D11.3 Clustering and stakeholder's engagement

Acronym:
NEO-CYCLE

Project Title:
Upcycling of NdFeB magnets in the EU for green applications

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DISCLAIMER

The NEO-CYCLE project received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No 101138058.

ABBREVIATIONS

CE	Circular Economy
CORDIS	Community Research and Development Information Service (EU projects database)
CRM	Critical Raw Materials
CRMA	Critical Raw Materials Act
DPP	Digital Product Passport
EC	European Commission
ECOCastulum	NEO-CYCLE consortium partner (acronym used in project)
EIT	European Institute of Innovation and Technology

EIT RawMaterials	EIT Knowledge and Innovation Community for raw materials
EU	European Union
EURAW	European Raw Materials Clustering Event
ExpSKILLS	EU-funded project initiative (acronym used in deliverable)
GA	Grant Agreement
HDD	Hard Disk Drive
HE	Horizon Europe
H2020	Horizon 2020
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
LCC	Life Cycle Costing
NdFeB	Neodymium-Iron-Boron (magnet alloy)
NGO	Non-governmental organisation
REE	Rare Earth Elements
RMIS	Raw Materials Information System
SENE	Selective electrochemical neodymium extraction
SME	Small and medium-sized enterprise
SSC	Solid-state chlorination
TRL	Technology Readiness Level
TRL6	Technology Readiness Level 6
WEEE	Waste Electrical and Electronic Equipment
WP	Work Package

TABLE OF CONTENTS:

EXECUTIVE SUMMARY

This deliverable (D11.3) presents NEO-CYCLE's clustering and stakeholder engagement approach, designed to accelerate knowledge exchange, avoid duplication of efforts across EU initiatives, and strengthen uptake pathways for circular-economy solutions in the Critical Raw Materials (CRM).

Building on a structured mapping of sister projects and a project-driven stakeholder classification workflow, the deliverable defines how NEO-CYCLE selects, prioritises, and engages external actors across the CRM value chain.

It reports the first implementation milestone (the Seville hybrid stakeholder workshop) and provides an auditable roadmap for 2026–2028 to translate initial contacts into sustained cooperation, including technical cross-fertilisation, policy alignment, and stakeholder validation of evidence packages (e.g., traceability and Digital Product Passport requirements).

1. Introduction

The transition towards a circular economy for Critical Raw Materials (CRMs) is a pivotal objective for the European Union's industrial strategy, driven by the Critical Raw Materials Act (CRMA), aiming to reduce import dependency, secure supply chains for green/digital tech (batteries, renewables), and meet ambitious 2030 targets for domestic extraction, processing, and recycling, boosting resilience and sustainability. The NEO-CYCLE project (Grant Agreement No. 101138058), titled "Upcycling of NdFeB Magnets in the EU for Green Applications," addresses this imperative by demonstrating, at Technology Readiness Level 6 (TRL6), the sustainable upcycling of spent Neodymium-Iron-Boron (NdFeB) magnets derived from hard disk drives (HDDs).

The project aims to convert these end-of-life materials into high-quality, market-ready products, demonstrating their value across four distinct industrial case studies: the pharmaceutical, ammonia, fertilizer, and polymer industries. The project shows how secondary raw materials can meet stringent quality, performance, and regulatory requirements by tailoring recovery and upgrading processes to the specific needs of each sector. It highlights the potential of circular value chains to reduce dependence on primary resources, lower environmental impacts, and strengthen the resilience and competitiveness of European industry.

As Europe moves decisively toward a more circular economy, companies are increasingly required to adapt and transform their business models to create long-term value not only for customers, but also for suppliers, employees, communities, and financiers. However, a broad commitment to stakeholder engagement alone is no longer sufficient. Executives must understand how stakeholders are interdependent and how value can be co-created across the system, enabling win–win–win strategies that simultaneously deliver economic performance, environmental benefits, and societal impact. This systemic perspective is particularly critical for sectors linked to Critical Raw Materials (CRMs), where supply security, sustainability, and competitiveness are deeply interconnected. (Freeman, 1984; Bryson, 2004; Reed et al., 2009).

This deliverable serves as a comprehensive roadmap in relation to stakeholder value creation with a high degree of interconnection and interaction, since in circular economy the stakeholder engagement requires heterogeneous stakeholders to be organised within networks with a high degree of interconnection and interaction, as compared to linear supply chains that lead from the supplier to the buyer.

This deliverable is focusing on two critical and interlinked pillars of the project's dissemination and exploitation strategy: **stakeholder engagement and common clustering activities plan.** These

activities are designed not merely as communication exercises but as strategic mechanisms to ensure the industrial viability, regulatory alignment, and market acceptance of the NEO-CYCLE technologies for a better implementation of circular economy strategies.

The document aims to provide a structured and strategic foundation for effective collaboration and impact by first analysing the broader ecosystem of Critical Raw Materials (CRMs). The methodology implemented follows 3-steps procedure:

1. **Analyse the ecosystem:** Map and select all relevant stakeholders and sister projects across the full Critical Raw Materials (CRM) value chain, extending from E-waste generation to the industrial application of upcycled catalysts.

2. **Develop a tailored engagement strategy:** Building on the previous ecosystem analysis, it was defined specific mechanisms for securing stakeholder buy-in and technical inputs from sister projects, ensuring that communication is relevant, timely, and bidirectional.

3. **Establish clustering mechanisms:** Finally, implement coordination frameworks with parallel EU initiatives to maximise collective impact and prevent the duplication of research efforts.

To operationalise these objectives, the report provides an exhaustive analysis of the NEO-CYCLE clustering ecosystem, underpinned by updated data gathered through internal surveys during the initial reporting periods. It details the methodology employed to identify these actors, assesses their functional roles within the circular value chain, and presents granular inventories of stakeholders and sister projects derived from the project's internal databases. Beyond the initial mapping, the document articulates the practical execution of clustering with "sister projects", specifically those funded under Horizon Europe and Horizon 2020 that exhibit technological or strategic synergies. This includes a performance report on major clustering milestones, such as the Stakeholder Workshop in Seville and the Raw Materials Week side event in Brussels. Finally, the report defines a forward-looking roadmap for the 2026–2028 period, establishing a structured plan to transition these initial interactions into sustained cooperation that reinforces the EU's raw materials resilience.

2. Strategic framework of clustering activities

The transition towards a climate-neutral and digitally resilient European economy is inseparable from the security, sustainability and circular use of Critical Raw Materials (CRMs). Against this

backdrop, NEO-CYCLE's clustering and networking strategy is deliberately designed to go beyond conventional dissemination. Its purpose is to enable a structured external implementation dynamic, where knowledge, technical advances and policy-relevant evidence circulate effectively between NEO-CYCLE and a wider set of EU and national initiatives, industrial actors and enabling organisations. (European Commission, 2019, 2020).

This approach responds to the intrinsic complexity of Rare Earth Elements (REEs) value chains—particularly those associated with neodymium (Nd), iron (Fe) and boron (B). From collection and dismantling to chemical processing, upgrading and re-manufacturing, the lifecycle of these materials depends on coordination across actors that often operate in separate industrial and policy domains. Replicability, therefore, cannot be achieved through isolated technical progress alone; it requires alignment of evidence, shared assumptions, and interoperable practices across the chain.

NEO-CYCLE's strategic clustering framework is consistent with the direction set by the European Critical Raw Materials Act (CRMA), which highlights the need to reinforce domestic capacities, diversify supply sources and, critically, increase circularity in order to reduce exposure to external dependencies. Within this policy and market context, clustering serves as a practical accelerator: by engaging with complementary projects and stakeholder communities, the consortium strengthens comparability of results, advances readiness for industrial uptake, and reduces the time between demonstration and adoption (European Parliament & Council of the European Union, 2024).

The project structures its clustering activities around three mutually reinforcing pillars: **technical cross-fertilisation**, **policy alignment**, and **broad-spectrum stakeholder engagement**.

This architecture ensures that innovations developed in NEO-CYCLE are assessed not only for technical performance, but also against adoption conditions that determine real-world deployment, including downstream requirements, regulatory feasibility and stakeholder expectations.

The strategy explicitly acknowledges that circularity is a systemic challenge: it involves trust and legitimacy in supply chains, credible sustainability evidence, and the standardisation of enabling instruments such as digital traceability tools and the Digital Product Passport (DPP) (European Parliament & Council of the European Union, 2024).

In operational terms, NEO-CYCLE's networking architecture is built on a selection logic that differs from generic stakeholder outreach. Sister projects and related initiatives are prioritised where interaction directly supports project outputs—for example, through common validation needs,

transferable methods, or opportunities to converge on evidence requirements for recovered materials, catalysts and process performance. At the same time, engagement in external fora and multi-project events is used to extend impact beyond the project's immediate lifetime, ensuring that the knowledge generated contributes to longer-term upgrading of European industrial capabilities and the consolidation of replication corridors.

