusion and identification of the next steps.

1. About the DISCOVER project

DISCOVER aims to develop an autonomous, synchronous, continuous and intelligent identification and data analysis system for materials and products in existing end-of-life built works. The proposed approach will provide key stakeholders, including academia research performers, along with construction industry representatives, with data-driven insights to make deconstruction more efficient, optimise the use of resources, improve the environmental footprints and enhance the circularity of construction and demolition, unlocking the potential of end-of-life built works, which will become material banks. The expected outcomes include an autonomous robotic platform coupled with continuous identification tools to scan built works and provide synchronous quantitative and qualitative data from different materials, including complex and concealed elements. Artificial intelligence algorithms will allow a rapid analysis of the properties and characteristics of components and feed the automated scan-to-BIM model creation. The multi-dimensional BIM, including selective demolition processes, labour productivity, and technical planning, will become a Digital Twin of the demolition site optimised by social, economic, and environmental multi-criteria assessments. This approach will highly contribute to significantly increasing the supply of traceable and sustainable construction materials and products for enhancing their wider market acceptance, following the waste hierarchy. The social impacts of digital transformation in the construction sector will be considered, and also new professional development tools for the relevant stakeholders will be proposed. The system will be tested in four different real demolition sites (Spain, Portugal, Poland and Belgium), offering a complete range of built work typologies and wide geographical coverage to demonstrate the replicability potential of DISCOVER, increasing the project dissemination capacity and awareness among the construction sector.

The impact of the DISCOVER project covers the following aspects:

- **Economic:** Substantial economic gains, offering improved efficiency, cost savings, and reduced labour in construction and demolition. Additionally, it drives demand for reused and recycled materials, fostering innovation in design, architecture, and engineering through collaborative BIM tools, leading to better project coordination and waste reduction.
- **Environmental:** Aligning with EU circular economy objectives, reducing Construction and Demolition Waste (C&DW), lowering landfill rates, and decreasing CO2 emissions related to waste management and construction materials. It also promotes reduced waste and ecological damage for contractors, architects, and engineers, fostering eco-friendly practices and reducing the environmental footprint.
- **Social:** Influencing policymakers to create evidence-based regulations for sustainable construction and waste management. Contractors and demolition firms can enhance their public image, attracting environmentally conscious clients and partners, while workers benefit from a safer environment and opportunities for skill enhancement.
- **Scientific:** Researchers benefit from collaboration opportunities and access to valuable data, accelerating research in sustainable construction and waste management. Improved infrastructure advances knowledge and innovation in the field.

2. Exploitation strategy

According to the Article 16 of the Grant Agreement (GA): *Exploit(ation) is the use of results in further research and innovation activities other than those covered by the action concerned, including among other things, commercial exploitation such as developing, creating, manufacturing and marketing a product or process, creating and providing a service, or in standardization activities.*

At the project level, the following questions are crucial for the exploitation of outcomes by both project partners and third parties:

1. **Exploitable outcomes:** Which project outcomes are exploitable?
2. **Target audience and purpose:** For whom and for what purpose are these outcomes exploitable?
3. **Timing:** When will these outcomes become exploitable?
4. **Exploitation approach:** What exploitation route should be followed to enable effective use?

The exploitation strategy is implemented alongside the strategy associated with each result, both tangible and intangible. Its goal is to ensure that the project's outcomes and results continue to be utilized even after its lifecycle.

The main objectives of the DISCOVER exploitation and business plan are to:

- Define and implement a set of tools and activities to exploit the project results;
- Ensure that the project results last even after the project ends;
- Promote and inform the target stakeholders about the project developments and foster new collaborations;
- Ensure the uptake of project results into technical rules, guidelines and standards that facilitate different levels of exploitation;
- Guarantee open access to DISCOVER scientific publications and research data;
- Ensure the continued dissemination of the project's results to guarantee their sustainability;
- Define the different types of exploitable results (knowledge, methods, agreements, networks, technologies) and clearly identify their direct and indirect value and impact for different stakeholders;
- Describe concrete measures to ensure that the results meet real needs, and will be taken up by potential users and stakeholders (e.g. engaging them in the project).

