MADITRACE

Intermediate Advisory Board Recommendations Report

Deliverable D6.3

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Summary

The following deliverable summarizes the first recommendations and comments received from the Advisory Board members after the first meeting introducing MaDiTraCe project results.

Keywords

Traceability, advisory board, critical raw materials, sustainable sourcing, due diligence

Abbreviations and acronyms

Acronym	Description
AB	Advisory Board
DEL	Deliverable
NDA	Non-disclosure Agreement
WP	Work Package
MFP	Material fingerprint
ESG	Environmental, Social, and Governance

1 Description of the Advisory Board

1.1 Mission of the AB

The Advisory Board plays a crucial role in the MaDiTraCe project. Its external and independent analysis and recommendations will ensure the project's quality and excellence, as well as support strategic decisions. The AB involves representatives of organisations with strong background in mining sector, mineral resources, industrials sectors such as battery and magnet manufacture, sustainability.

The synergy between the Consortium and the AB generates valuable feedback to the project in order to align its objectives and deliverables with end-user needs. AB members have access to selected key deliverables and data and are invited to share their insights regularly over the life of the project through attending meetings and participation in the lecture series and workshops.

The main recommendations provided by the AB concern the development of MaDiTraCe project progress; identification of possible shortcomings and suggested steps for improvements; exchange of knowledge and practical experience.

AB roles are also described in the MaDiTraCe grant agreement, under measures to maximise impact (Pag. 24), WP1 and WP6.

1.2 Selection process of the AB

An initial list of experts coming from major stakeholders in sustainable mining, mineral resources management, geochemistry, traceability systems, battery and vehicles manufacturing was established. The experts were selected by the Project Management Office and the Coordinator based on proven expertise in here above-mentioned project research topics, including methodological expertise and good knowledge of the EU research and innovation policy and Horizon Europe program and availability to fulfil their responsibilities for the duration of the project. Then, the experts have been validated by consortium partners.

The Project Management Office and the Coordinator chose the experts based on their proven expertise in the project's research topics, including their methods, knowledge of EU research and innovation policy, and the Horizon Europe program. They were also selected for their availability to fulfil their responsibilities throughout the project. It is nevertheless worth noting that these members will not have any decision-making on the strategic implementation/orientation of the project.

1.3 Members of the AB

The MaDiTraCe AB is now composed of 5 members at the moment (one will join soon once the NDA is signed). Further competencies or expertise may be added during the project implementation, if considered necessary. They represent different types of entities and different actors along the supply chain: from mining sector to final product. In the AB there are also members with experience in traceability in another sector such as nuclear.

A short description of AB members expertise is provided here below:

Table 1 - Qualification of the MaDiTraCe AB members

ABmember	Organisation	Country	Expertise
Andreas Bittner	Lithium Institute	Germany	Lithium, chemistry
Trond Watne	Rare earths norway	Norway	Geology, mineral resources
Jerome Gouin and Emmanuelle Robins	Avenia	France	Geology, mineral resources Traceability in pharmaceutic sector
Perrine Russias	Orano	France	Mineral treatment, magnets, mining, traceability in nuclear sector
Caroline Mini	Vektor	France	Battery giga-factory

1.4 AB involvement

The AB members were invited to join every MaDiTraCe Consortium meeting organized and held from the beginning of the project (kick-off meeting in Paris in January 2023 and general meeting in Leoben in February 2024).

In May 2024, after the NDA procedure was finished, a specific meeting with the AB was held virtually (90 minutes). In this meeting the main results and achievements of the project during the first 16 months were presented. During this meeting the AB members evocated and raised questions and awareness about the progress of the project and several scientifical questions and also about the potential implications of MaDiTraCe project results in raw material supply chains. These recommendations are evocated in the next section of this report.

In this meeting the results of WP1 to WP5 were presented, with a particular attention to already finished deliverables:

- WP1 (D1.2-D1.3), current intervention for due diligence in the material supply chain
- WP2 (D2.3), state of art of artificial tagging techniques.
- WP3 (D3.1), supply chain mapping.

During this meeting the relations the project with external entities and other initiatives such as the UN CEFACT CRM Traceability[1] project were also evocated.

In parallel, the AB members can be reached by WP for questions related to the work progress in the project such as material sample acquisition for WP2.