This creates a resilient collaboration fabric in which clustering is not treated as passive attendance but as an active pursuit of synergy. Networking actions are framed around clear contribution pathways: identifying gaps in the current state of the art, seeking complementary partners, and translating interaction into reusable outputs. Whether through sharing LCA assumptions to improve consistency of environmental baselines, aligning traceability approaches to support interoperability, or co-organising targeted workshops to address regulatory bottlenecks, each clustering action is calibrated to advance the project's core mission: enabling the sustainable recovery and upcycling of NdFeB magnets in support of Europe's green and circular transition.

2.1. Mapping sister projects and initiatives

A cornerstone of NEO-CYCLE's operational strategy is the proactive and structured development of synergies with other EU-funded projects running in parallel. Identifying sister projects allows for the pooling of resources, exchange of best practices, and joint tackling of regulatory and technical challenges. Accordingly, NEO-CYCLE foresees the establishment of evidence-based synergies with EU-funded initiatives operating in adjacent segments of the Critical Raw Materials (CRM) value chain. Figure 1 illustrates the analytical framework applied under Task 11.3 to structure the identification and assessment of sister projects relevant to NEO-CYCLE's clustering and stakeholder engagement activities. Annex 1 describes in detail the methodology used for this selection.

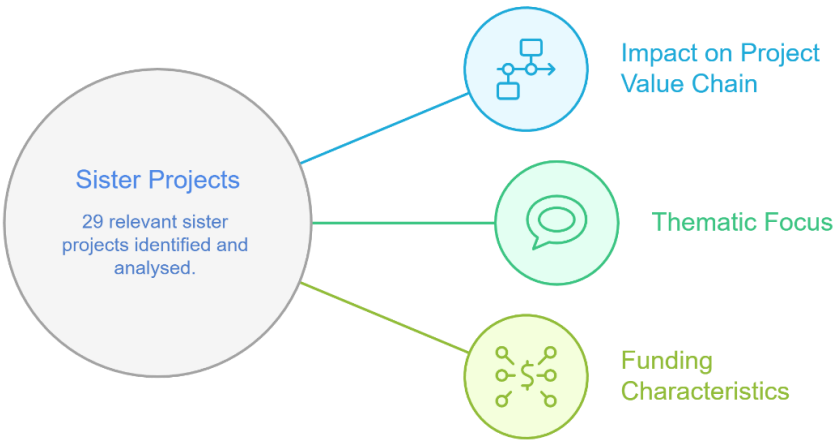

Figure 1. Task 11.3 framework for analysing 29 sister projects by value-chain impact, thematic focus and funding characteristics, supporting clustering and stakeholder engagement KPIs.

To ensure a systematic approach and avoid ad hoc networking, the consortium has developed and maintains a dynamic database for mapping sister projects.

In the current mapping exercise, 29 potentially synergistic projects were screened. Key collaboration opportunities were identified through desk research and reviews of databases such as CORDIS, covering Horizon Europe (HE), EIT RawMaterials, Interreg initiatives, and relevant national programmes.

The following steps guided the mapping process:

- Conduct documentary research on EU-funded projects, EIT RawMaterials initiatives, and relevant national projects related to mineral exploration and resource management, with a focus on clustering.
- Assess the relevance of mapped projects to NEO-CYCLE in terms of data exchange, knowledge sharing, and synergy potential.
- Prioritise projects with similar objectives, target sectors, or shared challenges for clustering activities.
- Develop and maintain a database of mapped projects and relevant contacts, updating it throughout the project lifetime.
- Identify sister projects funded under the NEO-CYCLE topic through desk research during the mapping process.
- Gather feedback from project partners.

Following this internal roadmap, the repository captures key metrics, including technical scope, project duration, funding programme, partner overlap, and a calculated relevance score. The mapping process applied under Task 11.3 is illustrated in Figure 2.

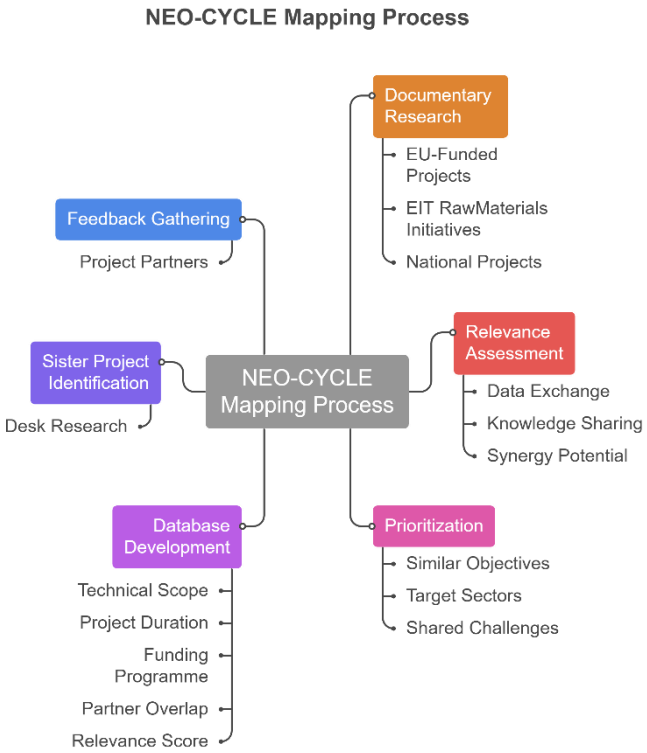

Figure 2. NEO-CYCLE mapping process applied under Task 11.3 to identify, analyse and prioritise sister projects for clustering and stakeholder engagement. The process combines documentary research, database development, relevance assessment and prioritisation to support structured identification of synergies, complementarities and uptake-oriented collaboration opportunities.

From the initial longlist, the consortium prioritised 14 projects as having *high* or *very high* relevance, applying a consistent selection methodology based on three main criteria:

- Strategic fit: Priority was given to projects addressing permanent magnets, rare-earth circularity, or enabling themes such as traceability, certification, LCA/LCC harmonisation, industrial recovery pilots, and downstream materials validation.

- Complementarity: Projects were favoured when their objectives addressed specific gaps relevant to NEO-CYCLE, whether upstream (collection networks, pre-processing, and quality constraints), downstream (catalyst development ecosystems and end-user requirements), or cross-cutting (digital traceability, policy alignment, and skills capacity).

- Transferability of results: Higher scores were assigned where methodologies, metrics, or stakeholder engagement models were reusable (e.g. shared environmental accounting conventions, comparable process performance KPIs, or aligned narratives supporting market acceptance), enabling collaboration to generate directly applicable common outputs.

However, the consortium deliberately extended the assessment beyond thematic alignment. After defining the *high relevance* shortlist, an additional interaction filter was applied to shift from theoretical relevance to operational collaboration.

This filter focused on identifying tangible interaction points through which synergies could be effectively activated and documented within the project lifecycle. In practice, this meant prioritising sister projects connected through established clustering environments, such as the Seville ecosystem (EURAW), Brussels-based catalyst clusters, or NEO-CYCLE's stakeholder workshop where sister initiatives were engaged within shared stakeholder communities.

This secondary filter refined the shortlist into an operational portfolio, clearly distinguishing projects that serve primarily as *informational references* from those that are *collaboration ready*.

Collaboration-ready projects are those where NEO-CYCLE can realistically co-create value through coordinated dissemination, shared stakeholder engagement, harmonised methodological frameworks (e.g. traceability evidence or sustainability reporting), and exploitation alignment (e.g. pursuing complementary rather than competing routes to industrial uptake). Importantly, the interaction filter makes synergy claims verifiable by linking each prioritised sister project to concrete collaboration contexts—such as joint events, documented participation, communication records, and meeting minutes—rather than relying on informal or undocumented exchanges.

Finally, this interaction filter strengthens both the quality and diversity of the portfolio by preventing an overly narrow focus on the closest technical matches. By anchoring selection in real-world cooperation platforms, the process naturally yields a balanced mix of project typologies essential for NEO-CYCLE's success: technology and pilot initiatives (for process benchmarking and scale-up insights), catalyst and chemical-production clusters (for end-product validation), and enabling projects (for traceability, policy alignment, and skills development).

In this way, the portfolio evolves into a coherent collaboration architecture around NEO-CYCLE's objectives: focused enough to be actionable, yet diverse enough to encompass the entire pathway from secondary magnet recovery to credible, market-ready circular products.

From this priority set, a final selection of 10 projects has already materialised into concrete collaborations through technical presentations and reciprocal participation in joint events. These interactions constitute a practical nucleus for ongoing cooperation and shared dissemination outcomes.

2.1.1. Sister projects database

The database is a tool designed to support the identification and analysis of projects to be contacted for the clustering activities under T11.3 of WP11 of NEO-CYCLE, led by ISMC and carried out with Ecocastulum.

As per the Grant Agreement the target group of the Task 11.3 is mostly, but not exclusively, Horizon Europe projects, *"clustering and networking activities with synergistic Horizon Europe projects and national projects"*. The review is opened to other programmes such as Horizon Europe, Interreg, and other funding initiatives.

The information is collected from online sources, especially the CORDIS database. Other sources such as KEEP (Interreg projects) are explored as well to widen the scope of projects identified. NEO-CYCLE partners are also asked, through a structured questionnaire, for their suggestions of projects to be included, to make the most of collective knowledge and experience within the consortium.

