



MADITRACE

Preliminary exploitation plan

Deliverable D5.2

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Summary

The results achieved in the MaDiTraCe project are intended to remain in operation in the long term after the end of the project and to be exploited step by step. A distinction must be made between non-material exploitation and commercial use.

Preliminary exploitation plan (D5.2) provides an initial project exploitation strategy, in order to merge project results and knowledge with partner interests, market and regulatory needs to develop business models and manage IP to produce plans and agreements for post-project exploitation.

The exploitation strategy is developed in the following sections:

- Context and description of exploitation objectives
- Introducing target audience and project results to be exploited
- Presentation of the overall exploitation methodology including
 - Definition and distinction of Intellectual Property
 - Identification of the exploitation measures and definition of the exploitation roadmap and
 - Requirements for the business cases of the three KER
- Exploitation timeline.

The three key exploitation results (KER) - MFP, DPP and CERA - are given a prominent position. For each of these three KERs, a customized roadmap will be designed for the evolution of the respective project into a product.

The exploitation strategy will be further developed and enhanced along with the project's progress.

Keywords

Material fingerprinting (MFP), digital product passport (DPP), CERA 4in1, exploitation roadmap, business case

Abbreviations and acronyms

Acronym	Description
AI	Artificial intelligence
BC	Business case
BP	Business plan
CCS	CERA 4in1 Chain-of-Custody Standard
CERA 4in1	Certification of raw materials standard
CFS	CERA 4in1 Final Product Standard
CPS	CERA 4in1 Performance Standard
CRS	CERA 4in1 Readiness Standard



DPP	Digital product passport
ERM	Exploitation roadmap
IP	Intellectual Property
KER	Key exploitation results
MFP	Material fingerprinting
ROL	Result ownership listing
WP	Work Package



1 Introduction

The MaDiTraCe project places particular emphasis on ensuring that all key exploitation results (KERs) are exploited after the project to maximize impact. The leader of the exploitation task (Task 5.2) is DMT.

An essential part of maximizing project results is clarifying ownership rights to the obtained project results. Therefore, in a first project step, all exploitable project results will be defined in an initial IP workshop with the partners involved and the individual rights to them will be agreed. The results are managed in an IP repository that accompanies the project. The development of the exploitation strategy is supported by at least one additional workshop in the further course of the MaDiTraCe project. Furthermore, part of the exploitation strategy are business cases for the three KERs - 1 MFP, 2 DPP, and 3 CERA. The exploitation strategy is rounded off by the exploitation roadmap in D5.3.

A first overview of the main exploitable results expected from the project and the first routes to exploitation were already described in the Grant Agreement and are presented in Table 1. In the table, the main exploitable are assigned to the KERs 1 MFP, 2 DPP, and 3 CERA.

KER	Main exploitable result	Routes to exploitation
1	Data bases of fingerprints for key commodities throughout the supply chains including experimentally produced batteries/magnets	Promotion of MFP towards actors in forensic sciences (police, customs)
1	New tailored added tracers to improve traceability from mine to concentrates	Upscaling and pilot testing within the project
1	Automated AI-enabled data analysis applied to material fingerprinting	Implementation in digital twins of processing/refining units using on-line analytical monitoring
2	Toolkit of decentral digital solutions for DPP implementation	Implementation in Battery Passport and future DPPs
3	CRS audit catalogue	Pilot testing
3	CPS audit catalogue	Pilot testing
3	CCS audit catalogue	Use case on material tracing together with an industry association
3	CFS audit catalogue	Use case to declare a selected product as sustainable, preferable together with an OEM

Table 1: Overview of main exploitable results expected from the MaDiTraCe project



2 Context and Objectives

An initial exploitation strategy plan on the traceability and certification of supply chains for raw materials will be developed by DMT and regularly updated and extended during the project by all MaDiTraCe partners. Traceability includes both legal liability of supply chain stakeholders as well as technical traceability of the raw materials supply chain. Exploitation activities will focus on developing, detailing, and communicating business cases for the MaDiTraCe technical traceability methodologies.

