Grant Agreement: 101084028

I4-GREEN
(Final I3 / I4-GREEN Public Report)
D1.9
30/04/2025

I4-GREEN Consortium

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General information				
Work Package	WP1 - I4-GREEN Management and coordination			
Deliverable	Final I3 / I4-GREEN Public Report			
Due Data	M30 30 April 2025			
Submission Date	M30 30 April 2025			
Deliverable Lead	ICAMCYL			
Dissemination Level	X	Public (PU)		Sensitive (SEN)
Document Nature	X	Report (R)		Other (O)
Description of the related task and the deliverable. Extract from DoA	The coordinator will be responsible for all contractual obligations towards the EC as defined by the Grant Agreement, including daily administrative management; submission of periodic/final reports and cost statements to the EC; control of work progress including timely preparation and submission of project results (Deliverables); control of budget expenditure in relation to the foreseen tasks and activities; update of the work plan accounting for risks and contingency planning. A smooth communication mechanism will be implemented between the participating organisations and with the project officer/EC through progress meetings and both online and off-line interactions between project leader and the EC. In addition, under this Task: A Consortium Agreement (CA) will be signed by all beneficiaries at the beginning of the project, including access rights to background and foreground knowledge, IPR and confidentiality arrangements (D1.1). The project Steering Committee (SC) will be established which will gather one representative from each full partner organisation and shall take key strategic and potential conflict management decisions. It will be gathered every 3 months, starting from the Kick-Off meeting in M1. A Management Plan (Task 1.2) will be delivered at the beginning of the project (M2) that will depict management and delivery modalities, internal procedures, I4-GREEN management structure. Progress, technical and financial reports will be submitted by the coordinator as per the project timeline and in line with I3 requirements (D1.5-D1.8).			
Authors	ICAMCYL			
Reviewers	All partners			
Status		Draft	X	Final

Revision History				
Version	Date	Author	Organisation	Status
V1	01/03/2025	AG, RC, AF	ICAMCYL	First Draft

V2	21/04/2025	RA, AG, JB	LEONORE, ISMC, LAIN	Draft
V3	22/04/2025	AGG, RC	ICAMCYL	Draft
V4	30/04/2025	AGG, RC	ICAMCYL	Final

Glossary	
Acronym	Meaning
AMBP	Advanced Materials for Batteries Partnership
EC	European Commission
GA	Grant Agreement
OC	Open Call
PO	Project Officer

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EXECUTIVE SUMMARY

I4-GREEN project has successfully completed its thirtieth month, the end of the project being the point at which the different objectives have been achieved to enable a more sustainable access to critical raw materials, a crucial requisite for ensuring Europe's recovery and is essential to preserve and further improve the environment and the life quality.

In the last months of the I4-GREEN project the effort has been focused on technology development, pilot plant installations, collaborative research, and public outreach. On the other hand, work was concentrated on bringing this ecosystem to EU scale through interregional collaborations across the raw materials value chain.

Previous deliverables have covered the progress of I4-GREEN over the past months of the project, with D1.5 (Public Progress Report M12) that covered M1 to M12, D1.6 (Mid-term technical and financial report) that collected information until M15 and D1.7 (Public Progress Report M24) that covered M16 to M24.

The present deliverable D1.9 presents I4-GREEN project, its objectives, developments and achievements during the last months of execution, from M24 to M30.

1. INTRODUCTION

2.1. I4-GREEN

Enabling access to raw materials is a crucial requisite for ensuring Europe's recovery and is essential to preserve and further improve the environment and the life quality. I4-GREEN is an industry-driven project wishing to deploy regional circular economy innovations in the mining processes.

I4-GREEN is an industry-driven project, entailing the following 2 green strands:

- Iron Holm Oak creates an EU lighthouse of a forefront technology to recover rare earth minerals from iron mining waste, reducing environmental impact and alleviating EU dependency on foreign rare earth elements Rare Earth Elements (REE) in particularly for Neodymium element.
- Riotinto will innovate with a SME-owned Green Tech to extract strategic raw materials (Cu, Zn, Co and PGMs).

Main objectives:

1. Unleashing the green innovation power of EU interregional Ecosystems and fostering the green transition of other EU regions facing similar challenges in mining/extractive industry.
2. Turning mining green, circular and social through joint innovation investments for the green and circular extraction and the processing of raw materials.
3. Re-evaluating of mining dumps and wastes.
4. Reviving the ecosystems that are (often hardly) touched by the deindustrialization.
5. Establishing a unique interregional ecosystem, a node for the green transformation of extractive industries and the emergence of an EU sustainable mining value chain.
6. Generating a concept for forefront sustainable and environmentally friendly processing recovery technologies and of low environmental impact.

An interregional system is growing thanks to innovative tools as well as enablers ready to align regional investments to turn the mining process into a green one.

2. I4-GREEN ORGANISATION STRUCTURE

2.1. I4-GREEN project structure

I4-GREEN is industry-driven, with two pilots (Figure 1) at its core which will deploy circular innovations to the market:

Pilot 1 – Extremadura, Spain - With the objective to create and develop a forefront technology to recover minerals from iron mining waste, reducing environmental impact and alleviating EU dependence.

Pilot 2 - Andalucía, Spain - Will be implemented for scaling up hydrometallurgical leaching of primary sulphide minerals for the sustainable recovery of essential metals for the green transition.

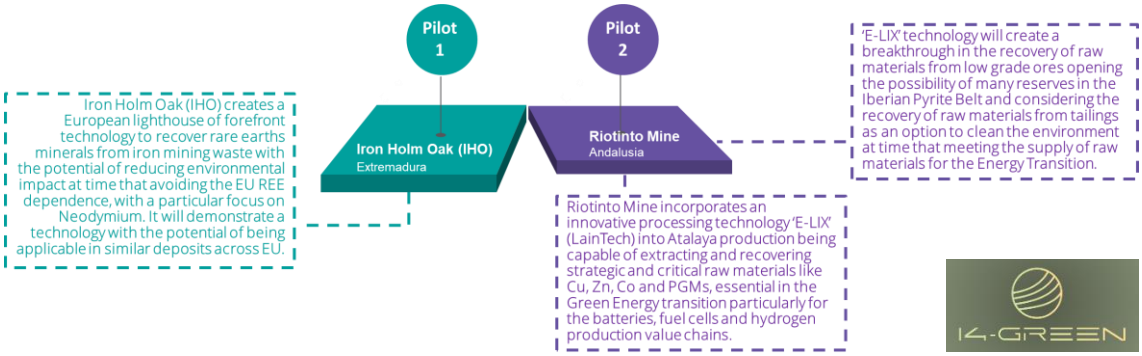


FIGURE 1 - I4-GREEN PILOTS

In parallel, and within the overall I4-GREEN project, several actions were being carried out that are essential and necessary for the success of the final achievement of the entire project, and they were reflected in the scope of cascade funding actions.

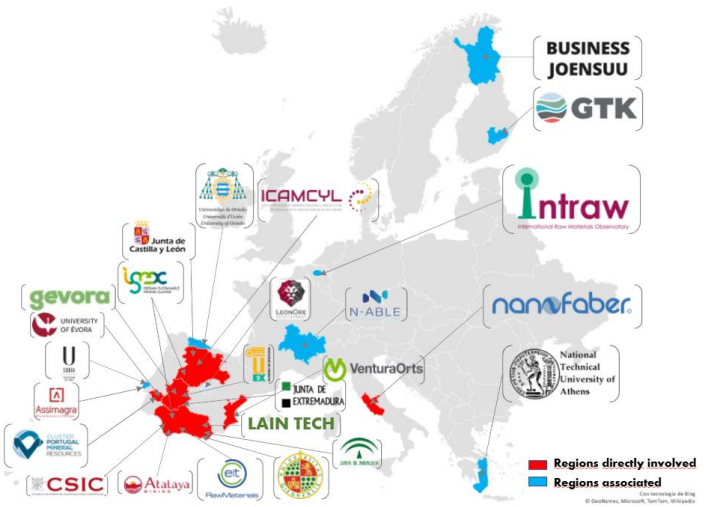
In this development of actions, it was established as a system of cascade funding for SMEs, for the development of innovation projects within the two industrial pilots, with the objective of establishing new interregional and inter-sectoral value chains.

The open and competitive call required SME-driven innovation projects to foster the inclusion of new products, processes and/or technical services in Pilot 1 and Pilot 2 projects.

For this purpose, a budget of 356.265,75 € has been financed, where 12 SMEs received up to 30.000,00 € each to develop innovation projects within the two industrial pilots.

3. CONSORTIUM OVERVIEW

Around these 2 pilots, an interregional system (Figure 2) has grown organically with investors, tech partners, regional governments (which bring their own resources to I4-GREEN), and other enablers were identified and aligned in regional investments to improve green mining.