The information gathered is largely of qualitative type as the nature of the information collected does not offer strong quantitative indicators; it is however helpful to guide the identification and selection of "synergistic projects". Some of the information collected can be typified and grouped, such as keywords and type of funding programme.

Although the database does not have a quantitative approach, it includes a field for a simple scoring of relevance on four values: low; medium; high; and very high. This enables a simple ranking, and a comparison of the projects identified. The relevance scoring is based on the interpretation of the qualitative data collected. The overall results and scoring are revised and rebalanced by the ISMC and Ecocastulum teams together to provide a consistent assessment.

The database is in the form of an excel spreadsheet with four sections and 29 fields, of which 15 are mandatory. The sections are Project Identification; Project basic data; Project content; and Relevance to NEO-CYCLE. Table 1 shows the structure of the database.

The full list is reviewed and firmed up by end of month 24 (August 2026), revised with T11.3 contributors (ISMC and Ecocastulum), WP11 lead (LCI) and the project coordinator (IDE) by March 2025.

The most relevant and interesting projects were selected to be contacted for the clustering activities of T11.3: drafting a plan of common clustering activities, hold individual hybrid meetings with relevant projects, and organise the first clustering meeting.

The database list will be reviewed and modified as necessary at the general assembly meetings or when appropriate during the development of the project.

Table 1 - structure of the "List of synergistic projects" datababase

Section	Field name (*mandatory)	Description and comments	Field type & format
Project Identification	***Project name**	Full name of the project	Text
	***Project acronym**	Main ID field. From CORDIS or similar source	Text
	CORDIS Link	Useful to retrieve info quickly. If not a Horizon project no need	URL
	Project website	If not available, use COO website or other relevant URL	URL
	Contact email	If the project does not have an email address, it can be used the contact of the coordinator, or clustering/comms partner.	Email
Project basic data	***Status**	It helps scoring project relevance. Closed projects should be included only if highly relevant.	"Ongoing" or "Closed"
	Start date	From CORDIS or similar source	Date (dd/mm/yyyy)
	End Date	From CORDIS or similar source	Date (dd/mm/yyyy)
	Budget total amount	From CORDIS or similar source	Number (Euros)
	***Coordinator name**	Organisation name	Text
	***Coordinator country**	Two-letter code of the country of the coordinator	Text
	***Number of partners**	From CORDIS or similar source. Include also Affiliated Entities, associated partner and any active partner. No need for observer or similar types.	Number
	***Number of NEO-CYCLE partners**	Any partner in the project that is also a partner in NEO-CYCLE. This helps to score relevance and ease of contact and involvement	Number
	***NEO-CYCLE partners name(s)**	Acronym of partners, full list in the excel file.	Text

	***Programme**	Name of the funding programme (short) such as Horizon Europe, Horizon 2020, Interreg Europe, etc. Use standard list, or dropdown from previous entries if possible.	Text
	Call	If Horizon EU it helps identify other projects and understand better the relevance. If not Horizon	Link
	Horizon Topic	If HEU it helps identify other projects and the relevance scoring.	Link
Project content (short and focused text)	***Short description**	Could be a short description lifted from the project website, cordis, or other material. Has to be short and focused.	Text
	***Industry field**	A short indication of which industrial fields or activity area the project is about. E.g. recycling, magnets, pharmaceuticals, etc.	Text
	***Objective(s)**	A short paragraph on the aim of the project.	Text
	***Keywords**	List of keywords from CORDIS page, chose only the most relevant for NC. Also add your own if helpful. This helps to screen and filter projects selected	Text
	Challenges	Short description of what the project wants to sole, e.g. traceability, chemical processes, policy hurdles, WEEE, recycling, etc .	Text
	Results / outputs	Any interesting result, publication, product	Text
Relevance to N-C	Topic / fields	Short list of which fields of NC the project can align with, focusing on the 4 areas of Pharma, fertiliser	Text
	Issues	Indicate any element that aligns with adresses NC challenges	Text
	Partners	Indicate any partner of the project that has an interesting role, either in the project (clustering communication, etc) or in general, i.e. could be a useful speaker, multiplier, involved in market uptake etc.	Text
	Type of involvement	What type of involvement the clustering activity could focus on, e.g. speaker, training, policy, industry, scientific. Keep it sharp to keywords if possible	Text

	***Relevance score**	Values from 1 to 4 1=low; 2=medium; 3=high; 4=very high. This is an assessment based mostly on project content and relevance.	Number
	***Relevance comment**	A short text resuming and explaining why the project is interesting for NEO-CYCLE clustering activity.	Text

The database of identified sister projects was consolidated and analysed to provide a clear and synthetic overview. In total, 29 relevant sister projects were identified and subsequently organised into three main analytical categories: impact on the project value chain, thematic focus (topic), and funding characteristics. This structured grouping enabled a coherent comparison across projects and facilitated the identification of common patterns and complementarities. The results of this classification are presented in Table 2, which summarises the sister projects according to the three categories.

In addition, the Annex includes the complete file resulting from the sister projects search, with all fields fully developed and detailed.

Table 2 – List of projects datababase

PROYECT	VALUE CHAIN LINK			LEVEL	TOPIC	CALL	PROGRAMME
COMENZE	Research			Low	Research	HORIZON-MSCA-2023	Horizon Europe
ICARUS	Recycling phase			Low	Upcycling	Horizon Europe-CL4-2023	Horizon Europe
RISERS	Standardisation			High	Standardisation	Horizon Europe-CL4-2023	Horizon Europe
HARMONY	Collection phase	Recycling phase	Standardisation	Very high	Recycling technology	Horizon Europe-CL4-2023	Horizon Europe
ICARUS	End-user			Low	Research	Horizon Europe-CL5-2022	Horizon Europe
MaDiTraCe	Standardisation			High	Traceability	Horizon Europe-CL4-2022	Horizon Europe
EJP SOIL	End-user			Medium	Standardisation	H2020-SFS-2018-2020	H2020
SUSMAGPRO	Collection phase	Recycling phase	End-user	Very high	Recycling technology	H2020-SC5-2018-2019-2020	H2020
NEOHIRE	Recycling phase			High	Recycling technology	H2020-NMBP-2016-2017	H2020
FER-PLAY	End-user			Medium	Research	Horizon Europe-CL6-2021	Horizon Europe
BIORECOVER	Recycling phase			High	Recycling technology	H2020-SC5-2018-2019-2020	H2020
CLOSER	Collection phase			Medium	Upcycling		I3
AUTOMATed	Recycling phase	End-user		High	Recycling technology	H2020-ICT-2014	H2020
REMHUB	Collection phase	Recycling phase		High	Recycling technology	Horizon Europe-CL4-2024	Horizon Europe

SUPREEMO	Collection phase	Recycling phase	End-user	Very high	Recycling technology	Horizon Europe-CL4-2023	Horizon Europe
SecREEts	Collection phase	Recycling phase	End-user	Medium	Recycling technology	H2020-SC5-2016-2017	H2020
REEproduce	Collection phase	Recycling phase	End-user	High	Recycling technology	Horizon Europe-CL4-2022	Horizon Europe
REEcycle	Research	Recycling phase		High	Recycling technology	HORIZON-MSCA-2022	Horizon Europe
PERMANET	Collection phase	Standardisation	End-user	Very high	Standardisation	Horizon Europe-CL4-2024	Horizon Europe
DEMETER	Research	Recycling phase	End-user	Very high	Recycling technology	HORIZON-MSCA-ITN-2015	H2020
OCARINA	Research	Recycling phase		High	Recycling technology	HORIZON-MSCA-IF-2020	H2020
RAW4RES	Standardisation			High	Standardisation		Interreg Europe
EXPSKILLS-REM	Standardisation			High	Traceability		EIT Raw Materi-als
CRUSADE	Recycling phase	End-user		Very high	Upcycling	Horizon Europe-CL4-2023	Horizon Europe
FIREFLY	Recycling phase	End-user		High	Catalysis/Electrocatal-ysis	Horizon Europe-CL4-2022	Horizon Europe
PEACOC	Recycling phase	End-user		Very high	Recycling technology	H2020-SFS-2018-2020	H2020
ALCHEMHY	Recycling phase	End-user		Very high	Catalysis/Electrocatal-ysis	Horizon Europe-CL4-2024	Horizon Europe
SUSTAINCELL	Recycling phase	Research		High	Catalysis/Electrocatal-ysis	HORIZON-JTI-CLEANH2-2022-1	Horizon Europe
HIGHLANDER	End-user			High	Catalysis/Electrocatal-ysis	HORIZON-JTI-CLEANH2-2022-1	Horizon Europe

Figure 3 summarises the distribution of sister projects across the NEO-CYCLE value chain, highlighting the relative incidence of research, standardisation, collection, recycling and end-user-oriented activities.