The two main marketable MaDiTraCe technical traceability methodologies and the certification scheme are to be developed within the framework of the MaDiTraCe project. These are the Key Exploitation Results (KER) MFP, DPP (both technical traceability methodologies), and CERA (certification scheme) and will be object of a business case (BC):

1. *Material Fingerprinting of Raw Materials (MFP) / Artificial micro-tagants*. MaDiTraCe will - analogue to the successful traceability scheme for gold - develop BCs for MFP for lithium and graphite down to battery cells (a) *Lithium* (BRGM) - The BC lies in the forensic application of lithium traceability from ore to battery cell, and regulatory demand for mining companies and battery manufacturers for proof of sustainable and traceable supply chains. (b) *Graphite* (MUL) - The potential BC will include sustainability audits of the graphite mineral concentrate supply chain traceability, and the development of a database to compare different material origins. To complement the MFP, artificial (micro)tagants are being developed for artificial tracing (AHK), placed at specific points in the supply chains and monitored downstream. The focus is on the upstream, mining of raw ore, transport and processing (concentrates).
2. *Digital product passport (DPP)*. The BC for the DPP lies in the application by the (end) product manufacturers to meet compliance and due diligence reporting requirements for supply chain traceability and sustainable raw materials. The functionality of the DPP will be optimized with Spherity and the international IT expert members of the MaDiTraCe Advisory Board (Microsoft, MaibornWolff) and the traceability use case project with the automotive CATENA-X industry partner network. CEA will deliver patterns for blockchain solutions and best practices guidelines.
3. *CERA 4in1 Certification System (CERA)*. It comprises regulated, industry professional (TÜV NORD certified) audit catalogues and its regulatory compliancy will be independently benchmarked against the German Lieferkettengesetz, the EU Criteria for Sustainable Raw Materials and the draft of the EU Corporate Sustainability Due Diligence Directive. Audit catalogues of the CERA 4in1 certification system are disclosed to clients only (confidential) and protected by NDA's and Copyright registrations. The BC for this product is the regulatory compliance for recovery and processing of sustainable raw materials.

The three results are closely related. The digital trail of certified information summarized in DPPs, including MFP conformity/nonconformity information and artificial labeling, will be auditable through the CERA 4in1 certification system, which will cover the entire value chain of primary and secondary raw materials with four sub-standards that are compatible and linked to each other by the end of MaDiTraCe under a single system.



In addition, there are other KERs that focus primarily on non-commercial exploitation. This links socially and politically oriented target groups.

3 Target audiences

In Table 2, a target group analysis is shown. In this table, the totality of all relevant target groups is listed, regardless of their assignment to the three KERs.

All target groups <ul style="list-style-type: none">• Secure supply of sustainably exploited and processed raw materials is crucial for the development and resilience of European society.• Sustainable (critical) raw materials are pivotal for EU Green Deal• All actors across the value chain (e.g., manufacturers, suppliers, researchers, policy makers, standards organizations) have important roles in RM traceability• Different actors' actions shape each other and the perceptions around RM tracing and certification• Joint meaning-making and co-creation between actors from various backgrounds can lead to innovative new solutions and actions towards sustainable raw materials
Industry <ul style="list-style-type: none">• Industry actors can contribute to significant changes in how raw materials are sourced• RM traceability and certification is a way to enact business sustainability, circular economy and corporate social responsibility, also being a selling point to customers• Manufacturers can impact their customers' and suppliers' RM-related norms and practices through, for example, marketing, labelling and packaging• RM traceability should be addressed on a strategic level
The general public, consumers <ul style="list-style-type: none">• Urgent changes are needed to reduce the environmental footprint of RMs• Consumers' actions play an important role in leading the way for other consumers', as well other RM actors', actions• Frontrunner consumer-citizens and civil-societal actors are needed to spread RM tracing and certification, including through grassroots initiatives
Multidisciplinary scientific community <ul style="list-style-type: none">• Researchers from different fields are needed to find effective solutions for RM tracing• New scientific knowledge is needed that other researchers can build upon
Other projects, initiatives and networks <ul style="list-style-type: none">• Cooperation among different RM initiatives and projects is vital• MaDiTraCe is open for collaboration between researchers
Communicators, media <ul style="list-style-type: none">• Communicators and media have a significant role in disseminating information on RM tracing and certification• The ways these issues are addressed in communication, media and education shape the norms around it• New evidence-based information created in MaDiTraCe can be used in



communication and education
Policymakers and global organizations <ul style="list-style-type: none">• Decision-making regarding RM tracing and certification should be based on the insight gathered from the impact assessment of existing solutions• RM tracing and certification contributes to achieving the goals of the CE Action Plan and the EU Green Deal

Table 2: Target groups and key messages

To develop the customized exploitation strategy, a survey was conducted among the project partners for the detailed target group analysis. When the main exploitable results are assigned to the Commercial, Political, Scientific & Educational and Societal clusters, the following picture emerges (see Table 3).