Partners	Type
ACPMR cluster	Cluster
ISMC Cluster	Cluster
ICAMCYL	NGO
GEVORA	Industry
NANOFABER	Industry
LEONORE	Industry
LAIN TECHNOLOGIES	Industry
ATALAYA MINING	Industry
VENTURA ORTS	Industry
Associated partners	**Type**
UNIVERSITY OF OVIEDO	RTO
INTRAW	NGO
National Technical University of Athens	RTO
GTK Mintek	RTO
Business Joensuu	Industry
University of Jaen	RTO
University of Extremadura	RTO
EIT Raw Materials Andalusia Hub	EU association
CSIC-EIT Raw materials Hub-Andalusia	NGO
ASSIMAGRA	Cluster
University of Evora	RTO
Junta de Castilla y León	Government
University of Lisboa	RTO
N-ABLE	RTO
Junta de Andalusia	Government
Supporting Institutions & Entities	**Type**
Government of Extremadura	Government
Junta de Extremadura	Government
EU Cluster Alliance	Cluster
EIT Raw Materials GmBH	EU association
AMINER	Association
S3P Mining Industry	EU association
S3P Advanced Materials for Batteries	EU association

FIGURE 2 - I4-GREEN ECOSYSTEM

Associated Partners are I4-GREEN supporters, academics, environmental actors, NGOs and general society through local communities.

Supporting Institutions & Entities are policy makers at local, regional and EU levels, and professional networks and platforms, among others, setting the base of mining regions development.

Partners (Figure 3) are I4-GREEN core Agents, mining and raw materials providers & suppliers, mining companies, application enterprises, technological companies dedicated indirectly to raw materials, cross-regional & sectoral organisations, professional platforms.

FIGURE 3 - I4-GREEN PARTNERS

3.1. Management structure

The management structure of I4-GREEN (Figure 4) project has been designed to ensure smooth operability of project activities, provide effective leadership, and promote cooperation between the consortium and external supporters and partners. The final aim is the successful completion of tasks and deliverables, the two pilots and the parallel planned Open Call and support services to SMEs, the two main crucial activities within the project. An effective cooperation between the coordinator and the project officer will also ensure that no major deviations are taking place, corrective measures are being considered and activities are being successfully implemented in compliance with the European Commission standards and rules for I3 projects. Considering the wide range of activities to be implemented, an efficient and effective coordination, decision-making and communication is therefore required.

FIGURE 4 - I4-GREEN MANAGEMENT STRUCTURE

4. WP1 - I4-GREEN MANAGEMENT AND COORDINATION

Leader: ICAMCYL
Contributor: ALL
Timeline: M1-M30

	Leader	Contributors	2024												2025			
			Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
			M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30
WP1 - I4-GREEN Management and Coordination	ICAMCYL	All																	
T1.1 – Contractual and Financial Project coordination	ICAMCYL	All																	
T1.2 – Operational I3 Investment Management	ICAMCYL	All																	
T1.3 – Technical coordination	ICAMCYL	All																	
T1.4 – Close Consortium and I3 ecosystem follow up	ICAMCYL	All																	
T1.5 – Data management and protection	ICAMCYL	All																	
T1.6 – Quality assurance and risk management	ICAMCYL	All																	
T1.7 – Gender dimension and gender balance surveillance	ICAMCYL	All																	

Executed	
Programmed	

FIGURE 5 - WP1 GANTT CHART

Developments (Timeline M24-M30):

At the finishing point of I4-GREEN, all the results in line with the objectives set at the start of the project have been achieved. Throughout this period, the consortium has worked in a collaborative and coordinated way to ensure successful value chain integration, driven by regional innovation ecosystems and supported by effective management and clear leadership.

- Efficient project management, meeting budget, timelines and milestones, and delivering deliverables on schedule.
- Implementation of effective internal procedures and strategic guidance consistent with European Commission requirements and other legal and practical regulations, ensuring the smooth execution of each phase of the project.
- Regular communication channels have been established both within the consortium and with external actors, including key partners, stakeholders, intermediaries and industry initiatives. This interaction has allowed us to strengthen synergies and maintain a constant relationship with the European Commission and other relevant actors, which has been crucial for the success of the project.
- Work towards operational sustainability of the project, addressing potential risks and ensuring quality at every stage. An important milestone was the preparation of the operational structures that allowed to maintain a sustainable network beyond the EU financial support, ensuring the continuity of the impacts generated by I4-GREEN.
- Coordination of the ecosystem created in I4-GREEN with the regional strategic partnerships
- All the partners contributed to ensure a correct management of the project, leaded by ICAMCYL, coordinator of the project.

Through a collaborative approach, strong project management and commitment to sustainability, I4-GREEN has succeeded in establishing a solid foundation for the creation of an innovation network that will contribute to the evolution of key sectors in the region. This project has been an important step towards a greener and more sustainable future, with a lasting impact beyond its life cycle.

Deliverables								
WP	**D**	**Deliverable Name**	**Lead Benef.**	**Diss Level**	**Due date**	**New Due Date**	**Delivery Date**	**Status**
WP1	D1.1	Consortium agreement	ACPMR	SEN	30 Nov 2022	-	02 Dec 2022	Approved
WP1	D1.2	Management Plan and Project Management Handbook	ACPMR	SEN	31 Dec 2022	-	16 Dec 2022	Approved
WP1	D1.3	Shared digital platform	ACPMR	SEN	30 Nov 2022	-	22 Nov 2022	Approved
WP1	D1.4	Quality assurance (Manual) risk management, data management and protection plan	ACPMR	SEN	31 Jan 2023	-	23 Jan 2023	Approved
WP1	D1.5	Public Progress Report M12	ACPMR	PU	31 Oct 2023	-	31 Oct 2023	Approved
WP1	D1.6	Mid-term technical and financial report	ICAMCYL	SEN	31 Mar 2024		18 Jun 2024	Approved
WP1	D1.7	Public Progress Report M24	ICAMCYL	PU	31 Oct 2024	-	31 Oct 2024	Approved
WP1	D1.8	Final technical, financial and I3 Investment Report	ICAMCYL	PU	31 Oct 2024	-	28 Apr 2025	Submitted
WP1	D1.9	Final I3 I4-GREEN Public Report	ICAMCYL	SEN	31 Oct 2024	-	Current report – Apr 2025	Pending

TABLE 1 - WP1 DELIVERABLES (M30)

4.1. T1.1 - Contractual and financial project coordination

Leader: ICAMCYL
Contributor: All
Timeline: M1-M30

Developments (Timeline M24-M30):

Work was monitored to ensure that deliverables, milestones and tasks were taking place on time and accordingly to the Grant Agreement. Effective communication with EC and the project partners was ensured, having progress meetings to check the state of the play in the project. Internal meetings were taking place regularly every six months, but in addition, several meetings were set at demand of the partners and coordinator. The present deliverable D1.9 (Final I3 I4-GREEN Public Report) is summarising the technical progress between M24 and M30.

Task deviations (Timeline M24-M30):

N/A.

4.2. T1.2 - Operational I3 Investment Management

Leader: ICAMCYL

Contributor: All
Timeline: M1-M30

Developments (Timeline M24-M30):

Guidelines defined in the project management handbook, including the quality manual, were followed on the management and quality process of the I4-GREEN project. The use of that guidelines aimed to ensure better collaboration among the project partners. All the project partners followed this handbook to ensure the quality assurance during the whole project and to facilitate the detection and prevention of possible deviations from the work plan.

Task deviations (Timeline M24-M30):

N/A.

4.3. T1.3 - Technical coordination

Leader: ICAMCYL
Contributor: All
Timeline: M1-M30

Developments (Timeline M24- M30):

The project coordinator organised individual and group meetings and performed continuous communication with partners involved in pilot tasks execution (GEVORA, LEONORE, LAIN, ATALAYA), for ensuring a correct involvement in the project, and for ensuring a correct understanding of their duties and responsibilities. In addition, the last consortium meeting (M30) was held in Madrid for the proper monitoring of the project execution with all partners of I4-GREEN.

Task deviations (Timeline M24-M30):

N/A.

4.4. T1.4 - Close Consortium and I3 ecosystem follow up

Leader: ICAMCYL
Contributor: All
Timeline: M1-M30

Developments (Timeline M24- M30):

The last physical meeting was held during the period of this report in Madrid (M30) (Figure 6).

FIGURE 6: FINAL CONSORTIUM MEETING (M30)

Communication flows, activities and their monitoring were jointly established. Moreover, different events took place during this period to integrate the ecosystem into other interregional activities for scaling the interregional impact of I4-GREEN, such as the Results and Impacts Event (M30, Figure 7).

FIGURE 7: AGENDA R&I EVENT IN MADRID (M30)

Task deviations (Timeline M24- M30):

N/A.

4.5. T1.5 - Data management and protection

Leader: ICAMCYL
Contributor: All
Timeline: M1-M30

Developments (Timeline M24- M30):

Monitoring of the Data Management Plan (DMP) covering the full data life cycle and including security measures was conducted to prevent unauthorised access to personal data or the equipment used for processing. For internal purposes, D1.3 (Shared Digital Platform) indications were followed for digital shared space and channels related with I4-GREEN project management, coordination, execution, and internal communication.