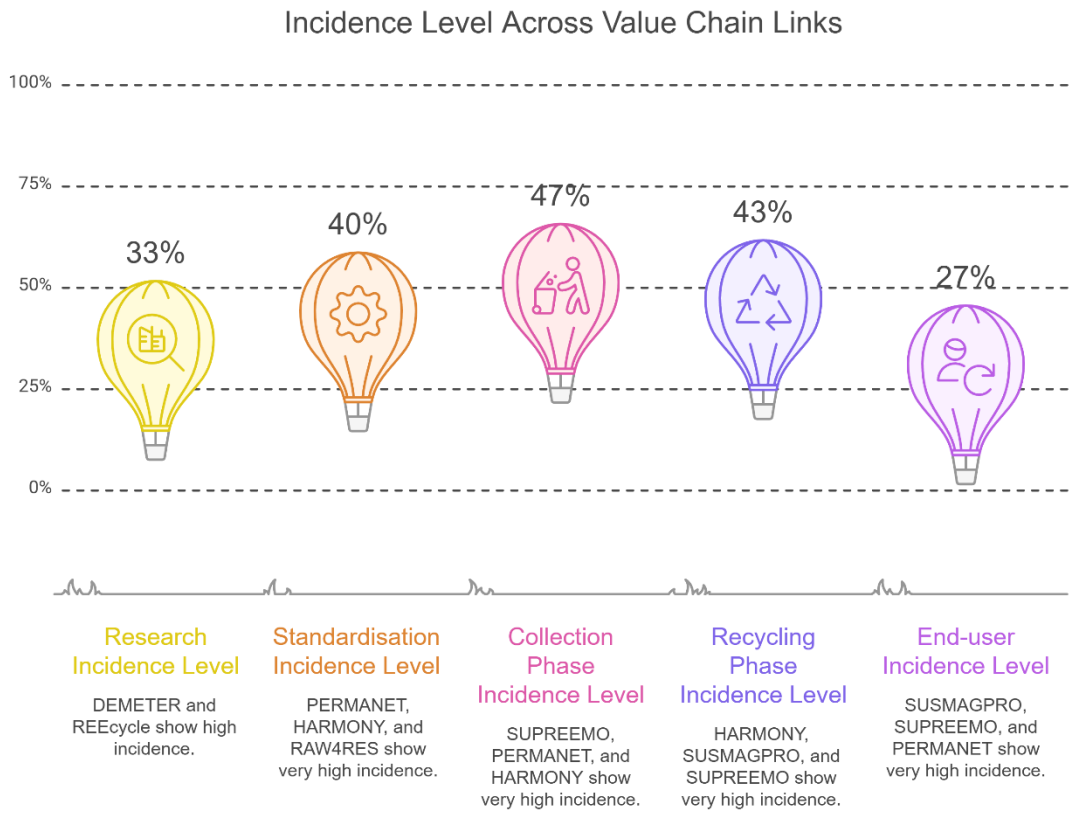

Figure 3. Distribution of sister projects across the NEO-CYCLE value chain, showing the relative incidence of activities in the research, standardisation, collection, recycling and end-user phases. The figure is based on the analysis of the 29 identified sister projects and supports the identification of clustering priorities and value-chain segments with the highest engagement potential.

Following the analysis of the distribution of sister projects across the NEO-CYCLE value chain, a more detailed thematic review was carried out to understand the main technological and strategic topics addressed by these initiatives. This thematic mapping allows the project to identify concentrations of expertise, overlapping areas of activity and potential gaps along the value chain. Figure 4 presents an overview of the key project topics identified among the sister projects and their positioning across the different value-chain segments relevant to NEO-CYCLE.

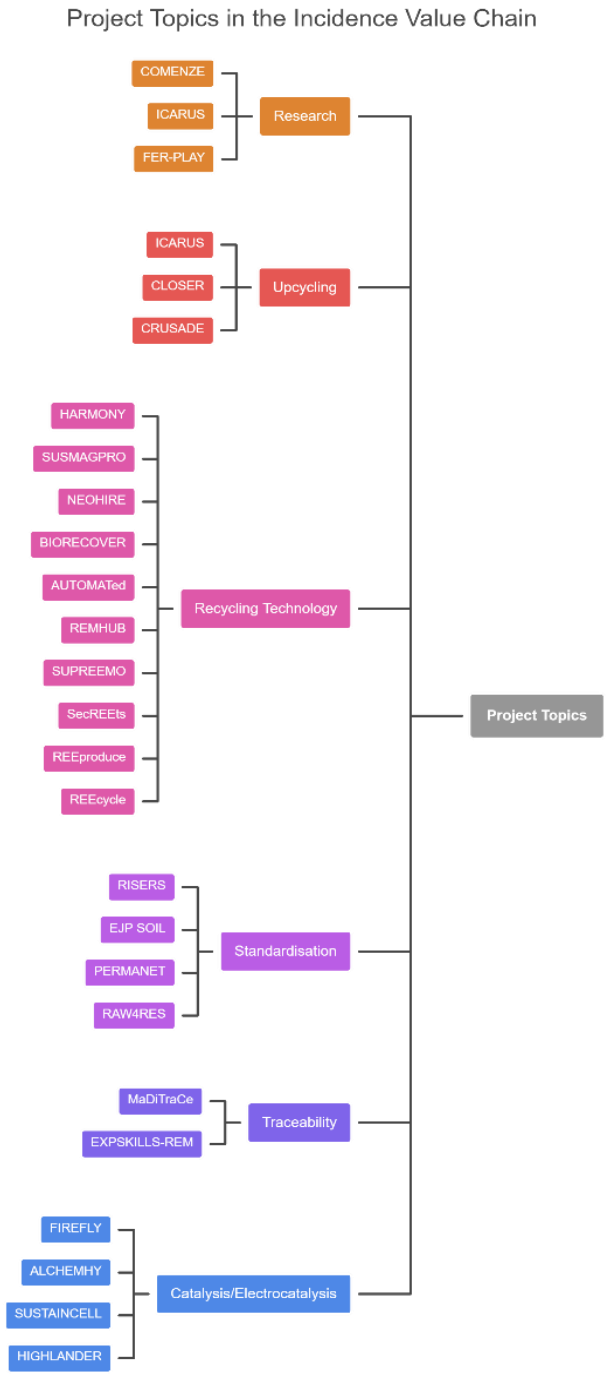

Figure 4. Project topics addressed by the identified sister projects and their positioning along the NEO-CYCLE value chain, supporting the identification of clustering priorities under Task 11.3.

In addition to analysing thematic focus and value-chain positioning, the identified sister projects were also examined according to their funding programmes. Understanding the funding landscape provides useful context for assessing existing collaboration frameworks, network structures and opportunities for coordinated clustering activities. Figure 5 presents an overview of the main funding programmes supporting the sister projects considered in NEO-CYCLE, highlighting the diversity of European and regional instruments represented in the mapping.

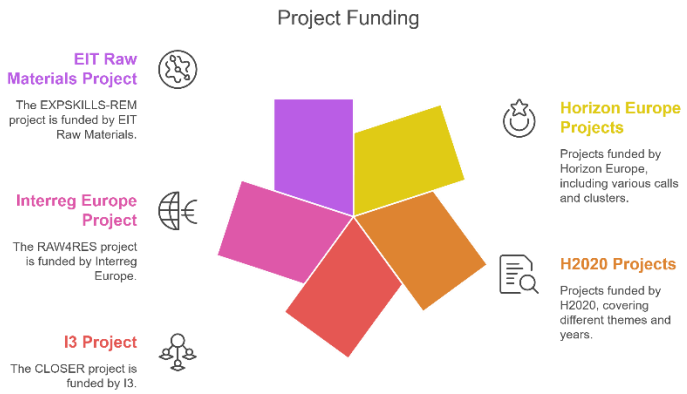

Figure 5. Funding programmes supporting the identified sister projects, providing context for clustering and stakeholder engagement under Task 11.3.

Overall, the mapping of sister projects provides a structured overview of the external landscape relevant to NEO-CYCLE, combining value-chain positioning, thematic focus and funding context. This integrated analysis allows the project to move beyond descriptive mapping and to identify concrete opportunities for coordination, complementarity and uptake. The insights generated in this section form the analytical basis for prioritising engagement actions and structuring clustering activities, which are addressed in the following section.

2.2. Identifying and selecting stakeholders

A core methodological pillar of NEO-CYCLE's external scalability strategy is the design, development and deployment of a survey-based stakeholder registration tool hosted on the project website. Rather than relying on open-ended outreach, this tool provides a structured entry point into the stakeholder network, converting expressions of interest into a searchable and segmentable database that enables targeted engagement throughout the project lifecycle.

The stakeholder section of the project communication framework explicitly sets out that a participatory external knowledge base will be established and consulted during the full duration of the project. Stakeholders are not only informed about progress and results; they are engaged to identify needs, contribute data, test outcomes and support awareness raising. In line with the engagement logic described in Deliverable D11.2, stakeholders are therefore invited to participatory activities such as workshops, webinars, conferences, clustering sessions and presentation-based events, according to relevance and expected contribution.

In this context, the stakeholder engagement plan functions as a coherent system consisting of four linked components:

- stakeholder identification,
- classification into stakeholder groups and sectors,
- tiering based on influence–interest dynamics, and
- task-driven selection for specific engagement activities.

Stakeholder identification is positioned as the first step of the stakeholder analysis process, with an explicit objective to define stakeholder groups and appropriate mechanisms to reach and involve them effectively. The public registration tool operationalises this approach by embedding the project's taxonomy and value-chain segmentation into a short survey form, while clearly communicating that registrants may be consulted during the project and invited to engagement activities.