KER	Exploitable results	Exact designation of the IP	Commercial	Political	Scientific and Educational	Societal
1 MFP	Material fingerprinting methodology and data base for lithium supply chain	Method for lithium fingerprinting in battery supply chain	Mining and processing industry, refiners, manufacturers, recycler, trader, OEMs, financial institutes, insurance companies, material traceability companies	Policy makers	European scientific research organizations	NGOs (promote sustainability)
1 MFP	Material fingerprinting methods for cobalt	Analytical method(s) for geochemical fingerprinting of cobalt minerals and materials	Mining and processing industry, refiners, manufacturers, recycler, trader, OEMs, financial institutes, insurance companies, material traceability companies	Policy Makers	EU and international scientific research organizations	Law enforcement, NGOs
1 MFP	Material fingerprinting methodology and data base for graphite supply chain	Method for graphite fingerprinting in supply chain	Mining and processing industry, refiners, manufacturers, recycler, trader, OEMs, financial institutes, insurance companies, material	Policy makers	European scientific research organizations	NGOs (promote sustainability)



D5.2 Preliminary exploitation plan

KER	Exploitable results	Exact designation of the IP	Commercial	Political	Scientific and Educational	Societal
			traceability companies			
1 MFP	Geochemical database of cobalt, lithium, graphite and REE	Database	Mining and processing industry, refiners, manufacturers, recycler, trader, OEMs, financial institutes, insurance companies, material traceability companies	Policy Makers	EU and international scientific research organizations	Law enforcement, NGOs
1 MFP	Fraud detection algorithm and machine learning	Algorithm	Insurance companies, traceability companies, financial institutes	Policy makers	Scientific groups	Law enforcement, NGOs
1 MFP (Tracer)	Micro-tagchants or other artificial tracers	Type, properties/ formulation and manufacture as well as the associated technology to develop, apply and detect	Mining and processing industry, refiners, manufacturers, recycler, trader, OEMs, financial institutes, insurance companies, material tagging and tracing companies	Policy Makers	EU and international scientific research organizations	Law enforcement, NGOs
1 MFP (Tracer)	Artificial micro-tagchants or other artificial tracers	Type, properties/ formulation, standard operating procedures,	Mining and processing industry, refiners, manufacturers,			Police and law enforcement and Government Organizations



KER	Exploitable results	Exact designation of the IP	Commercial	Political	Scientific and Educational	Societal
		methodologies, strategies, and manufacture as well as the associated technology to develop, apply and detect	recycler, trader, OEMs, financial institutes, insurance companies			
2 DPP	Architecture and components for traceability of raw materials	Raw material data handling for the DPP, e.g. integration of Materials Fingerprint data into the DPP.	Supply chain actors, audit companies, recyclers	Policy makers	European scientific research organizations, Standards bodies	NGOs (promote sustainability), End consumers
2 DPP	Patterns for blockchain solutions and best practices guidelines	Tracking Methods via Digital Solutions			International Scientific Community	
3 CERA	CRS audit catalogue	checklist with detailed certification requirements	Financial institutes, insurance companies, exploration companies	Policy makers	European scientific research organizations	NGOs (promote sustainability)
3 CERA	Downstream CPS audit catalogue	checklist with detailed certification requirements	Manufacturers, recyclers	Policy makers	European scientific research organizations	NGOs (promote sustainability)
3 CERA	Upstream and Downstream CCS audit catalogue	checklist with detailed certification requirements	Mining and processing industry, refiners, manufacturers, recycler, trader, OEMs	Policy makers	European scientific research organizations	NGOs (promote sustainability)



KER	Exploitable results	Exact designation of the IP	Commercial	Political	Scientific and Educational	Societal
3 CERA	CFS audit catalogue	checklist with detailed certification requirements	Financial institutes, insurance companies, exploration companies	OEMs, customers	European scientific research organizations	NGOs (promote sustainability)

Table 3: Key exploitation results and clustered target groups



A distinction can be made between non-commercial - i.e. non-material - and commercial target groups. The MaDiTraCe project also aims to reach the main target groups in which there is commercial interest, including e.g.:

- Mining and processing industry,
- refiners,
- manufacturers,
- recyclers,
- traders,
- customers,
- forensic police
- IT services provider,
- Financial institutes,
- insurance companies,
- exploration companies
- OEMs

The KER refer to different target groups. Table 4Table 2 shows the relationship between the specific named commercially viable products resulting from the three KERs (1 MFP, 2 DPP, and 3 CERA) and their respective primary target groups.