Task deviations (Timeline M24- M30):

N/A.

4.6. T1.6 - Quality assurance and risk management

Leader: ICAMCYL
Contributor: All
Timeline: M1-M30

Developments (Timeline M24- M30):

The quality assurance process was launched in M3 (D1.4) and was monitored by the project management team until the end of the project. ICAMCYL reviewed all the deliverables submitted until the end of the project following this quality assurance process.

Task deviations (Timeline M24- M30):

N/A.

4.7. T1.7 - Gender dimension and gender balance surveillance

Leader: ICAMCYL
Contributor: All
Timeline: M1-M30

Developments (Timeline M24- M30):

Equality work-life balance and encourage female team members to lead teams and take responsibility were applied during the entire project duration. Additionally, specific measures to ensure gender balance were applied when appointing external experts forming the Strategic Advisory Board (50% female representation).

Task deviations (Timeline M24- M30):

N/A.

5. WP2 – SME ENGAGEMENT AND INTERREGIONAL INDUSTRIAL ECOSYSTEM CREATION

Leader: ICAMCYL
Contributor: ACPMR, ISMC
Timeline: M1-M30

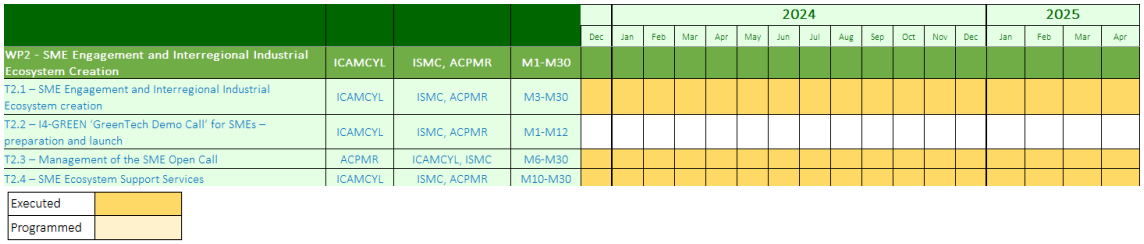


FIGURE 8 – WP2 GANTT CHART

Developments (Timeline M24- M30):

The closure and finalisation of tasks related to SME Engagement and Interregional Industrial Ecosystem Creation were conducted. These included:

- Support and integration of SMEs in the innovation ecosystem.
- Best practices in financial support to SMEs and practical applications.
- Promotion and management of communication between I4-GREEN pilot partners and SMEs.

Deliverables								
WP	**D**	**Deliverable Name**	**Lead Beneficiary**	**Diss Level**	**Due date**	**New Due Date**	**Delivery Date**	**Status**
WP2	D2.1	SME and ecosystem engagement report	ICAMCYL	PU	31 Jan 2023		31 Jan 2023	Approved
WP2	D2.2	Open call package	ACPMR	PU	28 Feb 2023	30 Jun 2023	12 Jul 2023	Approved
WP2	D2.3	Individual, Consensus Evaluation and Integrated Evaluation reports	ICAMCYL	SEN	30 Jun 2023		30 Nov 2023	Approved
WP2	D2.4	SME project follow up Report	ICAMCYL	PU	31 Oct 2023		21 Mar 2024	Approved
WP2	D2.5	SME project final monitoring Report	ICAMCYL	SEN	30 Apr 2024		26 Jul 2024	Approved
WP2	D2.6	Expert Final Services Report	ICAMCYL	SEN	31 Oct 2024		11 Oct 2024	Approved
WP2	D2.7	Implementation of the business investments (open call) belonging to the portfolio including information on the compliance with the 70% company investment rule	ACMPR	SEN	30 Sep 2024		30 Sep 2024	Approved

TABLE 2 – WP2 DELIVERABLES (M30)

5.1. T2.1 – SME Engagement and Interregional Industrial Ecosystem creation

Leader: ICAMCYL
Contributor: ACPMR, ISMC

Timeline: M3-M30

Developments (Timeline M24-M30):

Engagement actions were successfully carried out with ecosystem actors from the technological sector and mining networks across the regions involved (Alentejo, Andalucía, Extremadura, Castilla y León). The identification and description of enablers and stakeholders who could join the I4-GREEN interregional innovation network, as well as those who could facilitate or directly exploit the project results, were fully completed. This process included defining the common structural objectives and action lines that were developed and supported through the implementation of I4-GREEN.

Task deviations (Timeline M24- M30):

N/A.

5.2. T2.2 - I4-GREEN 'GreenTech Demo CALL' for SMEs – preparation and launch

Leader: ICAMCYL
Contributor: ACPMR, ISMC
Timeline: M1-M12

Developments (Timeline NA):

This information was provided in D1.5 (Public Progress Report M12).

Task deviations (Timeline NA):

N/A.

5.3. T2.3 - Management of the SME Open CALL

Leader: ACPMR
Contributor: ISMC, ICAMCYL
Timeline: M6-M30

Developments (Timeline M24- M30):

The 12 SMEs funded completed their works according to their planned schedules and submitted the final reports on time. On the Pilots' side, they carried out the validation of their activities and approved their works and final report. The financial implementation of the I4-GREEN business investment ended with approximately 77% of the total available financial support allocated to investments in SMEs, fostering SMEs growth and innovation, creating and scaling up the I4-GREEN ecosystem.

Task deviations (Timeline M24- M30):

N/A.

5.4. T2.4 - SME Ecosystem Support Services

Leader: ICAMCYL
Contributor: ACPMR, ISMC
Timeline: M10-M30

Developments (Timeline M24- M30):

Different activities (compiled in D2.6) were carried to support SMEs awarded in the I4-GREEN Open Call. ICAMCYL, highlighting the invitation to different innovation and clustering events within I4-GREEN framework, such as the Results and Impact Event (M30).

Task deviations (Timeline M24- M30):

N/A.

6. WP3 – IHO PILOT – DEMONSTRATING COMBINED CIRCULAR PROCESSING FOR RARE EARTH AND IRON ORE

Leader: GEVORA
Contributor: LEONORE, ICAMCYL, NANOFABER, ACPMR, GTK, UNIOVI, ISMC, JDA
Timeline: M1-M30

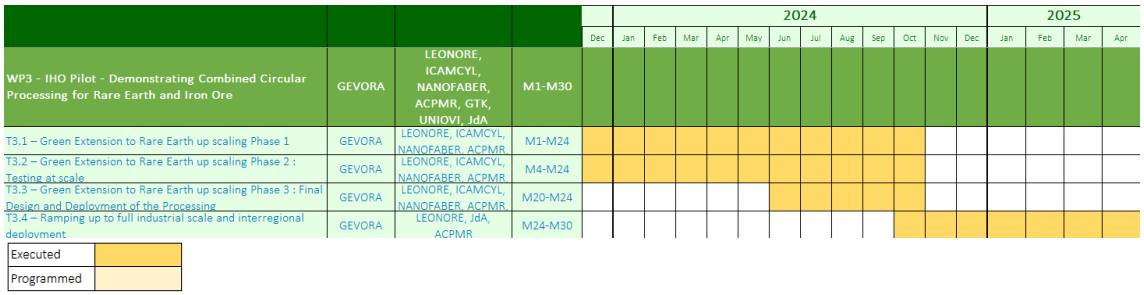


FIGURE 9 – WP3 GANTT CHART

Developments (Timeline M24- M30):

In the last six months of the project, work has focused on finalizing business development for industrial scale-up and modeling the final operational model. Activities included completing T3.3 for process design and conducting CAPEX and OPEX studies for the financial model, exploring financing sources, marketing strategies and updating licenses and permits. Additionally, the environmental, social, and economic impact of the project was assessed. For interregional scaling, a database of iron ore deposits in Andalucía and Alentejo was developed, suitable deposits were selected, and pilot results were presented to European and Latin American stakeholders to foster synergies.

Deliverables								
WP	**D**	**Deliverable Name**	**Lead Beneficiary**	**Diss Level**	**Due date**	**New Due Date**	**Delivery Date**	**Status**

WP3	D3.1	Global report on IHO operation design & extension plan to REE, incl. technology benchmarking, digital models & maps, specialised tests results and preliminary validation for scaling up the pilot.	GEVORA	SEN	31 Oct 2024	-	31 Oct 2024	Approved
WP3	D3.2	Tier 1 & Tier 2 technology report integration into IHO pilot for tech providers focusing on optimisation of IHO plant for REE recovery.	GEVORA	SEN	31 Oct 2024	-	31 Oct 2024	Approved
WP3	D3.3	Innovative water treatment solutions at the IHO pilot.	NANOFABER	SEN	31 Oct 2024	-	29 Oct 2024	Approved
WP3	D3.4	Final delivery of transversal projects implemented and designed to conform the IHO circular approach.	LEONORE	SEN	30 Apr 2025	-	09 Apr 2025	Submitted
WP3	D3.5	Industrialisation plan. Full operation model and pilot deployment report for IHO, including pilot delivery.	GEVORA	SEN	30 Apr 2025	-	07 Apr 2025	Submitted
WP3	D3.6	Interregional mirroring, fertilisation & industrial plan of the project in Extremadura region and beyond.	LEONORE	SEN	30 Apr 2025	-	09 Apr 2025	Submitted

TABLE 3 – WP3 DELIVERABLES (M30)

6.1. T3.1 - Green Extension to Rare Earth up scaling Phase 1

Leader: GEVORA
Contributor: LEONORE, ICAMCYL, NANOFABER, ACPMR
Timeline: M1-M24

Developments (Timeline M1-M24):

N/A for M30. This information was provided in D1.7 (Public Progress Report M24).

