

SUMMARY

Introduction

Advancing Sustainable Metallurgical Processes: MECALO Updates	1
Latest Project Progress and Technical Advances	1
Building Knowledge and Industrial Capacity	2
Anticipated Impacts and Future Direction	3
Closing Thoughts	3

Introduction

Since the start of MECALO, the project has steadily reinforced its role as a bridge between cutting-edge research and sustainable industry. Over the past months, partners have validated innovative carbon materials for metallurgical use, aligned modelling and planning efforts across key work packages, and showcased MECALO's vision at industry-level events.

In this edition, we share these developments as evidence of the project's deepening maturity and its potential to reshape sustainable critical raw materials production in Europe.

Advancing Sustainable Metallurgical Processes: MECALO Updates

In recent months, the project has achieved significant milestones in the development of carbon agglomerates and the integration of renewable hydrogen into silicon and silicomanganese production cycles. Preliminary tests have confirmed the quality and reactivity of these new materials, bringing MECALO closer to the pilot demonstration phase. These achievements not only mark a step forward in reducing CO₂ emissions but also provide a concrete opportunity to establish sustainable and resilient production chains across Europe.

Latest Project Progress and Technical Advances

Successful Carbon Agglomerate Tests

A central milestone since our last update has been the successful development and testing of carbon agglomerates that are showing high promise for manganese production. Produced by the Institute of Energy and Fuel Processing Technology (ITPE) using innovative bio-binders from BTG, these agglomerates have demonstrated **excellent mechanical strength and reactivity**, both critical for metallurgical application. Trials conducted by ERAMET and SINTEF confirm that these renewable carbon materials perform well under conditions representative of real industrial processes.



Source: ITPE

Encouraged by these outcomes, the consortium is now considering advancing toward **Technology Readiness Level 6 (TRL6) piloting several months ahead of schedule**, reflecting confidence in both the research and cross-partner collaboration.

Strengthening Technical Coordination: Internal Workshop

Collaboration and alignment across partners are foundational to MECALO's success. In October 2025, technical teams from the Luxembourg Institute of Science & Technology (LIST) and the Process Design Center (PDC) convened for a two-day workshop dedicated to aligning methodologies and advancing key work streams, especially within Work Package 6. Sessions focused on harmonizing modelling assumptions for silicon production, reviewing recent deliverables, and advancing integration between **Life Cycle Assessment (LCA)** and **process simulation tools**. The workshop also involved hands-on discussions around data needs and joint planning, laying the groundwork for coherent progress toward upcoming milestones.



Source: List

Spotlight on MECALO at the CRU Silicon Market Forum

In September 2025, MECALO's vision was brought to a global industry audience at the **CRU Silicon Market Forum** in Lyon, where representatives highlighted the urgency of sustainable silicon production in the context of carbon neutrality goals. Presenters emphasized the challenges inherent in reducing fossil carbon use in silicon production — a process that today emits up to five kilograms of CO₂ per kilogram of silicon produced — and the critical importance of solutions like MECALO's integrated approach. This forum provided an excellent platform for deepening industry awareness and reinforcing partnerships across metallurgy and materials supply chains.



Source: SINTEF

Building Knowledge and Industrial Capacity

Fostering Collaboration and Expertise

Beyond technological advances, MECALO is generating valuable new knowledge through multidisciplinary collaboration among research organizations, SMEs and key industry players. This knowledge transfer, spanning renewable hydrogen utilization, carbon capture and materials synthesis, is foundational to scaling sustainable production pathways across Europe. Training activities and research dissemination are already contributing to **human capital development**, preparing engineers and scientists to lead in low-carbon metallurgy and future industrial decarbonization efforts.

Anticipated Impacts and Future Direction

Environmental and Societal Impact

By eliminating fossil carbon in Si and Mn production, MECALO supports Europe's roadmap to climate neutrality. The shift to renewable hydrogen and carbon reuse is expected to lower metal production emissions profoundly, while also driving sustainability across value chains. The project's findings are expected to inform broader decarbonization strategies, potentially including other industrial sectors like cement manufacturing through adaptations of carbon looping technologies

Economic and Industrial Benefits

MECALO is charting a path toward **new European value chains** for critical raw materials. Its technologies aim to reduce reliance on imports, boost competitive advantage and enable domestic production of strategic inputs for clean energy and digital sectors. The project's commercialization roadmaps envision deployment of production facilities across Europe by 2040, contributing to economic resilience and industrial growth.

Closing Thoughts

The MECALO project continues to break new grounds in sustainable metallurgy. By combining scientific rigor, industrial collaboration and strategic vision, we are not only addressing one of Europe's most critical decarbonization challenges but also shaping future-ready value chains for essential raw materials.

Looking ahead, the next MECALO project meeting will take place in mid-April and will be hosted by ERAMET, providing an important opportunity for partners to review progress, align on upcoming activities and further strengthen cooperation as the project advances toward its next milestones. Stay connected and engaged as we continue to drive these innovations forward together.