2.1. Expected outcomes

The DISCOVER project is expected to contribute to the following outcomes:

- Faster and less labour-intensive identification, analysis and digitisation of materials and products from existing built works;
- Increased supply of secondary materials and construction products for reuse, thus reducing the resource- and energy-intensity of the construction sector;
- Reduction in construction and demolition waste;
- Improved facility to re-use and repair construction products;
- Improvements to labour productivity as a result of using the developed solutions.

2.2. Target stakeholders

The identification of the exploitation target audiences allows an easier transfer of the project solutions and results and the definition of more focused common and individual exploitation tools and activities. In this context, the exploitation tools and activities take into consideration the real needs and expectations of the identified target audiences in order to guarantee that the project results are exploited and can have different uses considering their characteristics.

The following main groups of stakeholders are expected to benefit from the project outputs, and, therefore, are targeted by the consortium for exploitation activities:

- Industrial community in the construction and demolition activities: workers, general contractors, deconstruction and demolition companies, designers, architects, engineers and developers;
- Professionals and researchers in the areas of civil and building engineering, circularity, robotics, signal processing, AI and social sciences;
- Public authorities, policy makers;
- Professional associations and networks;
- Universities and R&D centres;
- Citizens and the general public.

Additionally, DISCOVER will integrate a strong gender dimension across all activities. DISCOVER will actively engage with gender issue by using non-sexist language and imagery and promoting attendance and employability of women within the scope of the project through activities such as questionnaires, research activities, demo site events, conferences, training sessions. The consortium will be respectful of gender equality and ensure there is no discrimination on the basis of a person's gender during the project's activities.

2.3. Market potential for the DISCOVER project results

The market potential for the DISCOVER project's results is vast, spanning multiple sectors, including construction, demolition, material recycling, energy efficiency, and digital transformation. The project's KERs are designed to address critical challenges in the industry, such as improving data accuracy, enhancing efficiency, and enabling sustainable practices.

2.4. Main approach of the exploitation and business plan

Before presenting the most relevant results of the DISCOVER project, several concepts must be clarified to better understand later all the elements that describe the main aspects of the proposed KERs.

The main goal of the DISCOVER project is the development of a comprehensive solution that includes: a) in-situ autonomous, synchronous, continuous and intelligent data acquisition and analysis; b) a BIM-based framework for the identification and measuring of components and materials in the existing built works; c) BIM-based demolition and recovery protocols to minimize cost and environmental impacts; and d) a secondary material database with emphasis on traceability and accessibility. This approach will leverage state-of-the-art robotics, sensing and AI technologies with a comprehensive understanding of the potential of components from end-of-life built works. The proposed approach will provide key stakeholders, including contractors, demolition companies and researchers, with data-driven insights to make deconstruction more efficient, optimize the use of resources, improve the environmental footprints and enhance the circularity of construction, unlocking the potential of built works to become material banks.

3. Exploitation tools and channels

DISCOVER has defined a set of dissemination tools that have been carried out in a close relation with the exploitation activities. This common strategy is crucial to guarantee that the benefits of the project will last beyond its lifetime. In this context, the partners use these dissemination tools along with the defined exploitation activities to exploit the results and reach out to the different target audiences. In this respect, the following tools have been defined as the most suitable for the dissemination and further exploitation of DISCOVER results.

3.1. Project website

All the relevant project results/deliverables will be published on the project website and will be free to access. The DISCOVER project website is the main information gateway, where all the outputs and results will be uploaded (Figure 1). The project website will remain online for another four years after the project is completed ensuring that the outcomes to be accessible to public.