Task deviations (Timeline M1-M24):

N/A.

6.2. T3.2 - Green Extension to Rare Earth up scaling Phase 2: Testing at scale

Leader: GEVORA
Contributor: LEONORE, ICAMCYL, NANOFABER, ACPMR
Timeline: M4-M24

Developments (Timeline M4-M24):

N/A for M30. This information was provided in D1.7 (Public Progress Report M24).

Task deviations (Timeline M4-M24):

N/A.

6.3. T3.3 - Green Extension to Rare Earth up scaling Phase 3: Final Design and Deployment of the Processing

Leader: GEVORA
Contributor: LEONORE, ICAMCYL, NANOFABER, ACPMR
Timeline: M20-M24

Developments (Timeline M20-M24):

N/A for M30. This information was provided in D1.7 (Public Progress Report M24).

In addition, activities have been carried out to complement task T3.3, aimed at finalizing the process design:

- Water study.
- Energy and renewable sources study.
- Automation and carbon footprint reduction by introducing conveyors.

Task deviations (Timeline M20-M24):

N/A.

6.4. T3.4 - Ramping up to full industrial scale and interregional deployment

Leader: GEVORA
Contributor: LEONORE, JDA, ACPMR, ISMC
Timeline: M24-M30

Developments (Timeline M24-M30):

The main work carried out in WP3 during this period has focused on activities to complete the business development of the project's industrial scale. In addition, the environmental, social, and economic impact of the IHO pilot project, as well as its potential replication in other Spanish and European regions, has been studied.

Works carried out for business development in industrial scaling:

- Complete CAPEX and OPEX study of the project, including meetings and obtaining quotes from industry representatives such as SANVIC and METSO for process equipment and GRUPO PEAL for mining operation models.
- Development of a project financial model, including financing requirements, NPV, and IRR.
- Events and meetings to attract potential investors to the project, as well as the development of financial tools for its construction and operation.
- Study of marketing and trading tools, including negotiations for the signing of an MOU with CARGILL International Trading for the commercialization of 100% of iron ore production.
- Activation of procedures for updating permits and licenses to scale the activity to the scope proposed for the IHO pilot.

Works carried out for the study of the impact of the pilot:

- Environmental impact: Studies on water use, the incorporation of renewable energy, the disposal of final process tailings, and the automation of operations, processes, and logistics to reduce the carbon footprint by introducing innovative techniques.

- Social impact: Study of the main economic activities in the area, population, available labour force, qualifications, and inclusion of women in the sector.
- Economic impact: Study of local suppliers, infrastructure to be developed, jobs created, and possible replication in other nearby mineral deposits.

Works carried out for the study of the potential replication in other Spanish and European regions:

- Developing a database of similar iron ore deposits in adjacent regions (Andalucía and Alentejo).
- Selecting deposits with appropriate characteristics to apply the methodology developed in the IHO pilot.
- Presenting the results of the IHO pilot in bilateral and multilateral meetings with other European and Latin American mineral deposits in search of technical and business synergies.

Task deviations (Timeline M24-M30):

N/A.

7. WP4 – ATALAYA-E-LIX PILOT – SCALING UP THE HYDROMETALLURGICAL LEACHING OF PRIMARY SULPHIDE MINERALS TO A SUSTAINABLE RECOVERY OF METALS ESSENTIAL FOR THE GREEN TRANSITION

Leader: LAINTECH
Contributor: ATALAYA, JDA, ACPMR
Timeline: M1-M30

				2024												2025			
				Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
WP4 - Atalaya-E-LIX Pilot – Scaling up the hydrometallurgical leaching of primary sulphide minerals to a sustainable recovery of metals essential for the green transition	LAIN	ATALAYA, ACPMR, JdA	M1-M30																
T4.1 – Commissioning and first testing round	LAIN	ATALAYA	M9-M12																
T4.2 – Scaling-up operation and optimization including the extension towards different strategic materials	LAIN	ATALAYA	M12-M30																
T4.3 – Implementing innovative water treatment and remediation technologies in Atalaya's circular lighthouse	NANOFABER	ATALAYA	M6-M30																
T4.4 - Environmental & construction permitting	LAIN	ATALAYA, JdA	M1-M9																
T4.5 – Ramp-up	LAIN	ATALAYA, ACPMR, JdA	M9-M30																
T4.6 – Innovative gas suppression & scrubber system for the metals electrowinning area	VENTURA	LAIN, ATALAYA	M23-M30																
Executed																			
Programmed																			

FIGURE 10 - WP4 GANTT CHART

Developments (Timeline M24- M30):

During these months, the team involved in the WP was working on running the full plant on maximum capacity in order validate the design criteria (CAPEX, OPEX, metal recoveries, plant availability, etc.) and the plant commissioning was continued.

The hidromet plant has been stabilised in the end of this task which has allowed to extend the technology to new mineralogies through the Iberian Pyrite Belt and overseas.

Deliverables								
WP	**D**	**Deliverable Name**	**Lead Beneficiary**	**Diss Level**	**Due date**	**New Due Date**	**Delivery Date**	**Status**
WP4	D4.1	Contracts and technical plans, including Service contracts, EPCM (Tech) package contract signed.	LAIN	SEN	30 Nov 2022		02 Dec 2022	Approved
WP4	D4.2	Plant operational benchmark and optimisation adjustment for different raw materials and operation modes.	LAIN	SEN	31 Oct 2024	31 Dec 2025	17 Dec 2024	Approved
WP4	D4.3	Innovative water treatment solutions at the Atalaya pilot.	NANOFABER	SEN	31 Oct 2024		29 Oct 2024	Approved
WP4	D4.4	Full plant commissioning in Atalaya premises and plant operation kick-off with final EPCM report.	ATALAYA	SEN	30 Apr 2025		03 Apr 2025	Submitted
WP4	D4.5	Final public report including ecosystem extension assessment.	LAIN	PU	30 Apr 2025		03 Apr 2025	Submitted
WP4	D4.6	Report on the processes of installation of a gas suppression & scrubber system	VENTURA ORTS	SEN	30 Apr 2025		03 Apr 2025	Submitted

TABLE 4 - WP4 DELIVERABLES (M30)

7.1. T4.1 - Commissioning and first testing round

Leader: LAINTECH
Contributor: ATALAYA
Timeline: M9-12

Developments (Timeline NA):

N/A. This information was provided in D1.6 (Public Progress Report M12).

Task deviations (Timeline NA):

N/A.

7.2. T4.2 - Scaling-up operation and optimization including the extension towards different strategic materials

Leader: LAINTECH
Contributor: ATALAYA
Timeline: M12-M30

Developments (Timeline M24- M30):

The scaling-up operation and plant optimisation have by M30 come to an end. The plant ramp-up was successfully completed, and the process flowsheets were fully commissioned. Throughout continuous operation, numerous issues related to plant design, operations, and maintenance were identified and addressed, leading to significant improvements. The pilot team was nearly 100% recruited and trained while

the plant was in operation. The control philosophy was implemented across most of the operating processes, enhancing overall plant performance.

The first copper metal was produced, and the team involved in the task continued progressing along the learning curve. Continuous improvement was applied from day one of commissioning, and the modular nature of the plant's flowsheet and design allowed for improvements to be implemented progressively. As commissioning advanced, process optimisations were applied to the uncommissioned sections of the plant as well.

The commissioning process has played a crucial role in supporting ongoing operational improvements, ensuring the plant is moving forward on the learning curve and will reach nameplate production levels more quickly and safely.

Task deviations (Timeline M24- M30):

N/A.

7.3. T4.3 - Implementing innovative water treatment and remediation technologies in ATALAYA's circular lighthouse

Leader: NANOFABER
Contributor: ATALAYA
Timeline: M6-M30

Developments (Timeline M24- M30):

All activities were designed, and prototypical electrospun membranes were produced to assess their feasibility for operating under a wide range of pressures. More detailed information can be found in D1.7 (Public Progress Report M24).

Task deviations (Timeline M24- M30):

N/A.

7.4. T4.4 - Environmental & construction permitting

Leader: LAINTECH
Contributor: ATALAYA, JDA
Timeline: M1-M9

Developments (Timeline NA):

N/A. This information was provided in D1.6 (Public Progress Report M12).

Task deviations (Timeline NA):

N/A.