The methodological advantage of this approach is threefold. First, it ensures continuity, as the stakeholder list remains dynamic and can expand beyond the initial mapping exercise. Second, it provides standardisation, as the same core classification information is collected consistently for all registrants. Third, it enables consent-based traceability, since explicit consent statements are integrated into the registration process, supporting transparent engagement management.

For these reasons, the mechanism goes beyond a simple newsletter subscription. The information collected is aligned with the project's stakeholder taxonomy and value-chain framing, allowing engagement to operate through a structured "database-to-invitation" workflow, where selection for activities can be justified on objective criteria rather than informal networks or ad hoc outreach.

2.2.1. Survey classification criteria

The online registration form integrates the stakeholder taxonomy through two primary classification dimensions: stakeholder type and sector of operation.

For stakeholder type, registrants select from predefined categories including regulatory bodies and policymakers, public funding agencies, NGOs, professional associations, industrial actors, public and private research organisations, the general public, and related projects and initiatives. Importantly, this structure supports clustering by treating "related projects and initiatives" as a distinct and searchable segment rather than a residual category. This allows the engagement plan to quickly extract a cooperation-relevant subset when clustering activities require project-to-project alignment or mutual visibility.

For sector, registrants indicate their position within the value chain and end-use context. This includes, among others, recycling and e-waste management (collection phase), manufacturers of HDDs and electronic devices (collection phase), WEEE recycling (recycling phase), upcycling activities (Fe, B, Nd recovery), and downstream end-user sectors such as fertilisers/agrichemicals, green ammonia, pharmaceuticals and chemicals.
This segmentation reflects the engagement plan's requirement to connect upstream, midstream and downstream perspectives, enabling engagement formats to operate as value-chain dialogues rather than isolated, sector-specific discussions.

From an implementation perspective, this classification logic also supports purpose-driven selection. For example, a clustering activity may prioritise "related projects and initiatives" and professional associations while ensuring the participation of policymakers and selected industry stakeholders to ground synergy discussions in regulatory feasibility and adoption constraints. Similarly, a technical workshop focusing on catalyst validation can prioritise industrial end-users and research organisations, consistent with the "collaborate closely" tier typically assigned to these groups.

To make this selection process operational, the classification system supports rapid filtering across both dimensions, enabling the consortium to create fit-for-purpose participant subsets, such as:

- **Policy-facing subgroups** (regulators, public authorities, standardisation-oriented organisations),
- **Industrial uptake subgroups** (manufacturers, recyclers, end-users),

- **Evidence-generation subgroups** (data providers, research organisations, technology developers),
- **Synergy subgroups** ("related projects and initiatives" for clustering and alignment activities).

2.2.2. Identification methodology with project-driven stakeholder mapping

The engagement plan recognises that a functional and representative stakeholder database cannot be built through a single identification channel. Instead, NEO-CYCLE applies a diversified acquisition strategy that combines **bottom-up inclusion** with **top-down mapping**.

The public registration tool enables external stakeholders to self-identify and register their interest, ensuring openness and accessibility. In parallel, project-driven mapping provides deliberate coverage of strategic actors who may not self-register due to limited visibility, language barriers, sector fragmentation, or weak connectivity to EU project communication channels.

In the project's methodological framing, stakeholder identification is treated as the first step of stakeholder analysis and a prerequisite for managing project complexity and clarifying interfaces with key stakeholder communities, consistent with the logic outlined in Deliverable D11.2. The objective is therefore not merely to populate a list, but to ensure that all major stakeholder categories along the value chain are adequately represented and can be engaged meaningfully across the project lifetime.

Operationally, the engagement plan functions as a two-stage funnel. The first stage is **long-list creation and continuous expansion**, supported by the public registration tool and complemented by ongoing partner-led identification. This keeps the stakeholder pool dynamic and responsive as new actors emerge, priorities shift, or new engagement needs arise across project phases. The second stage is **purpose-driven selection**, where task-specific stakeholder subsets are formed for targeted engagement activities. Selection is based on relevance to the critical raw materials value chain, positioning within the influence–interest matrix, and the expected contribution to the specific objective—whether technical validation, policy dialogue, clustering and synergy development, or dissemination amplification.

This combined approach delivers both **comprehensiveness** (through continuous expansion) and **strategic focus** (through tailored selection aligned with operational and policy objectives).

As a result, NEO-CYCLE implements a dynamic, evidence-based stakeholder management framework capable of sustaining collaboration and supporting measurable impact generation over time.

To support consistent execution, the stakeholder taxonomy is translated into a practical **engagement matrix**.

This matrix clarifies what each stakeholder type typically contributes, what NEO-CYCLE offers in return, and how engagement is designed to remain relevant, proportionate and respectful of stakeholder constraints. The matrix is used to shape invitations, define workshop compositions and structure follow-up dialogues.

It is also presented publicly to make the engagement logic transparent, allowing stakeholders and sister projects to understand how and why they are engaged.

Table 3. Stakeholder engagement matrix

Stakeholder group	Expected role in NEO-CYCLE	Value proposition offered by NEO-CYCLE	Engagement objectives
Public authorities and policymakers	Translate technical evidence into implementation and policy contexts; clarify regulatory barriers and enabling measures; act as multipliers through programmes and initiatives.	Policy-ready evidence, best practices, and clear links between circular solutions and regulatory objectives; opportunities to test recommendations through dialogue.	Validate regulatory assumptions; identify barriers to WEEE magnet recovery and secondary material uptake; co-develop policy briefs and workshop outcomes.
Industrial participants (SMEs to large companies)	Provide operational feasibility checks; identify constraints in logistics, processing, quality and cost; explore adoption pathways for recovered materials and data systems.	Access to early insights, networking and potential partnerships; opportunity to influence practical design choices (data sharing rules, quality requirements, adoption conditions).	Validate feasibility of processes and data flows; identify minimal adoption conditions; explore replication opportunities and supply chain links.
Professional associations and clusters	Act as multipliers and trusted intermediaries; distribute results to members; support matchmaking and shared positions.	Ready-to-use best practices and messaging; opportunities to co-host sessions and increase member value; access to an EU project network.	Scale dissemination; align best practices; co-create joint sessions; identify member needs; connect SMEs to adoption routes.
Research organisations (public and private)	Contribute methods, validation and interpretation; support pre-standardisation; connect to scientific community and open evidence.	Access to project data narratives and results; collaboration opportunities; joint publications and method exchange.	Strengthen credibility; validate assumptions; compare methods (LCA/LCC/s-LCA); identify research gaps for follow-up initiatives.
NGOs and civil society organisations	Represent societal concerns; support legitimacy and responsible innovation; help raise awareness and connect to broader sustainability dialogues.	Transparent explanation of circular impacts; opportunities to influence responsible design choices; participation in events and public-facing materials.	Identify social concerns and acceptance conditions; improve communication clarity; contribute to s-LCA dialogue where relevant.
General public	Indirect stakeholder group; supports awareness and societal acceptance of circular approaches; contributes to communication reach.	Accessible information, quizzes and public updates; opportunities to attend public webinars and final events.	Raise awareness; improve transparency; gather broad perceptions when relevant.

3. Clustering and external engagement roadmap

NEO-CYCLE operationalises this multiplier effect through Work Package 11 (WP11), which has a cross-cutting coordination role for stakeholder engagement, clustering activities and communication actions. WP11 supports scalability by activating synergies with other initiatives, leveraging digital and networking channels to amplify results, maintaining the stakeholder engagement tool hosted on the project website, and linking NEO-CYCLE to wider European raw materials platforms and alliances. In this way, project knowledge is progressively positioned within Europe's broader innovation and replication landscape, rather than remaining confined to internal consortium exchanges.

Importantly, WP11 functions as a strategic interface rather than a stand-alone dissemination work package. It connects clustering and communication actions to the internal evidence needs of the technical, sustainability and regulatory work streams. Engagement formats are therefore built around concrete outputs—such as process performance evidence, end-product validation requirements, digital traceability artefacts and sustainability metrics—so that external interaction directly strengthens the credibility, usability and adoption potential of NEO-CYCLE results.

To ensure a consistent and operational approach, the consortium agreed early on a project-specific definition of both **"cluster"** and **"clustering"**. This definition was discussed and validated during the first NEO-CYCLE General Assembly (February 2025) and has since served as a common reference for WP11 planning and for the implementation of engagement and synergy activities across work packages.

Within NEO-CYCLE, a **cluster** is understood as a structured cooperation environment where multiple projects, platforms and stakeholder organisations converge around shared challenges in the NdFeB and Critical Raw Materials value chain. It is not defined by formal membership alone, but by the existence of a recurring interaction space in which technical evidence, enabling methodologies (e.g., traceability and sustainability assessment) and adoption conditions can be compared, aligned and reused.

Accordingly, **clustering** is defined as the set of deliberate actions through which NEO-CYCLE activates and manages cooperation within these environments. It includes the identification and prioritisation of relevant initiatives and actors, the creation of interaction opportunities (internal or external), and the conversion of these exchanges into traceable outputs such as shared messages, aligned evidence templates, joint dissemination actions, and documented follow-up steps. In this

sense, clustering is treated as an implementation tool that supports replicability and scalability, rather than a networking activity driven by attendance.