The official website of the DISCOVER project: https://discover-horizon.eu/

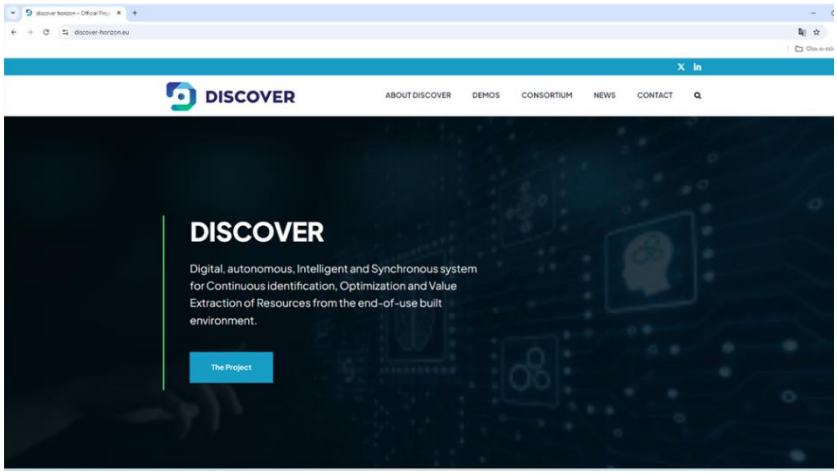

Figure 1. The DISCOVER project website

3.2. Social media channels

The results of the project are exploited through its social media accounts in LinkedIn and X (former Twitter).

- X: https://x.com/Discover1017435
- LinkedIn: https://www.linkedin.com/company/discover-horizon-project/

3.3. Scientific publications

DISCOVER partners will publish the key project results and achievements in scientific journals and magazines to promote the project's visibility at both the EU and international levels. According to the DISCOVER dissemination strategy, at least 20 open-access publications will be made in high-impact journals, with more than 30% of them authored by multiple project beneficiaries. All articles will be published as 100% open access. For peer-reviewed scientific publications, a "green open access" policy is planned, ensuring that publications are freely accessible within six months. The scientific publications resulting from DISCOVER will be published under the Creative Commons Attribution International Public License (CC BY). The publications will be immediate, without any embargo period, applying the principle "as open as possible, as closed as necessary".

3.4. Demo events

The demo sites events play a pivotal role in disseminating the DISCOVER project's outcomes by offering diverse, tangible, and educational representations of sustainable construction and demolition practices. These demo sites will allow stakeholders, policymakers, industry professionals, and the public to witness the project's solutions in action.

4. Plan for the Key Exploitation Results

As defined by Horizon Europe, a KER is an identified main interesting result, which has been selected and prioritized due to its high potential to be "exploited" – meaning to make use and derive benefits- downstream the value chain of a product, process or solution, or act as an important input to policy, further research, or education.

After the primary goal has been identified, it must be explained in a series of key exploitable results (KER), which are project outcomes that fit a certain criterion or meet the demands of a specific group of users. KERs are more than just commercial things that can be sold to generate income. It is useful to be more focused on who the potential users are and what requirements are addressed or the problem is handled, even if it is convenient to include specifics about how this could happen and seek to define consumers, competitors and market.

The next key issue is the innovation related to our KER, often known as the unique selling point or value proposition. This can refer to any type of innovation, such as a new product or process, that differs from existing solutions. The value proposition gives a collection of arguments for selecting the newly proposed solution over another of the existing items or techniques. At this point, it is more appropriate to consider users who benefit from your value offer rather than consumers. All potential users align with the focus of your product or solution. The market can be seen as more than just a conventional market. The KER could be a new element in the production or a new methodology/ process.

Key Exploitable Results (KERs) of the DISCOVER project are defined in the project proposal. They form the basis for further investigating the exploitation potential during the project. Each KER is designed to address critical challenges within the construction and demolition sectors, focusing on sustainability, digitalization, and circular economy principles (Table 1)

No.	Name of the KERs	Result type	Current TRL[1]	TRL target at the end of the DISCOVER
KER 1	Autonomous robotic solutions for materials and construction product sensing & sampling	Technology	4/5	6
KER 2	A set of non-invasive sensors that can be integrated into mobile platforms for scanning, mapping, and identifying materials and components at construction sites	Technology	4	6
KER 3	Portable set of invasive tools and sensors integrable on mobile platforms	Technology	3	6
KER 4	AI algorithms for sensor's data exploitation and fusion for real-time construction elements recognition	Software	4	6
KER 5	Post-processing AI-based algorithms for precise material recognition, localization, classification and quantification	Software	3	6
KER 6	Open Semantic Building Information Model	Software	4	6
KER 7	Open dataset of deconstruction elements for machine learning	Dataset	4	6
KER 8	Material Bank: Digital catalogue with databases of routes and outputs from reusing, recycling and recovering	Dataset	5	7