7.5. T4.5 - Ramp-up

Leader: LAINTECH
Contributor: ATALAYA, JDA, ACPMR
Timeline: M9-M30

Developments (Timeline M24- M30):

Project ramp-up ended after the pre-commissioning, cold and hot commissioning.

During the ramp-up LAIN experienced a significant growth in term of indirect employees (up to 72 currently), in addition to increase the operational capacity of the plant (operating 24 hours, 7 days per week).

JDA and ACPMR supported the study of applicability of sustainable resources in the South of Europe towards the Green transition (info available int the D4.5).

Task deviations (Timeline M24- M30):

N/A.

7.1. T4.6 - Innovative gas suppression & scrubber system for the metals electrowinning area

Leader: VENTURA
Contributor: LAIN, ATALAYA
Timeline: M23-M30

Developments (Timeline M24- M30):

Final works were carried out on the study of the optimisation of the suction in the E-LIX electrolysis line as well as on the implementation of improvements in the electrolysis tanks.

Task deviations (Timeline M24- M30):

N/A.

8. WP5 - INTERREGIONAL ECOSYSTEM INTEGRATION FOR CIRCULAR AND SUSTAINABLE TECH DEPLOYMENT

Leader: ISMC
Contributor: All
Timeline: M1-M30

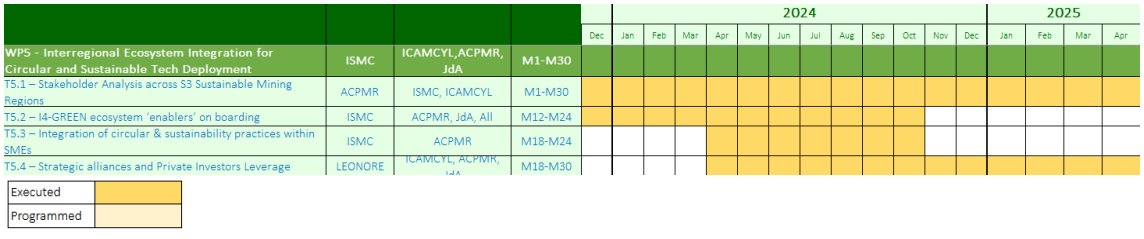


FIGURE 11 - WP5 GANTT CHART

Developments (Timeline M24-M30):

In the final phase of the project, WP5 consolidated the integration of circular and sustainable innovation across the interregional mining ecosystem. Key efforts included finalising and expanding the stakeholder database, deepening collaboration with

ecosystem actors, and translating previously collected knowledge into tools and practices accessible to SMEs.

Over the last six months, significant progress has been made in expanding the ecosystem through engagement events and integrating circular models into SME operations. Strategic efforts have also focused on connecting public and private investors to strengthen the long-term impact and continuity of the initiative. These actions reinforced the positioning of I4-GREEN within the European green transition and raw materials value chain.

Deliverables								
WP	**D**	**Deliverable Name**	**Lead Beneficiary**	**Diss Level**	**Due date**	**New Due Date (if delay)**	**Delivery Date**	**Status**
WP5	D5.1	Stakeholder database and Map of 'Enablers'.	ACPMR	SEN	31 Oct 2024		31 Oct 2024	Approved
WP5	D5.2	Review of sustainable practices	ISMC	PU	31 Oct 2024		11 Oct 2024	Approved
WP5	D5.3	SME Guide on transition support instruments.	ISMC	PU	31 Oct 2024		17 Oct 2024	Approved
WP5	D5.4	Emulation sessions Sustainable Practice Exchange Platform Report	ISMC	SEN	31 Oct 2024		31 Oct 2024	Approved
WP5	D5.5	Enablers and investors engagement Report.	LEONORE	SEN	30 Apr 2025		28 Apr 2025	Submitted
WP5	D5.6	Assessment of the market readiness (innovation radar)	ACPMR	SEN	30 Apr 2025		28 Apr 2025	Submitted

TABLE 5 – WP5 DELIVERABLES (M30)

8.1. T5.1 - Stakeholder Analysis across S3 Sustainable Mining Regions

Leader: ACPMR
Contributor: ISMC, ICAMCYL
Timeline: M1-M30

Developments (Timeline M24-M30):

Stakeholders database was defined by ACPMR with the support of ISMC and ICAMCYL, and included in M24 for D5.1. This database incorporated companies, studies and generation organizations (RTOs), universities and research centres, technology providers, policymakers at regional, national, and EU levels, investors, generation systems, intermediaries together with clusters, agencies, and tech parks, in addition to networks and partnerships which included S3P partnerships (e.g. S3P industry - EU mining regions) and the Advanced Materials for Batteries Partnership (S3P industry - AMBP). This information was of great value in reaching out to more contacts in dissemination and communication tasks.

Task deviations (Timeline M24- M30):

N/A.

8.2. T5.2 - I4-GREEN ecosystem 'enablers' on boarding

Leader: ISMC
Contributor: ACPMR, JDA, All
Timeline: M12-M24

Developments (Timeline M24-M24):

This information was provided in D1.7 (Public Progress Report M24).

Task deviations (Timeline M24-M24):

N/A.

8.3. T5.3 - Integration of circular & sustainability practices within SMEs

Leader: ISMC
Contributor: ACPMR
Timeline: M18-M24

Developments (Timeline M24-M24):

This information was provided in D1.7 (Public Progress Report M24).

Task deviations (Timeline M24-M24):

N/A.

8.4. T5.4 - Strategic Alliances and Private Investors Leverage

Leader: LEONORE
Contributor: ICAMCYL, ACPMR, JDA, ISMC
Timeline: M18-M30

Developments (Timeline M24-M30):

Led by LEONORE, with the support of ICAMCYL, ACPMR, ISMC and JDA, this task, leveraged the company's contacts and its presidency of the Madrid Mining Club to implement alliances and map further strategic collaborations (including investors) for the I4-GREEN ecosystem. The last working sessions for EU funding raising opportunities and investment (organised by ISMC) took place in Madrid (April 2025) aligned with the last investors breakfast (organised by LEONORE).

Task deviations (Timeline M24-M30):

N/A.

9. WP6 - INTERREGIONAL DEPLOYMENT AND REPLICATION TO FULL EU SCALE

Leader: ICAMCYL
Contributor: ISMC, ACPMR, JDA
Timeline: M1-M30

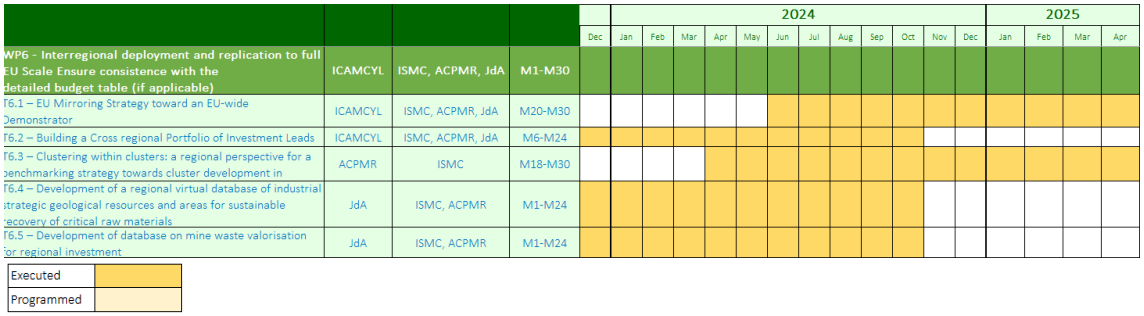


FIGURE 12 - WP6 GANTT CHART

Developments (Timeline M24-M30):

At the conclusion of the I4-GREEN project, efforts were successfully made to build a cross-regional portfolio of investments, alongside an extensive research into the most up-to-date information on the geology and mineral deposits of the target areas. Additionally, joint strategic intelligence was developed, and coordinated actions, such as the cross-cluster action plan and mine waste valorisation database, were established to support and guide future sustainable mining investments within the partner regions.

Deliverables								
WP	**D**	**Deliverable Name**	**Lead Beneficiary**	**Diss level**	**Due date**	**New Due Date**	**Delivery Date**	**Status**
WP6	D6.1	Mirroring Strategy.	ICAMCYL	PU	30 Apr 2025		09 Apr 2025	Submitted
WP6	D6.2	Pilots Action Plan & Portfolio of Investment Leads	ICAMCYL	PU	30 Apr 2024		28 Jun 2024	Approved
WP6	D6.3	Report Benchmarking & clustering.	ACPMR	PU	30 Apr 2025		29 Apr 2025	Submitted
WP6	D6.4	Priority Sector Report.	ACPMR	PU	30 Apr 2025		09 Apr 2025	Submitted
WP6	D6.5	Regional database of industrial strategic geological resources and areas for sustainable recovery of critical raw materials	JdA-SGIM	PU	31 Oct 2024		31 Oct 2024	Approved
WP6	D6.6	State of the art study on mine waste valorisation technologies	ISMC	PU	31 Oct 2024		11 Oct 2024	Approved
WP6	D6.7	Mine waste Database and Report on interregional mine sites	JdA-SGIM	PU	31 Oct 2024	31 Jan 2025	15 Jan 2025	Approved

WP6	D6.8	List of remaining bottlenecks resulting from the pilot sites demonstrations applicable to EU level	GEVORA	SEN	30 Apr 2025		09 Apr 2025	Submitted

TABLE 6 - WP4 DELIVERABLES (M30)

9.1. T6.1 - EU Mirroring Strategy toward an EU-wide Demonstrator

Leader: ICAMCYL
Contributor: ISMC, ACPMR, JDA
Timeline: M20-M30

Developments (Timeline M24-M30):

Led by ICAMCYL and with the support of ACPMR, ISMC and JDA, a Mirroring Strategy between EU regions with similar RIS3 profiles and strategies (Mirror Regions) was set up. I included all information regarding raw metals-rich regions: Alentejo, Extremadura, Castilla y León and Andalucía. This information was compiled in D6.1 Mirroring Strategy (M30).