KER	Main exploitable result	Target group(s)
1	Data bases of fingerprints for key commodities throughout the supply chains including experimentally produced batteries/magnets	Mining and processing industry, refiners, manufacturers, recyclers, customs, forensic police
1	New tailored added tracers to improve traceability from mine to concentrates	Mining and processing industry
1	Automated AI-enabled data analysis applied to material fingerprinting	Mining and processing industry, forensic police, insurance and financial companies
2	Toolkit of decentral digital solutions for DPP implementation	IT services provider
3	CRS audit catalogue	Financial institutes, insurance companies, exploration companies
3	CPS audit catalogue	Manufacturers, recycler
3	CCS audit catalogue	Mining and processing industry, refiners, manufacturers, recycler, trader
3	CFS audit catalogue	OEMs, customer

Table 4: Most important usable results and associated commercial target groups

The different target groups must be addressed with different arguments and key messages, resulting in a different strategy in each case. In the further development of the exploitation plan, these statements need to be expanded and the respective strategy sharpened.



4 Exploitation methodology

The ambition of the exploitation strategy is to help maximize the impact of MaDiTraCe by following a three-tiered approach:

1. Intellectual Property (IP): Identification, characterization and clear definition of exploitable results
2. Exploitation plan & exploitation roadmap (ERM): Structuring and scheduling of the individual exploitations plans for each key exploitation result
3. Business case (BC): Development of business cases for commercial exploitation of the three KER

The objective is to provide a guideline on how the respective KER reached in MaDiTraCe can be developed into a commercially applicable product. The implementation of the guideline is not part of the Exploitation Strategy (Task 5.2) but is carried out within the framework of the respective tasks.

4.1 Intellectual Property

Within this work package, coordination with the project partners on intellectual property (IP) takes place. Issues to be taken into account during the project and beyond will be clarified. For this purpose, there will be a workshop with the project partners at an early stage of the project to clarify the IP rights. It allows information to be gathered to form the basis for the project exploitation strategy. The results of the consultation with partners will feed into a common IP repository, which is a table that categorizes all IP related to the project.

Ownership rights will be assigned to each IP output and a specific strategy for use or dissemination will also be defined and written in the ROL (Result ownership listing). It is of course expected that these strategies will evolve as the project and its outputs mature. At the end of the project, the ROL will be finalized.

For the development of the ROL list, a survey was conducted already with all project partners prior to the preparation of this report. The results will serve as preparation and basis for the IP workshop in May 2023. A preliminary list of the main IP elements and the associated partners can be found in Table 5.

Involved Partner	Exploitable result with IP Protection	Task
BRGM	Material fingerprinting methodology and data base for lithium supply chain	2.2
GTK	Material fingerprinting methods for cobalt	2.2
MUL	Material fingerprinting methodology and data base for graphite supply chain	2.2
GTK	Geochemical database of cobalt, lithium, graphite and REE	2.2



Involved Partner	Exploitable result with IP Protection	Task
GTK	Micro-tagants or other artificial tracers	2.3
AHK	Artificial microtagants or other artificial tracers	2.3
BRGM	Fraud detection algorithm and machine learning	2.5
CEA	Patterns for blockchain solutions and best practices guidelines	3.2
Spherity	Architecture and components for traceability of raw materials	3.3
DMT	CRS audit catalogue	4.1
DMT	Downstream CPS audit catalogue	4.2
DMT	Upstream and Downstream CCS audit catalogue	4.3
DMT	CFS audit catalogue	4.4
BRGM	Integration of traceability tools and compatibility with EU product passport	4.5
DMT	methodology for integration of traceability tools into CERA 4in1	4.5

Table 5: Preliminary overview of generated IP, associated tasks and involved partners

4.2 Exploitation plan and exploitation roadmap

A customized roadmap will be designed for the three KERs MFP, DPP, and CERA lighthouse-like to optimize the beneficiation process. The individually roadmaps are intended to ensure the successful transfer from project to product. The CERA roadmap will be developed first. It will serve as a blue print for the two other roadmaps. Prior to the development of the MFP roadmap, a process step is inserted in which the fundamental aspects of a possible commercialization, for example through a spin-off, are evaluated. Only then a decision is made as to how and whether the commercial exploitation should take place.