[1] The maturity of technologies is classified through technology readiness levels (TRLs), ranging from **TRL 1** (basic principles observed) to **TRL 9** (actual system proven)[1]: TRL 1 – basic principles observed; TRL 2 – technology concept formulated; TRL 3 – experimental proof of concept; TRL 4 – technology validated in lab; TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies); TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies); TRL 7 – system prototype demonstration in operational environment; TRL 8 – system complete and qualified; TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space). See: https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2018-2020/annexes/h2020-wp1820-annex-g-trl_en.pdf

KER 9	Decision-making tool, helping to manage the end-of-life of different wastes	Software	4	5
KER 10	Web3-Based Traceability Tool for Building Materials and Products	Process	4	6
KER 11	Handbook for good integration of digital tools in demolition/ reconstruction sector	Documentation	4	5

Table 1: List of KERs and the TRL Progression

Two robots will be developed by the end of the project: Pokeye and Oliwall (KER1), which will be outfitted with a set of sensors (KER2 and KER3). These robots will be able to navigate the building or infrastructure and identify materials and components in real-time (KER4). Data will be sent to the cloud, where AI-based algorithms (KER5) will post-process the data and create an interactive database BIM 3D model (KER6) that contains information about the composition of the material, its dimensions, mass, technical/mechanical properties and performance, the presence of hazardous substances, the need for repairs, and other aspects. With less than 0,002 human interventions/m2, the entire system will be able to scan more than 95% of the building site, categorize more than 95% of the parts, quantify more than 80% of them at a speed of more than 5 m2/min, and convert them into semantic objects in a BIM model.

DISCOVER will be able to demonstrate the improvement provided to re-use and repair the products. In order to facilitate decision-making, the first step is to identify and categorize the products (KER 8), offer insights and evaluations to help manage those elements based on their conservation status or repair requirements, and include an economic, social, and environmental assessment for each demolition scenario (KER 9). With the help of Web3-Based Traceability Tool for Building Materials and Products (KER10), assets will be tracked and exported to existing marketplaces and apps, allowing architects, builders, and consumers to make better-informed decisions about the materials they use. Additionally, the project guarantees data interoperability (less than 1% of collected data generated interoperability issues) to monitor the entire value chain during and after demolition.

By the end of the project, DISCOVER will be able to demonstrate a 25% increase in the percentage of construction components that are reused or repurposed and a 75% increase of reused complex and concealed components. DISCOVER will reduce work-related accidents by more than 95% by utilizing all developed KERs and adhering to the guide for proper interaction of digital tools in the demolition/reconstruction sector (KER11).

At this stage, each KER is defined according to general characterization, including the description of the KER, identification of the problem, alternative solutions in place, market characterization, containing the identification of the target market, potential market, and barriers to the exploitation.

KER1 - Robotic solutions for operating in construction environments

KER1	
Description	A robotic solution for autonomously navigating and acquiring C&D information on real buildings.
Objectives covered	To create a set of autonomous and synchronous robotics systems for the precise, fast and less labour-intensive analysis, identification and digitisation of materials and construction components from existing built works, based on mobile manipulators and new data fusion approaches.
Impact	Accelerates construction site data capture and analysis, reducing labour-intensive tasks and improving data accuracy; enables precise material analysis and identification before demolition or renovation; addresses the industry's need for efficient and accurate data collection in construction.
Stakeholders involved/Target Market	Large construction and demolition firms, infrastructure projects.
Market Potential	Strong interest from large construction companies focusing on automation.
Potential exploitation	The results guide further developments and improvements for the industrial version of the robots; collaboration with construction companies for field testing and commercialization and integration into their workflows.
Possible barriers to exploitation activities	High initial investment for robotics adoption, lack of awareness in small companies, low level of adoption to existing workflows in traditional construction settings.