Moreover, with the support of pilot leaders, possible remaining bottlenecks related with the I4-GREEN pilots or in other similar EU projects were defined. This information was gathered in D6.8 List of remaining bottlenecks resulting from the pilot sites demonstrations applicable to EU level (M30).

Task deviations (Timeline M24- M30):

N/A.

9.2. T6.2 - Building a Cross regional Portfolio of Investment

Leader: ICAMCYL
Contributor: ISMC, ACPMR, JDA
Timeline: M6-M24

Developments (Timeline 24-M24):

This information was provided in D1.7 (Public Progress Report M24).

Task deviations (Timeline M24-M24):

N/A.

9.3. T6.3 - Clustering within clusters: a regional perspective for a benchmarking strategy towards cluster development

Leader: ACPMR
Contributor: ISMC
Timeline: M18-M30

Developments (Timeline M24- M30):

The last clustering Workshops between I4-GREEN clusters and other relevant regional clusters were carried out to identify joint cluster collaboration actions, such as: cluster

innovation and international deployment, strategic analysis, regional ecosystem benchmarking, cluster partnerships in Europe and beyond.

D6.3 (Report Benchmarking & Clustering) provides an analysis of benchmarking and clustering activities undertaken within the I4-GREEN project (M30). Also, D6.4 (Priority Sector Report) provides a strategic analysis of the raw materials sector across four core regions involved in the I4-GREEN project (M30).

Task deviations (Timeline M24- M30):

N/A.

9.4. T6.4 - Development of a regional virtual database of industrial strategic geological resources and areas for sustainable recovery of critical raw materials

Leader: JDA
Contributor: ISMC, ACPMR
Timeline: M1-M24

Developments (Timeline M24-M24):

This information was provided in D1.7 (Public Progress Report M24).

Task deviations (Timeline M24-M24):

N/A.

9.5. T6.5 - Development of database on mine waste valorisation for regional investment

Leader: JDA
Contributor: ISMC, ACPMR
Timeline: M1-M24

Developments (Timeline M24-M24):

This information was provided in D1.7 (Public Progress Report M24).

Task deviations (Timeline M24-M24):

N/A.

10. WP7 - COMMUNICATION AND DISSEMINATION

Leader: ISMC
Contributor: All
Timeline: M1-M30

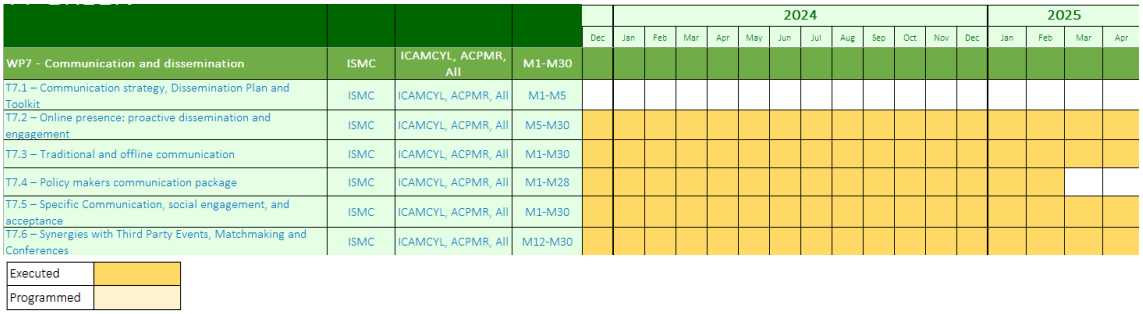


FIGURE 13 - WP7 GANTT CHART

Developments (Timeline M24- M30):

During the last six months, the communication activities reached full operational maturity and focused on consolidating the project's legacy. The final newsletter and sixth press release were published in April 2025 to mark the end of the project and highlighted the cross-cutting results of the pilot actions.

Importantly, the project website will remain active after the end of the project, serving as a long-term repository for project results, news and dissemination materials. This will ensure continued accessibility to stakeholders and the wider public.

Strategic participation in key sectoral events, such as Raw Materials Week (Brussels, Dec 2024) and MMH (Seville Oct 2024), increased the visibility of the project to industry and policy audiences. Offline engagement included dissemination of the policy brief and sustained outreach to local communities and ecosystem actors, complementing WP5 activities and the wider stakeholder engagement strategy.

WP7 successfully established a sustainable communication infrastructure and positioned I4-GREEN as a visible and credible voice within the European raw materials and green transition ecosystem and beyond.

Deliverables								
WP	**D**	**Deliverable Name**	**Lead Beneficiary**	**Diss Level**	**Due date**	**New Due Date**	**Delivery Date**	**Status**
WP7	D7.1	Communication strategy and Dissemination Plan.	ISMC	SEN	31 Mar 2023		28 Jun 2023	Approved
WP7	D7.2	Communication Toolkit: Final Logo, Branded Portal (website), Social Media Pages, YouTube Channel.	ISMC	PU	31 Mar 2023		31 Mar 2023	Approved
WP7	D7.3	e-Newsletters.	ISMC	PU	31 Aug 2023		30 Aug 2023	Approved

WP7	D7.4	Promotional Videos.	ACPMR	PU	31 Aug 2023		24 Aug 2023	Approved
WP7	D7.5	Press releases	ISMC	SEN	30 Apr 2024		29 Apr 2024	Approved
WP7	D7.6	Policy Brief	ICAMCYL	PU	28 Feb 2025		16 Jan 2025	Submitted
WP7	D7.7	Final Report on Communication and Dissemination	ISMC	PU	30 Apr 2025		30 Apr 2025	Submitted

TABLE 7 - WP7 DELIVERABLES (M30)

10.1. T7.1 - Communication strategy, Dissemination Plan and Toolkit

Leader: ISMC
Contributor: ICAMCYL, ACPMR, All
Timeline: M1-M5

Developments (Timeline NA):

This information was provided in D1.7 (Public Progress Report M24).

Task deviations (Timeline NA):

N/A.

10.2. T7.2 - Online presence: proactive dissemination and engagement

Leader: ISMC
Contributor: ICAMCYL, ACPMR, All
Timeline: M5-M30

Developments (Timeline M24- M30):

The project website (Figure 14) was managed by ISMC to ensure the effective promotion of the project's objectives, including news related to the raw materials and mining sectors, activities, partners, public documents, videos, and other communication and dissemination materials. Contributions from all consortium members were essential to keep the website content relevant and up to date. Towards the end of the project, new elements were introduced to highlight the publication of pilot results: a catchy summary was added to the homepage to boost visibility, with direct links to individual pilot pages outlining the most significant outcomes.