Structuring and scheduling of the individual exploitations plans will take place in the frame of developing the exploitation roadmap.

At this point, the activities listed in Table 1 can be identified as steps for the preparation of the roadmap.

To figure out the individual exploitation roadmaps for the exploitation of the KER the following questions will be answered:

- In what area do you expect to make an impact?
- What needs might be solved/met thanks to the results of your project?
- What outputs will be created?
- Where will the outputs be made available during and after the project?
- Who are the potential users of your results?
- How will you contact them?

Basing on that the steps of the exploitation roadmap for the KER will be defined.





An important step in the exploitation plan is the involvement of all relevant stakeholders, some of whom are already involved as partners in the project or as members of the advisory board. Both the partners and the members of the advisory board will be consulted when conducting interviews.

The following companies and organizations will become members of the advisory board once it is formally constituted:

- UNECE
- Stellantis
- Microsoft
- MaibornWolff
- Rare earth Norway
- Vulcan Energy
- European Lithium Institute
- AngloAmerican
- Orano

In addition, if necessary, further stakeholder groups are consulted or asked to test the results and provide feedback. Appropriate dissemination strategies must be selected for successful exploitation.

A dissemination and communication strategy and a corresponding plan is needed for targeted exploitation. This must be synchronized with the ERM. A detailed dissemination and communication plan will be produced in Task 5.1. It will outline the project's audiences in detail, key messages and communication channels for the dissemination.

Dissemination activities will bring results to the scientific community as well as to relevant policy-makers and standardisation bodies. On a scientific level, dissemination activities will pay particular attention to publication in international scientific peer-reviewed high impact journals and open access research data.

4.3 Business Case

Within the exploitation plan a business case (BC) for each of the three Key Exploitation Results will be developed with support of the partners involved - BRGM, GTK for MFP, Spherity for DPP, and DMT for CERA.

The business case also includes individual business plans (BP). As first, the business plan for KER 3 (CERA) will be developed by DMT. This BP serves as a blueprint for the other two BPs. If required, DMT will support the respective responsible partners by providing advice and guidance on the preparation. All business cases will content

- a Go-To-Market strategy,
- a plan for pilot testing in an operational environment to reach commercialization status,
- a business plan for commercialization, which will be detailed and amended according to regulatory and market demands throughout the project.

All exploitation activities and implementation of BCs will be monitored by UNECE for validation of their SDG added value.



The following questions will be considered:

- What exactly is the product and / or business model and how will it generate revenue in the medium term?
- What assumptions and conditions must occur for the business to be successful?
- Is commercial exploitation promising? What are the opportunities and risks?
- In which market and to which customers should sales be made?
- When are profits expected?
- What is the competitive situation? Where is your business unique (Unique Selling Point)?
- Which partners in the consortium will use the products or services commercially during and / or after the end of the project?
- What are the weaknesses and strengths (swat analysis)?
- What are the next steps to be taken?

Furthermore weaknesses and risks have to be tackled. Possible obstacles include:

- inadequate financing
- skills shortages
- regulation that hinders innovation
- intellectual property right issues
- traditional value chains that are less keen to innovate
- incompatibility between parts of systems (lack of standards)
- mismatch between market needs and the solution

Depending to the individual situation of the three KERs, the following aspects will be considered in the structure of the final BCs:

- Definition of the unit e.g. working group, company or founding who will offer the exploitation of the working result
- Exact formulation of the business idea
- SWOT-Analysis
- Unique selling proposition
- Necessary experience and professional qualifications
- Potential target groups
- Means how customers to be reached (results of the exploitation strategy)
- Capital requirement aspects
- Turnover expectation in the first years
- Definition of most important goals
- Implementation Plan

If further results are achieved in the course of the MaDiTraCe project realisation that prove to be KERs, these will also be created and processed in an exploitation roadmap according to the blueprint of the first 3 KER projects, if applicable.



5 Timeline

		End at the latest
M1	Start MaDiTraCe / Task 5.2	01/01/2023
M2	Internal survey	03/03/2023
M3	D5.2: Preliminary exploitation plan (public)	31/03/2023
M5	Initial IP Workshop	31/05/2023
M24	Workshop (Finalisation exploitation strategy)	31/12/2024
M27	3 Workshops (Developing Business plans)	31/03/2025
M30	D 5.3: Business plan and exploitation roadmap (confidential)	31/06/2025
M36	End MaDiTraCe / Task 5.2	31/12/2025