KER 2 - A set of non-invasive sensors that can be integrated into mobile platforms for scanning, mapping, and identifying materials and components at construction sites

KER 2	
Description	A set of portable, non-invasive tools and sensors for material and component identification and robotics integration.
Objectives covered	To create a set of autonomous and synchronous robotics systems for the precise, fast and less labor-intensive analysis, identification and digitisation of materials and construction components from existing built works, based on mobile manipulators and new data fusion approaches.

Impact	This allows for greater flexibility and easier expansion of the building and construction scanning system. It enables integration into other mobile devices to address scenarios not previously considered with different types of vehicles. For example, it opens the possibility of installing the system on a quadruped robot in the future.
Stakeholders involved/ Target market	Construction companies, robotics integrators, sensor manufacturers, and research institutions.
Market Potential	Potential for broad adoption in material recycling and sustainability projects.
Potential exploitation	Valorization through a company and/or collaboration with research entities. Potential partnerships with sensor manufacturers and robotics companies.
Possible barriers to exploitation activities	Integration challenges with existing platforms, high cost of deployment, technical difficulties in adapting to various construction environment.

KER 3 - Portable set of invasive tools and sensors integrable on mobile platforms

KER 3	
Description	A set of portable, invasive tools and sensors for material and component identification and robotics integration
Objectives covered	To create a set of autonomous and synchronous robotics systems for the precise, fast and less labor-intensive analysis, identification and digitisation of materials and construction components from existing built works, based on mobile manipulators and new data fusion approaches.
Impact	This allows for greater flexibility and easier expansion of the invasive system. It enables integration into other mobile devices to address scenarios not previously considered with different types of vehicles. For example, it opens the possibility of installing the system on a quadruped robot in the future.
Stakeholders involved/ Target market	Construction companies, robotics integrators, sensor manufacturers, and research institutions.
Market Potential	Potential applications in both construction and material recovery.

Potential exploitation	Valorisation through a company and/or collaboration with research entities. Potential partnerships with sensor manufacturers and robotics companies.
Possible barriers to exploitation activities	Integration challenges with existing platforms, high cost of deployment, and technical difficulties in adapting to various construction environment.

KER 4 - AI algorithms for sensor's data exploitation and fusion for real-time construction elements recognition

KER 4	
Description	AI algorithms and methods able to locate and quantify hidden and visible elements of buildings.
Objectives covered	To create a set of autonomous and synchronous robotics systems for the precise, fast and less labor-intensive analysis, identification and digitisation of materials and construction components from existing built works, based on mobile manipulators and new data fusion approaches. To achieve fully automatic understanding of data coming from cameras, ground-penetrating radar (GPR), laser-induced breakdown spectroscopy (LIBS), etc. using sensor fusion techniques and machine learning algorithms, rapidly analysing the properties and characteristics of elements and materials (e.g., composition, dimensions, mass, technical properties, identification of asbestos, fixing and repair needs, etc)
Impact	This system significantly enhances robot navigation efficiency, enabling smarter decision-making by processing data onboard. Moreover, it reduces data transmission requirements, optimizing transmission capacity, speed, and cloud-based processing and storage capabilities.
Stakeholders involved/ Target market	Software developers, digital transformation companies, large construction companies using BIM.
Market Potential	Opportunity for integration in large demolition and construction projects.
Potential exploitation	Collaboration with construction companies.
Possible barriers to exploitation activities	Potential barriers could be high development costs and data privacy.

KER 5 - Post-processing AI-based algorithms for precise material recognition, localization, classification and quantification

KER 5	
Description	AI algorithms and methods able to locate and quantify hidden and visible elements of buildings.
Objectives covered	To create a set of autonomous and synchronous robotics systems for the precise, fast and less labour intensive analysis, identification and digitisation of materials and construction components from existing built works, based on mobile manipulators and new data fusion approaches. To achieve fully automatic understanding of data coming from cameras, ground-penetrating radar (GPR), laser-induced breakdown spectroscopy (LIBS), etc. using sensor fusion techniques and machine learning algorithms, rapidly analysing the properties and characteristics of elements and materials (e.g., composition, dimensions, mass, technical properties, identification of asbestos, fixing and repair needs, etc.).
Impact	This tool will provide a robust model for material and building element identification, including state, quantities, arrangement, and more, streamlining construction processes and supporting sustainability.
Stakeholders involved/ Target market	Construction companies, recycling companies, and demolition companies.
Market potential	Strong potential in waste management, construction, and material recovery sectors.
Potential exploitation	Enable interoperability and data exchange across all substages of a building's end of life, by fostering standardized, machine-readable data and improve decision-making, reduce costs, and enhance sustainability through data-driven insights.
Possible barriers to exploitation activities	Barriers could be complexity of AI models, high cost of deployment and compatibility with various construction data systems and standards.