This shared definition is important for two reasons. First, it provides a common language across partners and work packages, ensuring that clustering remains linked to concrete project needs and outputs. Second, it strengthens auditability: by defining clustering through interaction spaces and documented outputs, the consortium can distinguish between contacts that serve as informational references and cooperation that is collaboration-ready, and it can report progress through verifiable evidence (agendas, minutes, participation logs and action lists).

Building on the definitions consolidated in Deliverable D11.2, the engagement plan also draws a clear distinction between **stakeholders** and **actors**. Stakeholders are entities with an interest in, influence over, or potential to be affected by the project's outcomes. Actors are an operational subset of stakeholders who engage in hands-on collaboration with the consortium. This distinction has practical implications for clustering and engagement design:

- **Actors** are mobilised when the project requires joint testing, validation, data-sharing exercises, or standardisation-oriented pilots.
- **Broader stakeholder groups** are engaged when objectives focus on dissemination, endorsement, policy integration, financing pathways or replication mechanisms.

Overall, external engagement in NEO-CYCLE is designed as both a delivery enabler and an impact enabler. From a delivery perspective, engagement helps ensure that technical developments, sustainability assessments and regulatory-oriented outputs remain consistent with operational realities, market expectations and relevant policy frameworks across the NdFeB magnet value chain. From an impact perspective, engagement ensures that results extend beyond the consortium by supporting uptake, replication and amplification through external organisations that can convene communities, shape standardisation discussions and channel dissemination effectively.

This dual function is aligned with NEO-CYCLE's stakeholder engagement and clustering roadmap, where clustering is treated as a structured instrument to maximise collective impact, strengthen collaboration and reduce duplication across European initiatives addressing Critical Raw Materials. In practice, clustering supports the development of a shared innovation space around circular magnets and rare earth value chains, reinforcing the European circular economy agenda and contributing to a more resilient raw materials ecosystem.

Consequently, the stakeholder ecosystem is treated as an operational asset. It is managed through systematic segmentation, tiering and task-specific selection, supported by the project's automated registration and "database-to-invitation" workflow.

3.1. Living cross-synergies: NEO-CYCLE implementation

Within NEO-CYCLE's methodological framework, engagement and clustering are not approached as generic networking activities. Instead, participation criteria are anchored in specific work package needs, so that stakeholder interactions are directly connected to the production, validation and uptake of project results.

In this context, WP11, WP12 and WP13 provide the operational backbone: through the communication and dissemination tasks in this period (Tasks 11.1–11.2), stakeholder segmentation is translated into concrete communication workflows, including the definition of key messages per audience and the selection of tailored channels and formats.

Importantly, WP11 also identifies and prioritises a dedicated subset of **"related projects and initiatives"** as a target group for clustering, synergy development and replication-orientated cooperation, strengthening alignment and mutual visibility within the wider EU innovation landscape. This prioritisation is intentionally designed to support the evidence needs of other work streams, ensuring that clustering channels are used to validate assumptions, converge on reusable methods, and accelerate uptake beyond the consortium.

In this sense, WP11 provides the engagement infrastructure through which requirements emerging from key tasks are addressed with the appropriate external counterparts:

- **Digital Product Passport** work (Task 9.6) requires sustained engagement between data providers and data users across the use-case partners and beyond, including exploratory dialogue on selective data sharing and feasible governance models for data exchange.

- **LCA/LCC** strand (Task 10.1) requires broad value-chain coverage to secure complete life-cycle inventories and robust, realistic cost assessments.

- **Social LCA** activities (Task 10.2) rely on qualitative, dialogue-based exchanges with stakeholders, placing emphasis on co-creation and stakeholder perspectives rather than database-driven results alone.

- **Policy and regulatory** strand (Task 10.6) engage directly with public authorities and policymakers through workshops, targeted consultations and participatory mapping, supporting the identification of barriers, incentives and enabling conditions for implementation.

This living cross-synergies model positions clustering as an **internal to-external bridge.** Technical and analytical work packages generate validated evidence packages—process performance results, traceability schemes, sustainability metrics and market viability narratives—which are then tested, compared and transferred through structured clustering formats involving sister projects and sectoral stakeholders. By making these exchanges continuous and iterative, NEO-CYCLE ensures that engagement functions as an enabling layer that strengthens the robustness, comparability and transferability of project outputs over time. Overall, this integrated approach supports an adaptive project trajectory within a collaborative ecosystem, ensuring that NEO-CYCLE innovations contribute directly to shared European goals on circularity, standardisation and sustainable raw materials management.

3.2. Clustering internal approach

In this context, all NEO-CYCLE partners contribute to identifying and attending events that support the project's clustering, dissemination and engagement objectives. Communication and dissemination resources are distributed across the consortium, and partners are expected to monitor European Commission channels and other relevant sources for conferences, workshops and seminars aligned with NEO-CYCLE's scope. This includes events organised by related EU-funded projects, European platforms, cluster organisations and stakeholder communities active in Critical Raw Materials, circularity and traceability.

Participation in these events allows NEO-CYCLE to present its approach, engage key actors across the NdFeB value chain, and initiate or strengthen cooperation with sister initiatives. These settings also provide a structured channel to collect feedback and exchange knowledge that can improve the validation and transferability of project outputs. Over time, sustained participation supports the creation of durable links with organisations able to amplify results and strengthen long-term impact and exploitation beyond the consortium.

To manage synergies in a consistent and operational way, NEO-CYCLE applies a dual-track clustering approach.

The **external track** focuses on participation in multi-project events used for benchmarking and strategic foresight. These environments position NEO-CYCLE within the broader European portfolio of circular economy and raw materials solutions and allow comparison of narratives, metrics

and implementation assumptions. They also help identify synergies that go beyond thematic similarity, including convergence opportunities related to traceability standards, digitalisation approaches, end-user requirements and industrial deployment conditions.

In parallel, the **internal track** functions as the project's main conversion mechanism for scalability and direct replication. It relies on consortium-led formats that translate external opportunities into auditable cooperation. This is supported by two WP11 "living assets": the stakeholder database and the sister-project mapping repository used to prioritise cooperation-ready initiatives. Together, these assets enable evidence-based selection, targeted invitations and structured follow-up, ensuring that clustering operates as a controlled pathway from identification to activation rather than as ad hoc networking

3.2.1. Organisation and attendance of international external events

As part of NEO-CYCLE's clustering strategy, the consortium combines participation in international events with the organisation of project-led formats to increase visibility, foster cooperation and support the exploitation and replicability of results.

These actions are planned in line with the Grant Agreement and with the WP11 engagement framework, and they are designed to generate synergies and joint initiatives in areas such as policy and regulation, standards and evidence alignment, data and traceability, and coordinated dissemination.

In this sense, NEO-CYCLE partners will participate in relevant conferences, events and workshops organised across Europe by other projects and initiatives. This allows the consortium to showcase results, connect with potential collaborators and adopters, and keep track of emerging developments in circular CRMs, traceability, and industrial uptake conditions.

An overview of the major external clustering events where NEO-CYCLE technical presentations have been delivered is provided in Table 4

Table 4. Major clustering external events with NEO-CYCLE technical presentations

Period	Event	Organization	Description
M2	European Raw	ISMC, Seville, Spain	EURAW 2024 was framed as a structured clustering platform bringing together EU-funded projects and

IDE ISMC	Materials Clustering Event (EURAW 2024)		ecosystem actors across sustainability, exploration, traceability and processing technologies. The event format supported cross-project comparability and cooperation through thematic sessions and matchmaking dynamics, enabling NEO-CYCLE to position its approach within a broader portfolio of EU solutions and to identify "adjacent" complementarities beyond direct thematic overlap. The scale and composition of the event (broad attendance, strong project density and relevant industrial participation) reinforced its role as a synergy accelerator, supported by the involvement of European projects such as MaDiTraCe, S34I and TERRAVISION and participation from policy representatives (DG GROW).
M13 WUT ISMC IKTS	Materials4Catalysts Cluster Workshop	PNO Innovation, Brussels, Belgium	The Materials4Catalysts clustering workshop was designed as an EU multi-project cooperation format focused on recycling, recovery and production of highly efficient catalysts for different applications. Implemented as a hybrid side event during Raw Materials Week 2025, it convened an emerging innovation ecosystem by connecting six EU-funded projects (FIREFLY and PEACOC as co-organisers, with participation from NEO-CYCLE, ALCHEMHY, SUSTAINCELL and HIGHLANDER). The workshop framework explicitly targeted synergy activation: it enabled peer comparison of technology routes and feedstocks, exchanged approaches for catalyst production and electrification, and—crucially for scalability—mapped potential exploitation routes and cross-project collaboration opportunities aligned with application requirements (chemical industry, fuel cells, automotive catalysts, biomass, ammonia and hydrogen
	12th Scientific Seminar	PROMETIA Naples, Italy	PROMETIA's 12th Scientific Seminar was structured as a three-day European technical and industrial dialogue on mineral processing and extractive metallurgy for

M13 UniTO ISMC			mining and recycling innovation. The programme combined policy framing (CRM Act and responsible processing), scale-up and piloting perspectives (MET-NET initiatives), analytical cooperation models (Lab-NET) and member-led R&I project contributions—creating a high-density environment for cross-fertilisation between industry, research and EU innovation networks. Within this framework, NEO-CYCLE was directly embedded through a dedicated technical contribution on "Up-cycling of NdFeB Magnets in the EU for green applications", placed within the scientific contributions block, alongside scale-up and recovery topics and EU/EIT RawMaterials perspectives. This positioning supports clustering objectives by linking NEO-CYCLE to communities working on upscaling, pilot infrastructures, and reusable methodologies—key channels for transfer and replication beyond the consortium.