Website address: www.i3-i4green.eu

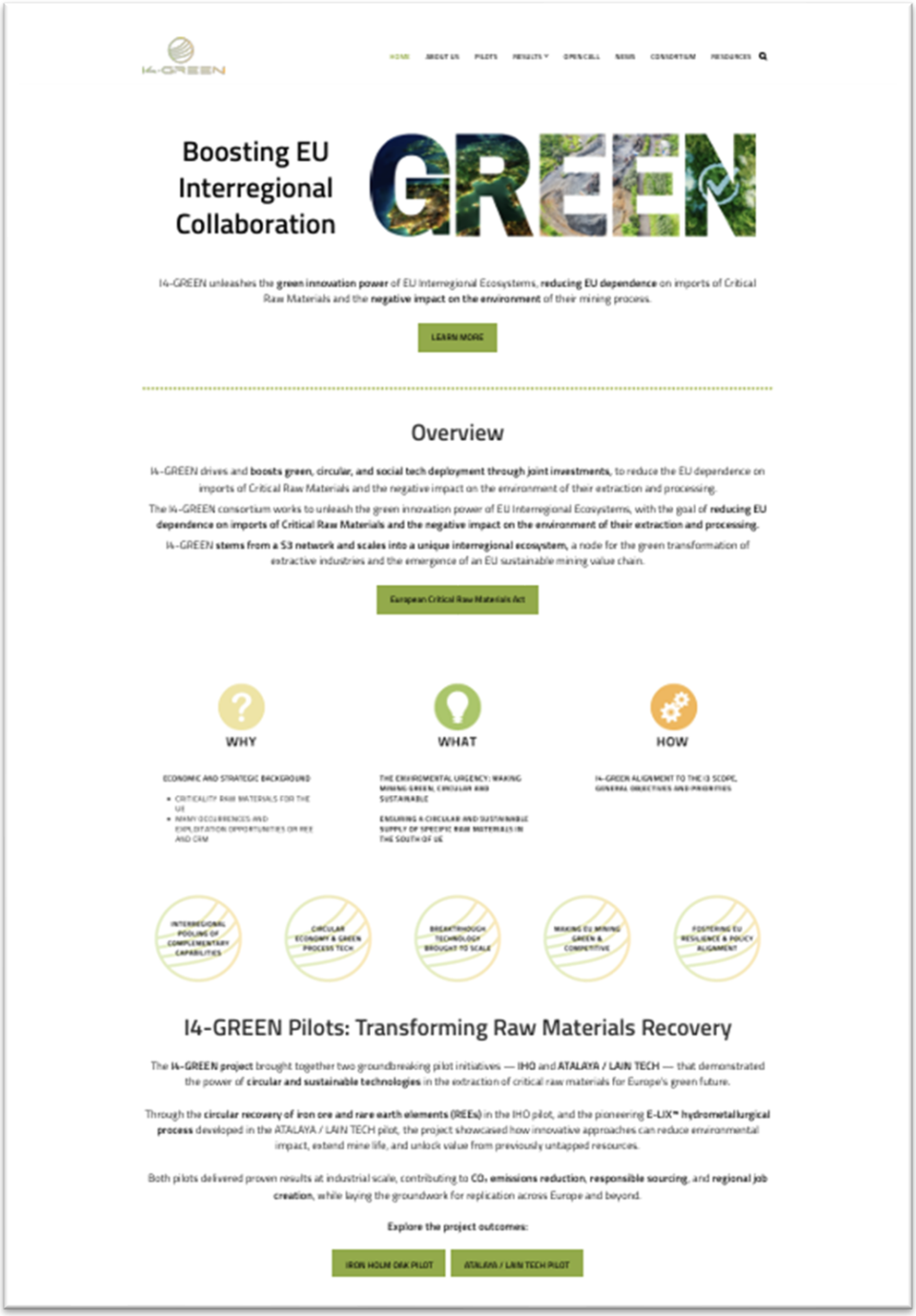


FIGURE 14 - I4-GREEN WEBSITE (WWW.I3-I4GREEN.EU)

A new "Results" section was also added to the main menu, featuring a dropdown with dedicated pages for each pilot (Figures 15-16).

FIGURE 15 - I4-GREEN IHO PILOT RESULTS (WWW.I3-I4GREEN.EU/IRON-HOLM-OAK-PILOT-OUTCOMES)

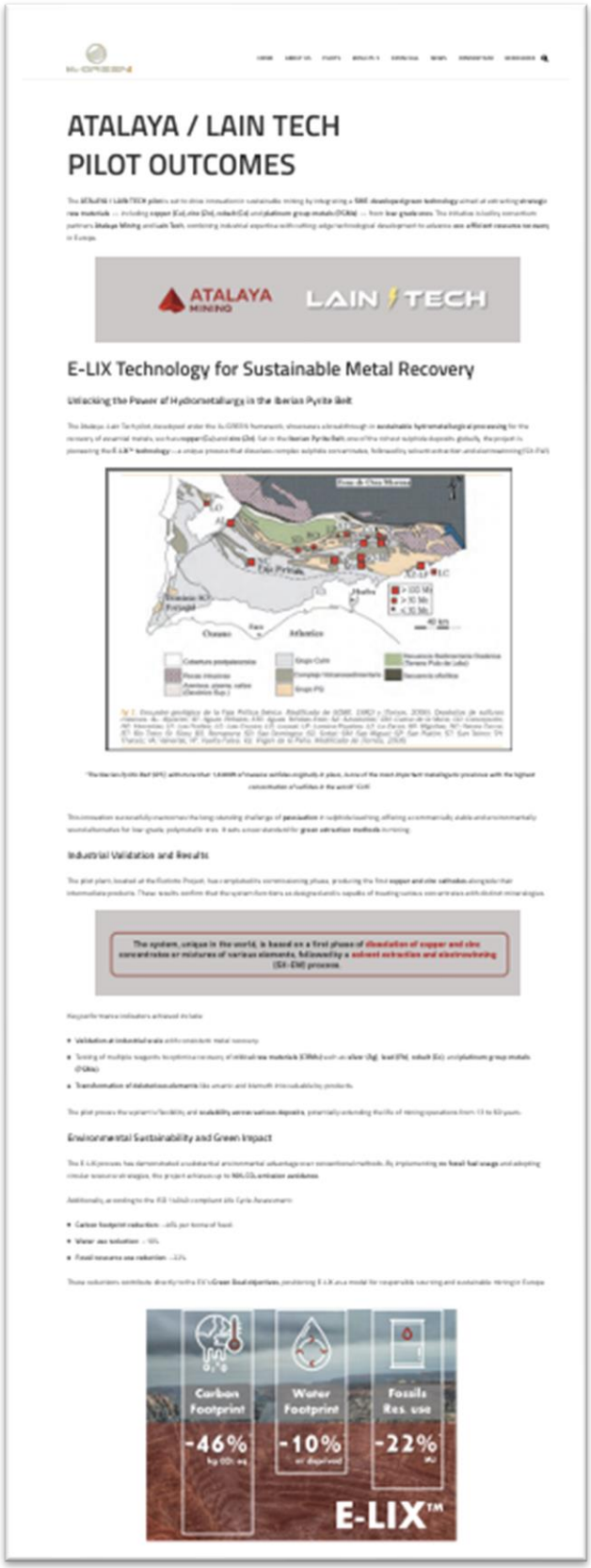


FIGURE 156 - I4-GREEN ELIX PILOT RESULTS (WWW.I3-I4GREEN.EU/ATALAYA-LAIN-TECH-PILOT-OUTCOMES)

Alongside the website, LinkedIn remained the main social media channel used to promote project activities, particularly those related to the ecosystem-building events under WP5-6, as outlined in the Communication Strategy and Dissemination Plan.

The event with the highest audience and engagement on LinkedIn was the participation of the Regional Government of Andalucía in the Raw Materials Week held in Brussels in December. This post achieved an exceptional engagement rate of 33.1%, significantly above LinkedIn's average of 1–3% for organic content. This outstanding performance not only highlights the relevance and timeliness of the topic within the professional community but also demonstrates the effectiveness of the communication strategy in amplifying project visibility and stakeholder interest.

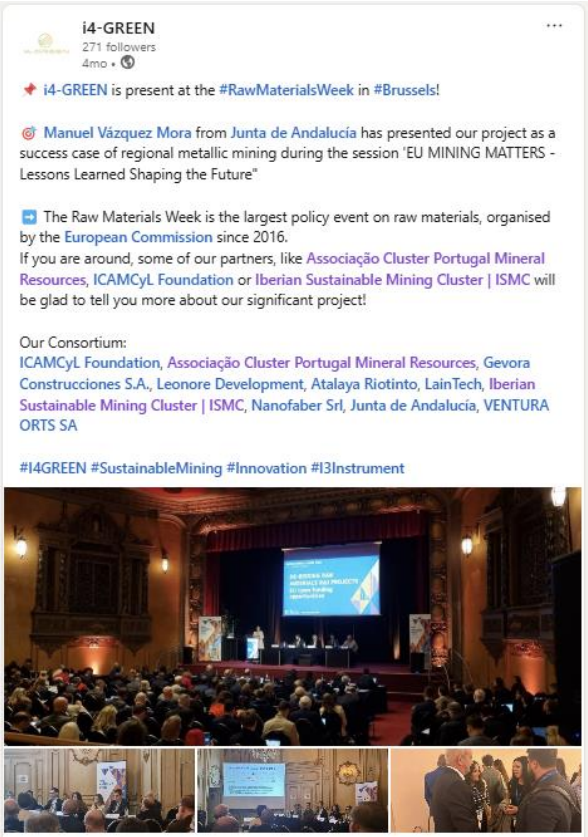


FIGURE 17 - I4-GREEN LINKEDIN PROFILE

Task deviations (Timeline M24- M30):

N/A.

10.3. T7.3 - Traditional and offline communication

Leader: ISMC
Contributor: ICAMCYL, ACPMR, All
Timeline: M1-M30

Developments (Timeline M24- M30):

The 3rd newsletter will be published at the end of the project (M30) and will include updated project results and conclusions, amongst other project-related news.

Moreover, 7 press releases were published until M30 of the project including during this period the RM Strategic Breakfast (M30) and the closing of the project (M30).

Additionally, the Resources section was updated to include the latest press releases issued by the project and the deliverables that have already been approved and made publicly available. (Resources Tab).