KER 6 - Open Semantic Building Information Model

KER 6	
Description	A BIM-based digital twin populated with robot inspection data and knowledge databases, with end-user interaction.
Objectives covered	To achieve fully automatic understanding of data coming from cameras, ground-penetrating radar (GPR), laser-induced breakdown spectroscopy (LIBS), etc. using sensor fusion techniques and machine learning algorithms, rapidly analysing the properties and characteristics of elements and materials (e.g., composition, dimensions, mass, technical properties, identification of asbestos, fixing and repair needs, etc.). To create an integrated digital framework to synchronously process and visualise the data brought by the system, leveraging on the wealth of information on the Building Information Modelling (BIM) digital twin.
Impact	Facilitates seamless data integration into BIM models, addressing the industry's need for improved data interoperability and enhancing the user interaction with the data as well as improving the decision-making experience.
Stakeholders involved/ Target market	Construction and demolition companies, BIM software developers, and architecture companies.
Market potential	Growing interest in BIM-based tools.
Potential exploitation	Enhance the demolition process by providing a standardized framework for documenting and sharing data related to the site's structures, materials, and environmental factors.
Possible barriers to exploitation activities	Barriers include standardization issues, cost of adoption, and the need for collaboration among various stakeholders in the construction industry.

KER 7 - Open dataset of deconstruction elements for machine learning

KER 7	
Description	A BIM-based digital twin populated with robot inspection data and knowledge databases, with end-user interaction.

Objectives covered	To create an integrated digital framework to synchronously process and visualise the data brought by the system, leveraging on the wealth of information on the Building Information Modelling (BIM) digital twin.
Impact	Provides an open and interoperable dataset for building and construction components, materials, and elements, labelled with textures and colours, enhancing accessibility and fostering machine learning advancements in the industry.
Stakeholders involved/ Target market	Research institutions and construction companies.
Market potential	To be defined
Potential exploitation	Research opportunities in pattern recognition algorithms, aiding machine learning and AI development, and appeals to software development companies seeking valuable data resources.
Possible barriers to exploitation activities	Data quality control and legal issues related to data ownership.

KER 8 - Material Bank: Digital catalogue with databases of routes and outputs from reusing, recycling and recovering

KER 8	
Description	A BIM-integrable catalogue with databases of routes for reuse, recycling and recovery of construction materials.
Objectives covered	To enhance the circularity of construction and building elements and materials by an improved identification and management of deconstruction methods.
Impact	Databases on demolition processes and recovered assets, with comprehensive information on environmental impacts, cost and technical specificities (demolition requirements and outputs and end uses for demolition assets), will provide valuable insights for sustainable construction practices. It fosters informed decision-making, reduces environmental footprints, and supports circular economy goals within the construction industry.
Stakeholders involved/ Target market	Demolition and construction companies, recycling companies and material suppliers.
Market potential	To be defined.

Potential exploitation	Exploitable as a database resource for consulting firms, local authorities and demolition companies, offering valuable data for informed decision-making and sustainable practices within the construction and deconstruction sectors.
Possible barriers to exploitation activities	Potential cost barriers to implementation and ensuring widespread adoption across the construction and demolition sectors.