3.2.2. Organisation of clustering events

Within NEO-CYCLE, clustering events are used as structured formats to move from thematic alignment to operational cooperation. Project-led clustering formats bring together representatives from relevant EU-funded initiatives and platforms, along with industry stakeholders, end-users, policymakers and research organisations. Coordinators and partners of sister projects are invited to actively contribute to sessions, with the objective of identifying concrete interaction points and follow-up actions.

The clustering events are designed to support the exploitation and replication of project outputs by enabling joint work in priority areas such as policy/regulation/standards, traceability and evidence requirements, and dissemination alignment. Each event is structured to ensure that cooperation is documented and traceable (agenda, participant list, minutes, action list), supporting reporting and continuity.

NEO-CYCLE's clustering events are organised with the following logic:

- **First clustering event (M14)**

The first clustering event was designed as an introductory and alignment milestone. Its focus is to present NEO-CYCLE's scope and transferable evidence packages, identify potential synergies with other EU initiatives, and discuss shared challenges and cooperation opportunities with participating actors. The objective is to build a collaboration-ready portfolio rather than a simple contact list.

- **Second clustering event (M24)**

The second clustering event builds on the outcomes of the first, with a stronger focus on follow-up and implementation. It is used to develop and track joint initiatives, align evidence needs (e.g., traceability and sustainability reporting), and define cooperation steps that can be progressed through bilateral exchanges or multi-project working sessions.

- **Final NEO CYCLE conference (M47)**

NEO-CYCLE will organise an international conference to engage key stakeholders and strengthen dialogue between industry, research and policymakers. The workshop will serve as a platform to present project results, share best practices, and identify collaboration opportunities that support replication. Needs and challenges will be jointly discussed to define common actions and to connect project outputs with real deployment conditions across regions and value-chain segments.

3.2.3. First NEO-CYCLE clustering event

In this context, the first NEO-CYCLE stakeholder workshop was designed as a hybrid clustering event in Seville and organised by ISMC and ECOCastulum, the workshop was explicitly framed to connect internal evidence packages (technical data, traceability requirements, and adoption narratives) with external communities capable of validating, challenging, and reusing them.

Preparation followed a structured engagement workflow consistent with the approach consolidated in D11.2. First, outreach was built on the intersection of the stakeholder list generated through the registration/database workflow and the prioritised sister-project shortlist produced through the mapping methodology.

This ensured that invitations were not issued solely based on topic proximity, but since *transfer relevance* and *interaction feasibility*. Second, the consortium applied a **complementarity lens** in composing the invited project portfolio. Instead of concentrating only on projects closest to NEO-CYCLE's core technology route, the workshop deliberately combined initiatives with different

funding schemes and implementation logics (e.g., Horizon Europe, EIT RawMaterials, Interreg, and other programmes), enabling a broader mix of TRL profiles, stakeholder communities, and exploitation routes.

Finally, the event was set up in hybrid mode to maximise accessibility and to ensure that participation was not constrained by travel, allowing targeted contributors to join remotely while preserving the integrity of moderated, documented exchanges.

Based on this preparation, the NEO-CYCLE stakeholder workshop aligned internal replication needs with external engagement through an agenda deliberately structured as a *transfer workflow*, moving from technical baseline setting to impact and methodology framing, and finally to participatory cooperation activation.

Strategic Alignment (transferable technical and evidence packages). The opening block established a shared baseline by presenting the project's core technology chain, REE recycling and NdFeB extraction via solid-state chlorination (SSC) and selective electrochemical neodymium extraction (SENE), followed by upcycling routes into industrial catalysts, complemented by a dedicated intervention on the Digital Product Passport (DPP) to explicitly connect technology outputs with traceability evidence needs and interoperability expectations (European Parliament & Council of the European Union, 2024).

The session then anchored transferability in adoption reality through a techno-economic viability segment focused on downstream end products (including green-ammonia and pharma-related catalyst contexts).

This sequencing operationalised replicability in a manner consistent with the project's task logic: it made explicit what is intended to be transferred, and it clarified how transfer conditions will be evaluated.

Impact and engagement methodology: The workshop then shifted from "what the project delivers" to "how results can travel" by introducing a dedicated framework discussion on stakeholder roles and engagement logic, followed by contributions orientated to clustering, regional innovation alignment, and replication-enabling conditions. In practical terms, this part of the agenda functioned as the methodological bridge between internal packages (data, KPIs, traceability evidence) and external uptake environments: it positioned NEO-CYCLE outputs within the broader ecosystem of Smart Specialisation priorities and cluster-driven value chains, and it provided the consortium with structured feedback on where replication is most realistic (which actor groups, which decision points, and which enabling instruments).

Stakeholders' participation (from alignment to cooperation). In the final block, the format moved from presentations to activation through an elevator-pitch session with selected external initiatives (RAW4RES, ExpSKILLS, CRUSADE and PERMANET) explicitly chosen to represent complementary programmes and communities. This was not a visibility exercise: the purpose was to map concrete intersection points where NEO-CYCLE evidence and methods could be reused, compared, or jointly stress-tested (e.g., shared conventions for traceability evidence, comparable performance/sustainability indicators, or coordinated narratives to support market acceptance).

The workshop concluded with a participatory interactive session facilitated by ISMC. The objective was to translate the preceding inputs into concrete follow-up logic. Participants jointly surfaced shared challenges, identified realistic cooperation opportunities, and clarified what the next interactions should look like (e.g., which topics require bilateral technical exchanges, which are better addressed in a multi-project setting, and which need engagement with policy or standardisation communities).

The session was designed to produce a compact set of priorities that can steer subsequent clustering actions and support auditable follow-up.

It therefore focused on four practical dimensions:

- **Replication focus:** identifying which NEO-CYCLE components participants consider most valuable and reusable.
- **System integration:** assessing whether traceability, recovery and skills are perceived as separate workstreams or as a coupled circular-economy system.
- **Scaling constraints:** prioritising the barriers that clustering can address through alignment, evidence convergence and cooperation formats.
- **Narrative consolidation:** capturing how participants frame the future of critical materials, supporting consistent positioning and shared messaging.

From a methodological standpoint, the questions mapped three core dimensions that determine replicability:

- *What is perceived as most transformative (replication asset),*
- *how stakeholders understand system interdependencies (replication logic),*

- *what is most likely to constrain scale-up (replication constraints).*

The results provide clear signals on where NEO-CYCLE is perceived to generate the highest value, which enabling conditions stakeholders consider essential, and what is most likely to limit scaling:

- **Transformative value and replication assets.** Stakeholders mainly associated NEO-CYCLE's transformative value with tangible circular technology and product outcomes. Traceability was perceived more as enabling infrastructure than as the headline innovation. This supports a practical approach for follow-up: lead engagement with recovery and upcycling outcomes, while positioning the Digital Product Passport and traceability as the mechanism that makes these routes comparable, credible and adoptable at scale (evidence readiness, compliance alignment and interoperability).

- **System logic linking traceability, recovery and skills.** Participants largely framed circularity as an integrated system in which digital traceability, material recovery and professional upskilling evolve together. This supports clustering formats that connect technology developers and pilot actors with data/traceability communities and skills-orientated initiatives.

- **Perceived scaling constraints.** Barriers were mainly linked to the interface between economics, process maturity and enabling governance conditions, followed by infrastructure and ecosystem connectivity challenges. This confirms that replication will depend on credible business and bankability narratives, robust benchmarking and maturity evidence, and convergence on common standards and regulatory-ready approaches.

- **Shared narrative signals from stakeholders.** Recycling was consistently highlighted as central for the future of critical materials and as crucial for Europe's future. At the same time, participants recognised the pathway as demanding, particularly from an economic perspective, yet ultimately promising.

This closing segment is foreseen a critical step in turning a clustering agenda into a replicability mechanism. It provides a structured basis for follow-up that can be tracked through meeting minutes and engagement logs, rather than relying on informal networking. It also supports the definition of action points, responsible contacts and cooperation hypotheses that can be pursued through WP11.

By combining targeted mobilisation through the stakeholder database, complementarity-driven selection of sister initiatives, and an agenda that linked technical evidence, traceability requirements and viability narratives with a participatory cooperation step, the first clustering event translated replicability into a structured and documentable process. Grounded in an agreed agenda, moderated exchanges and explicit participation contexts, it established a traceable foundation for follow-up cooperation and for the progressive transfer of NEO-CYCLE methodologies and evidence packages beyond the consortium.