AB have been also invited to open and external events. For example, Caroline Mini from Verkor participated in a round table organized by BRGM, the coordinator of the project, during the FEET[2] conference in Montpellier in May 2024 with the "Geopolitics of mineral resources and sustainable sourcing'.

[1] https://uncefact.github.io/project-crm/docs/pilots/CRM-requirements/
[2] https://feet-forum.com/edition-2024/

Figure 1: Picture of the round table organised in FEET conference celebrated in Montpellier in May 2024 with the presence of Caroline Mini (Verkor, member of the AB) and Capucine Nouvel and Daniel Monfort (BRGM, MaDiTraCe), Louis Marechal from OCDE, Guilherme Faria (Transitions company) and Benedicte Couffignal (Record association).

2 Intermediary recommendations of the AB

The main recommendations of the AB are the following:

- **Challenges of recycling in material traceability**

The advisory board suggests that it is important to investigate the traceability of recycled content. Understanding the origin of materials through the recycling process will help ensure transparency and accountability, as it is for example a requirement of EU battery regulation to have a certain recycled content and EU CRM Act for permanent magnets. The AB recommend investigating the feasibility of tracking systems to monitor recycled materials content from collection to their reintegration into new products (digital traceability and MFP).

Regarding the Material Fingerprint (MFP), the board advises conducting thorough studies to determine if MFP is maintained or how it is modified across recycling loops.

- **Heterogeneity of intrinsic material fingerprint within a deposit**

The heterogeneity in material fingerprinting (MFP) within a single geological deposit can be a critical issue in traceability work. It has been observed that within the same deposit, there can be significant variability in MFP criteria for one substance, such as isotopic compositions. These variations often arise due to differences in the mineral formation processes and the subsequent alteration of minerals over geological time scales.

Understanding and accounting for this heterogeneity is essential when establishing a robust traceability framework. Ignoring these variations could lead to inaccurate conclusions, potentially undermine the credibility of traceability efforts and the risk of false positives.

Therefore, it is imperative that traceability models incorporate mechanisms to address and adjust for the inherent variability in MFP within a single deposit such as confidence indicators, etc.

The consideration of this matter will ensure that traceability framework remains scientifically reliable.

- **Change of mining sector is driven by final customer and product manufacture**

The impetus for advancements in mining practices is increasingly driven by the stringent demands of end clients, particularly battery manufacturers, who are focused on ESG (Environmental, Social, and Governance) criteria and due diligence obligations. These manufacturers require not only high-purity materials to meet performance and safety standards but also sustainable and ethically sourced materials to comply with ESG standards and due diligence obligations. Consequently, they can exert significant pressure on mining companies and refiners to enhance their extraction and processing techniques. Innovations in mining are essential to produce the quality and sustainability of raw materials needed for advanced battery technologies.

The stringent ESG specifications set by battery manufacturers necessitate continuous improvements in mining operations. Mining companies are thus prompted to adopt more precise, efficient, and environmentally friendly methods and increasing yield while minimizing environmental impact. These enhancements improve product quality and align with both environmental and regulatory expectations. This underscores the critical relationship between raw material producers and end-product manufacturers. By meeting these demands, mining companies can secure their position in the supply chain, reinforcing their commitment to more responsible practices.

As battery technology advances as well as other technologies, the pressure on mining companies to improve their ESG performance will only intensify. The future of mining is thus closely tied to the requirements of battery manufacturers, who prioritize sustainability and ethical sourcing. The drive for better mining practices reflects a broader commitment to ESG principles, ensuring that the evolution of mining is shaped by the exigencies of final clients and the global push for more responsible industry practices.

- **Difficulties for processing and refining plants working with different material sources**

Processing and refining plants face significant challenges when handling materials from diverse sources. If the MFP relies on the presence of very specific trace elements, one major issue is the risk of cross-contamination, as these plants often do not thoroughly clean their installations after each batch operation. This lack of complete cleaning can lead to the mixing of materials from different sources, which can have a substantial impact on the material fingerprint, potentially compromising the quality and integrity of the final product.

When materials from different origins mix it becomes difficult to maintain the trace of different provenances required by end clients. If the requirements in terms of traceability are very high this can result in a product that does not meet stringent performance, leading to potential rejection of this material.