KER 9 - Decision-making tool, helping to manage the end-of-life of different wastes

KER 9	
Description	A decision-making tool for the recovered demolition materials.
Objectives covered	To enhance the circularity of construction and building elements and materials by an improved identification and management of deconstruction methods. Development of a sustainability assessment framework to guide demolition methods, considering reuse and recycling of demolition assets and improvement of the sustainability of demolition activities.
Impact	Empowers stakeholders to make informed decisions in line with EU recommendations, promoting efficient end-of-life building management that balances environmental, economic, and socio-cultural factors. Facilitates scenario simulation and evaluation of selective deconstruction strategies, contributing to sustainability and responsible resource utilization in construction projects.
Stakeholders involved/ Target market	Consultants, construction companies, regulatory bodies, policy makers.
Market potential	EU bodies
Potential exploitation	Integration in existing platforms for building management and deconstruction works.
Possible barriers to exploitation activities	Limited Market for Recovered Materials Complexity of decision tool

KER 10 - Web3-Based Traceability Tool for Building Materials and Products

KER 10	
Description	A Web3-based tool for traceability of C&D materials
Objectives covered	To enhance the circularity of construction and building elements and materials by an improved identification and management of deconstruction methods.
Impact	The tool exports its results to existing marketplaces and apps, enabling architects, builders, and consumers to make more informed decisions about the materials they use.
Stakeholders involved/ Target market	Construction companies, material suppliers, architects, building management platforms, and consumers.
Market potential	To be defined.
Potential exploitation	Integration in existing platforms for building management and deconstruction works.
Possible barriers to exploitation activities	Adoption barriers due to lack of understanding, and potential resistance from stakeholders.

KER 11 - Handbook for good integration of digital tools in demolition/ reconstruction sector

KER 11	
Description	A handbook for good practices and a set of MOOCs to help understand and disseminate the results.
Objectives covered	To foster the adoption of robotic systems and collaborative BIM tools within the work processes of stakeholders in the construction industry, in special for the deconstruction process, to increase safety and productivity.
Impact	The handbook gives an analysis of how the integration of new digital tools can impact positively or negatively on the work perception of workers in the demolition and reconstruction sector.
Stakeholders involved/ Target market	Demolition companies, training institutions, policy makers, and industry associations.
Market potential	High potential for knowledge transfer in the construction and demolition sectors.
Potential exploitation	Consulting for companies to identify the key social, political, and cultural factors allowing the implementation of next tools.
Possible barriers to exploitation activities	Lack of digital skills in the workforce, handbook and MOOCs may not fully align with the needs of the target groups

Beyond the project lifetime, each partner will implement measures which will be defined to ensure the exploitation of its results (either directly or indirectly) by one or more of the following methods:

- Using them in further research activities (outside the action);
- Developing, creating or marketing a product or process;
- Creating and providing a service.

5. Intellectual property rights strategy

The main step to be taken at the beginning of an Exploitation Strategy is to protect Intellectual Property (IP).

Intellectual Property Rights (IPRs) "*are private legal rights that protect the creation of the human mind: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce. They are commonly divided into two categories:*

- *Industrial Property Rights (e.g. patents, trademarks, industrial designs, geographical indications) and*
- *Copyright and Related rights (e.g. rights of the authors/creators and those of performing artists in their performances, producers of phonograms in their recordings, and those of broadcasters in their radio and television programmes).*[2]

The given document provides the methodology to define IPR strategy and the phases to conduct the IPR management strategy for the project's results. The background information, the access rights, the ownership of results and licensing options will be examined and presented in the D9.2 Exploitation and Business Plan update and IPR Report 1 (M24) and D10.2 Exploitation and Business Plan update and IPR Report 2 (M48).

DISCOVER's patenting efforts will focus on advancements in technologies for data acquisition and analysis of materials, improved strategies for demolition practices that reduce energy consumption and material waste, the creation of a twin digital model of existing end-of life buildings and its conditions based on data collected through the autonomous, intelligent and synchronous system, and the implementation of low carbon cost-efficient circular approaches.

DISCOVER also recognizes the need to find a balance towards open-sourcing aspects of the project's R&D, allowing other EU researchers to build on and share the progress of EC funded initiatives. The project commits to significant parts of the project being open-sourced, a full implementation of the EC's FAIR data principles, and adhering to EC guidance on open access conferences and journals, thus enabling continuity and sustainability of the project results, advancements, and strategic direction in support of continued research excellence in Europe.