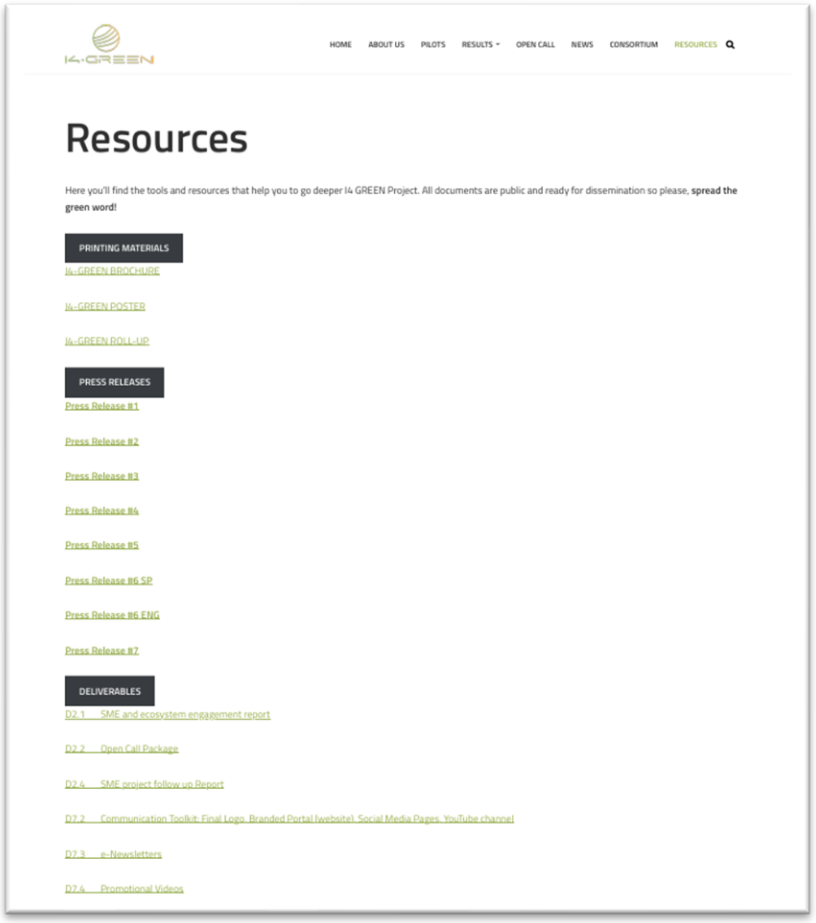


FIGURE 18: RESOURCES SECTION IN I4-GREEN WEBSITE

Other external news were promoted I4-GREEN Project such as: newspaper, blogs, etc.

FIGURE 19: EXTERNAL NEWS OF I4-GREEN

Task deviations (Timeline M24- M30):

N/A.

10.4. T7.4 - Policy makers communication package

Leader: ISMC
Contributor: ICAMCYL, ACPMR, All
Timeline: M1-M28

Developments (Timeline M24-M28):

Common advances were performed for T7.4 and T7.5 starting the project engagement with specific audiences, throughout the participation in different relevant events for industry, investors and policy makers. Examples of that events during this period are:

- Raw Materials WEEK (Brussels, Dec 2024)
- Strategic Breakfast in Raw Materials and Funding Opportunities (Madrid, April 2025), linked to this task developments for reinforcing the ecosystem activities.

Task deviations (Timeline M24-M28):

N/A.

10.5. T7.5 - Specific Communication, social engagement, and acceptance

Leader: ISMC
Contributor: ICAMCYL, ACPMR, All
Timeline: M1- M30

Developments (Timeline M24- M30):

In the final six months of the project, communication and social engagement efforts under Task 7.5 focused on reinforcing public awareness and acceptance of sustainable mining practices. Particular impact was observed at the local level, where pilot

activities and partner-led outreach fostered social engagement and contributed to shaping a more positive public perception. Messaging around the environmental and economic value of greener raw materials value chains was refined and aligned during the final consortium meeting, ensuring coherence across dissemination materials and events.

Task deviations (Timeline M24- M30):

N/A.

10.6. T7.6 - Synergies with Third Party Events, Matchmaking and Conferences

Leader: ISMC
Contributor: ICAMCYL, ACPMR, All
Timeline: M12-M30

Developments (Timeline M24- M30):

In addition to social media, website updates, newsletters, and press releases, broader communication efforts included the presentation of project goals and outcomes at third-party events such as matchmaking sessions and conferences.

Notably, the project was featured during Raw Materials Week in Brussels (December 2024), with the participation of the Regional Government of Andalucía (JdA) a key highlight in the project's outreach efforts. The event gathered over 1.400 participants from industry, government, civil society, research, and academia. Additionally, the Strategic Breakfast on Raw Materials and Funding Opportunities (April 2025) brought together over 50 key stakeholders, reinforcing the project's visibility within the European raw materials ecosystem.

In the final six months of the project, I4-GREEN was also presented at the TERRAVISION workshop (January 2025), which focused on cooperation between the mining industry and regional governments. A final public dissemination session held in Madrid showcased pilot results and key project impacts to a broad audience, strengthening the outreach achieved in the closing phase (April 2025).

Task deviations (Timeline M24- M30):

N/A

11. CONCLUSIONS

I4-GREEN has come to an end addressing different key dimensions of sustainable interregional innovation investments that were identified for the proposal stage:

- ✓ Reviving the ecosystems that are (often hardly) touched by the deindustrialization. This has been achieved thanks to the work carried out by pilot leaders in WP3 and WP4, established in Andalucia (E-LIX project) and Extremadura (IHO pilot) regions. I4-GREEN has made possible the socio-economic revitalization in these regions deeply affected by the decline of traditional industries. By introducing cutting-edge, sustainable mining technologies, both initiatives have generated local employment and reduced environmental impact, reactivating regional ecosystems, creating new value chains and opportunities in these areas.
- ✓ Establishing a unique interregional ecosystem, a node for the green transformation of extractive industries and the emergence of an EU sustainable mining value chain. WP5 played a pivotal role by consolidating circular and sustainable innovation across the ecosystem, strengthening collaboration with key actors, and ensuring the accessibility of tools and practices for SMEs. Through targeted stakeholder engagement, expanded databases, and strategic investor connections, the project deepened its long-term impact. These efforts solidified I4-GREEN's role as a catalyst within Europe's green transition and sustainable raw materials strategy.
- ✓ Generating a concept for forefront sustainable and environmentally friendly processing recovery technologies and of low environmental impact. The project has made significant strides in validating cutting-edge solutions that combine environmental responsibility with industrial scalability (WP3 and WP4). The IHO pilot successfully demonstrated circular technologies for the recovery of iron and rare earth elements (REEs), leading to a 20% reduction in operational costs, substantial job creation, and a 30% decrease in CO2 emissions through innovations like closed water loops and mining waste recycling. Meanwhile, the E-LIX project showcased a pioneering hydrometallurgical process for extracting metals such as copper and zinc from primary sulphides, achieving a 90% reduction in CO2 emissions and generating green hydrogen as a valuable by-product, with strong economic and social impacts, particularly in Andalucía. Therefore, both pilots serve as powerful examples of sustainable processing technologies with high replicability across the EU's mining sector.
- ✓ Unleashing the green innovation power of EU interregional Ecosystems and fostering the green transition of other EU regions facing similar challenges in mining/extractive industry. I4-GREEN highlights the strong replicability potential of the E-LIX and IHO technologies across diverse mineral contexts (WP6). E-LIX, with its innovative hydrometallurgical approach, presents promising applications beyond copper and zinc, extending to metals such as silver, lead, and platinum. Likewise, both E-LIX and IHO technologies offer adaptable solutions for other European mineral deposits and projects with similar environmental and economic challenges. This adaptability underscores the role of interregional collaboration in accelerating the green transition of

mining sectors across the EU, paving the way for broader adoption of sustainable and circular processing models.

- ✓ Turning mining green, circular and social through joint innovation investments for the green and circular extraction and the processing of raw materials
  I4-GREEN is a great example on how collaborative innovation can transform the mining sector (WP5, WP6). Through these pilots, significant advancements have been achieved in circular processing, environmental sustainability, and social impact. These joint investments have enabled the recovery of critical raw materials, setting a benchmark for a more inclusive, green, and circular future for Europe's raw materials industry.
- ✓ Re-evaluating of mining dumps and wastes. Within the project, the main waste deposits in the I4-GREENregions in Portugal (Alentejo) and Spain (Andalucía, Castilla y León, and Extremadura) were studied (WP6) aiming to support sustainable mining practices while unlocking economic potential from mining wastes, aligning with EU directives and regional investment strategies.
- ✓ Mirroring possibilities and continuation of the alliances created within the ecosystem. I4-GREEN aims for a long-term impact thanks to the network of strong partnerships between industries, research centres, administrations and local communities that has been created. These collaborations allow the results obtained to be easily adaptable and replicable in other geographical contexts and industrial sectors, significantly extending the scope of the project beyond its initial objectives. Thus, I4-GREEN becomes a catalyst for sustainable transformation on a European and international scale.