Implementing completely segregated flows to prevent cross-contamination presents a formidable challenge. Ensuring that materials remain isolated throughout the processing stages requires significant investments in infrastructure and operational protocols. This approach can be cost-prohibitive, particularly for smaller or less financially robust operations.

Furthermore, achieving and maintaining fully segregated processes demands rigorous monitoring and control systems, which can be technically complex and resource-intensive. It necessitates a high level of coordination and meticulous attention to detail to ensure that no inadvertent mixing occurs at any stage of the processing.

In addition to financial and technical hurdles, there are logistical challenges in managing the flow of diverse materials through a plant. This includes coordinating supply chains, scheduling production runs, and maintaining detailed records to track material origins and processing history accurately.

Despite these challenges, the importance of preventing material mixing cannot be overstated. Maintaining the material fingerprint is crucial for meeting the expectations of clients who demand high standards of quality and consistency. Thus, while implementing segregated flows is difficult and costly, it is essential for ensuring the integrity of the final product and sustaining client trust and satisfaction.

The industry must balance the costs and complexities of segregation against the risks and consequences of material mixing.

Ultimately, addressing these challenges requires a combination of strategic investments, technological advancements, and robust operational practices to ensure that processing and refining plants can deliver high-quality, consistent materials to their clients, regardless of the diversity of the material sources they handle.

- **Need for more harmonization between responsible sourcing standards**

Mining and raw materials companies need to homogenize requirements across different sustainable and responsible mining standards. They can work with customers who require different certification schemes or standards, leading to diverse operational demands in the field. This situation creates complexity, as each certification may impose different procedures, reporting methods, environmental protections, etc.

Aligning these standards is crucial to streamline operations and ensure consistent compliance. Without homogenization and interoperability, mining companies face increased costs and operational inefficiencies. Standardizing requirements can simplify processes, reduce redundancy, and improve overall performance. Ultimately, harmonized standards help mining companies meet customer expectations while maintaining high ethical and environmental practices.

- **Interoperability between digital traceability systems**

The battery manufacturing sector is increasingly dependent on robust supply chain traceability to ensure sustainability, compliance, and efficiency. To achieve this, there is a pressing need for interoperability between digital systems, including those utilizing blockchain technology. Interoperability enables seamless data exchange between various

stakeholders, such as raw material suppliers (mining companies, refiners and traders), manufacturers, and recyclers. This integration ensures that critical information regarding the origin, processing, and transportation of materials is consistently and accurately recorded across the supply chain. Blockchain systems provide immutable, transparent records, enhancing trust and accountability. However, these systems must be compatible with existing enterprise resource planning (ERP) software, quality management systems (QMS), and other traceability tools to fully realize their potential. Standardized data formats, communication protocols, and interfaces are essential to facilitate this interoperability. Moreover, regulatory requirements for traceability in battery manufacturing demand comprehensive, verifiable data, which can be efficiently managed through interoperable systems. Collaboration between industry stakeholders to develop and adopt common standards is crucial. By achieving interoperability, the battery manufacturing sector can improve operational efficiency, reduce costs, enhance product quality, and ensure compliance with environmental and safety standards. This will ultimately lead to a more transparent, responsible, and resilient supply chain.

3 Conclusion

The Advisory Board of MaDiTraCe project assisted to a dedicated meeting in May 2024 where the main ongoing results and tasks of the project were presented. A new AB members meeting will be held in the second half of the project.

These recommendations to the project were in summary:

- Practical and logistical questions related to the implementation of traceability systems,
- Awareness about the uncertainties of MFP techniques face to heterogeneities in geological mineral deposits and the necessity to integrate uncertainty assessment in the system,
- Induced cost to companies along the supply chain,
- Need for a more harmonized and interoperable framework for digital traceability tools and responsible mining standards,
- A need to integrate methods and tools to trace the recycled material content aligned with battery regulation targets and EU CRM Act.

These recommendations given by the AB members, external to the technical and scientific progress of the project MaDiTraCe, represent a list of major concerns and critical points related to project progress and should be integrated in MaDiTraCe project roadmap (task 4.5). This list of recommendations and awareness does not identify aspects that really come as a surprise to the members of the project, but their consideration becomes essential in the second part of the project.

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