Each beneficiary has an obligation to protect its results and must adequately protect them for an appropriate period and with appropriate territorial coverage. This is if the results can reasonably be expected to be commercially or industrially exploited, and any other possible, reasonable and justified circumstance. When deciding on protection, the beneficiary must consider its own legitimate interests and the legitimate interests (especially commercial) of the other beneficiaries.

[2] https://intellectual-property-helpdesk.ec.europa.eu/regional-helpdesks/european-ip-helpdesk/europe-glossary/europe-ip-glossary-i_en

Effective exploitation of the exploitable results depends upon, amongst other issues, the proper management of intellectual property, which should be part of the overall management of knowledge in the project.

Throughout the DISCOVER project, specific actions will continue to be, undertaken to address the issues related to the intellectual property rights. These include the preexisting knowledge (Background) of the project partners, an assessment of the results generated during the project, proposals for the optimal protection of IPR, and ownership and proper implementation of IPR protection measures.

The framework of the IPR management is set out within the Consortium Agreement, which stipulates the rules related to the following IP issues:

- Identification of the Background and the specific limitations and conditions for its implementation;
- Ownership of the results;
- Transfer of the results;
- Access rights to the Background and the results;
- Non-disclosure of the information.

5.1. Protection of results

The Consortium members will evaluate the potential for protecting their results once they are generated. Based on the Grant Agreement, results are owned by the beneficiaries that generate them. However, two or more beneficiaries' own results jointly if:

- they have jointly generated them and

- it is not possible to:

- establish the respective contribution of each beneficiary, or
- separate them for the purpose of applying for, obtaining or maintaining their protection.

Beneficiaries may select any appropriate form of intellectual property protection. Commonly considered forms of protection include patents, trademarks, industrial designs, copyrights, trade secrets, and confidentiality agreements.

The selection of the most appropriate form of IP protection, as well as the duration and territorial scope, will depend on the nature of the results (e.g., invention, software, or database), the business strategies for their exploitation, and the legitimate interests of consortium partners.

While an organization doesn't need to inform other partners about actions taken to protect intellectual property, it is recognized as good practice to consult with them prior to deciding whether to protect results, particularly in relevant cases.

Although the protection of Intellectual Property is vital for prospective commercial or industrial exploitation, it is not always mandatory. No protection is necessary if: i) it is impossible under EU or national law; ii) not justified in view of the (potential) commercial or industrial

exploitation; or iii) not required by the action's objective and other relevant elements, such as potential markets and countries in which competitors are located, whether or not the additional protection of a part of a certain technology would bring significantly broader protection.

6. Next Steps

Exploitation activities in DISCOVER will continue until the end of the project. The Consortium members will keep updating the description of the key exploitable results (KERs) and implementing risk assessment. It could be possible to find new KERs which will be added to the already established KERs. As part of the activities related to IPR, the list of related technologies, and potential competitors will be updated. The next step of the Exploitation Plan of DISCOVER project will be the definition of the most suitable Business Model for the analysed KERs.

7. Conclusions

The aim of this deliverable is to provide a first version of the Exploitation Plan for the DISCOVER project's results. Deliverable 8.2 is a first assessment of the preliminary key exploitable results and of the ways and modes of how the consortium intends to prepare for creating the post-project legacy. This will be by use of the results, or promoting the results, for use by stakeholders and other actors outside the consortium, and thereby creating impacts.

The preparation for exploitation is an iterative process that comes to the fore when project results are emerging. This deliverable will be updated twice: first, in month 24 (M24) - *Deliverable D9.2 Exploitation and business plan update and IPR Report 1*. This report will include an updated exploitation and business plan aimed at providing an up-to-date and detailed description of the exploitation strategy of the Consortium and the necessary adjustments based on the progress of the project. The second update will be performed in month 48 (M48), as a result of which, the final version of the document will be produced - *Deliverable D10.2 Exploitation and business plan update and IPR Report 2*. This report will include an updated exploitation and business plan aimed at describing the post-project strategy planned by the Consortium.

The updates will ensure dynamic and successful exploitation of project results, avoid infringement of Intellectual Property Rights and mitigate risks that could endanger the exploitation of results.

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