3.3. NEO- CYCLE operational framework

As established in the roadmap developed for results scalability and mutual integration of technical knowledge, the clustering activities plan—and its links with the other project tasks—is not conceived as an additional activity. Instead, it is framed as a continuous, practical mechanism through which NEO-CYCLE translates technical progress into broader uptake, shared learning, and replication beyond the consortium.

For this reason, Deliverable 11.3 presents the common clustering activities plan as a simple working structure, supported by prior analysis, to decide where the project should engage, with whom, and what each interaction should deliver. This is relevant because the value of clustering depends less on the number of events attended and more on whether interactions lead to traceable cooperation and reusable outputs.

This planning approach aligns directly with the logic of Task 12.3 (M19–M36) and Task 13.3 (M37–M48). Task 12.3 requires the consortium to implement the common clustering plan to foster synergies and coordinated action on policy/regulation/standards, data, and dissemination (supporting Tasks 11.1, 12.1 and 13.1), and to organise one clustering event with other relevant projects and external actors. Task 13.3 shifts the focus from activation to consolidation: it requires the exchange of best practices among synergistic projects, participation in the final clustering event, and the invitation of stakeholders to the presentation of project results during the Final Conference (hybrid). In summary, the project needs an external framework that is easy to execute, but also robust enough to leave auditable evidence and support replicability.

To deliver Tasks 12.3 and 13.3 in a simple and robust way, the plan is built around three basic rules:

- **First, each selected event must have a clear clustering objective.** Not all events serve the same purpose and treating them as equivalent often leads to diffuse outcomes. In NEO-CYCLE, events are therefore selected and labelled according to the function they enable,

as monitored in the internal table developed under D11.2: some serve **benchmarking** (comparing approaches and assumptions with similar initiatives); others support **policy and standards alignment** (linking evidence packages to regulatory or standardisation expectations); and others focus on **cooperation activation** (opening or advancing concrete collaboration with sister projects and key actors). This simple classification supports implementation and helps prioritise the right participants, messages and formats in each context.

- **Second, each interaction must generate a minimum set of auditable evidence.** Clustering creates real value for replicability when it produces cooperation traces that can be recorded, reported and followed up. For this reason, documentation is treated as part of the activity itself, not as an administrative afterthought. As a minimum, each event should be captured through an agenda or session reference, a participant list (or meeting list), a short note/minute's summarising key outcomes, and an action list identifying follow-up steps and responsible persons. This lightweight discipline is sufficient to distinguish meaningful clustering from informal networking and enables consistent reporting across deliverables.

- **Third, the project-led clustering event should function as the main transformation point.** External platforms are essential to broaden reach and identify relevant counterparts, but they rarely provide the controlled conditions needed to turn interest into cooperation. The internal event addresses this by bringing the right actors together in a structured format where the consortium defines the purpose, expected outputs and follow-up mechanism. In practice, this is where contacts generated through external participation are converted into concrete steps: joint dissemination actions, alignment of evidence templates (e.g., traceability and sustainability reporting), convergence on comparable KPIs, or planned technical exchanges. This "conversion" function is critical for replicability, because it turns good conversations into reusable outputs and documented collaboration pathways.

Building on these operating rules, the consortium translates the common clustering plan into a focused set of next actions for the next periods. As a priority, NEO-CYCLE will continue to participate in high-value European clustering platforms and sister-project events where EU initiatives, industrial actors and policy communities converge.

These environments will be used to benchmark approaches, test narratives and implementation assumptions, and identify cooperation-ready counterparts. In line with WP11's coordination role, each participation will be followed by structured documentation and targeted follow-up, ensuring that external engagement feeds directly into auditable cooperation steps and reusable outputs.

Organisation of a NEO-CYCLE-led clustering event with relevant actors (Task 12.3). A dedicated clustering event will be organised with sister projects and key external actors to translate identified synergies into operational collaboration. The event will be designed to produce traceable outputs, such as aligned evidence templates, agreed KPI conventions, and a prioritised action list for follow-up cooperation.

Implementation of recurring online engagement formats. In parallel to physical events, NEO-CYCLE will run online sessions to maintain continuity with stakeholders and sister initiatives. These formats will be used to refine replication conditions, exchange best practices, and advance specific cooperation topics (e.g., traceability evidence and data governance, sustainability accounting, or downstream validation expectations).

Participation in Raw Materials Week and related flagship EU events. NEO-CYCLE will maintain active presence in Raw Materials Week and similar EU-level fora as key milestones for policy-facing clustering, sister-project meetings and coordinated dissemination. These events provide an effective setting to align project evidence with emerging EU expectations on CRMs, circular economy implementation, and standardisation-oriented requirements.

Table 5. Potential external framework of clustering activities' plan

Event / action	Type	Main purpose for NEO-CYCLE clustering	Expected outputs (auditable)
EIT RawMaterials Summit (annual)	External	High-level ecosystem and market-facing networking; identify synergistic projects and exploitation corridors	Follow-up actions list; updated sister-project contacts
Technical/scientific venue on processing and recycling	External	Technical benchmarking; exchange on process maturity, validation approaches and scale-up constraints	Abstract/presentation; evidence of participation; contacts; summary of transferable insights
Raw Materials Week (European Commission, annual)	External	Policy-facing clustering; align narratives with EU priorities; meet sister projects and policy/standards actors	Cooperation proposals and scalability results; dissemination logs, joint visibility items; updated replication map

Industry circular economy expos	External	Market and deployment reality check; engage operators and industry adopters	Key industry feedback points; new leads for uptake, documented exchanges; agreed follow-up actions
European Cluster Cooperations conferences	External	Activate cross-cluster cooperation and identify "collaboration-ready" actors/projects (partners, regions, SMEs, cluster orgs). Strengthen alignment on standards, evidence needs, and replication conditions.	Stakeholder lists; dissemination outputs; synergy actions implemented

Best-practice exchange and final consolidation of clustering outcomes (Task 13.3). As the project advances, NEO-CYCLE will structure an exchange of best practices with synergistic projects and prepare participation in the clustering event. Stakeholders and sister initiatives will be invited to the presentation of project results during the Final Conference (hybrid), ensuring that transferable methods and evidence packages are communicated in a reuse-oriented way.

Development of a scalability and uptake-oriented portfolio. To support replication beyond the project lifetime, NEO-CYCLE will consolidate a structured portfolio of uptake opportunities and investment-relevant pathways linked to its results. This portfolio will be prepared in a format that can be shared through EU-facing channels, including the Raw Materials Information System (RMIS), so that key outputs, evidence packages and exploitation routes remain visible and accessible to external adopters. By aligning portfolio content with RMIS-related dissemination and European raw materials ecosystem practices, NEO-CYCLE strengthens exploitation readiness, supports post-project continuation, and facilitates the practical deployment of its methodologies and circular products in industrial contexts.

4. Conclusions

The clustering activity framework provides NEO-CYCLE with a structured framework to foster collaboration, promote systematic knowledge exchange, and maximise the project's impact beyond consortium boundaries. By combining participation in strategic multi-project environments with targeted, project-led clustering formats, the plan ensures that engagement is not reduced to visibility, but contributes directly to uptake, replication and evidence alignment across the NdFeB

magnet and Critical Raw Materials value chain. In this way, clustering becomes a practical pathway to embed NEO-CYCLE results within the wider European raw materials innovation space.

Through the coordinated implementation of clustering actions, NEO-CYCLE strengthens the conditions for transferability of its outcomes.

The plan supports the progressive convergence of technical approaches and enabling evidence packages, including process performance logic, end-product validation requirements, digital traceability artefacts and sustainability metrics. This improves comparability and reduces fragmentation across initiatives, helping external actors understand not only what NEO-CYCLE delivers, but under which conditions those results can be reused and scaled in other industrial contexts.

The plan also reinforces long-term cooperation by focusing on synergies with sister projects and complementary initiatives operating under different programmes and maturity levels. This approach allows NEO-CYCLE to build replication corridors that extend beyond a single project ecosystem, linking technology development with policy and standards discussions, data and traceability expectations, and dissemination channels with recognised convening power. As a result, clustering contributes to a more coherent European landscape where projects reinforce each other rather than compete through parallel, unconnected outputs.

In policy terms, the clustering activity supports EU priorities on circularity, resilience and strategic autonomy in Critical Raw Materials. By enabling structured dialogue with industrial actors, platforms and public stakeholders, the plan helps align NEO-CYCLE evidence with emerging expectations on due diligence, sustainability reporting, traceability and circular economy implementation. This strengthens the readiness of project outputs for wider adoption and contributes to the broader objective of reducing dependency on volatile primary supply while supporting decarbonisation pathways enabled by circular materials.

Finally, the plan is designed with continuity in mind. By requiring auditable interaction outputs (agendas, minutes, action lists and documented follow-up) and by using internal clustering moments as conversion points from engagement to cooperation, NEO-CYCLE establishes a collaboration architecture that can remain active beyond the project lifetime. In this sense, the plan does not only organise events: it supports the creation of a sustained cooperation ecosystem around circular magnets and rare earth value chains, enabling long-term replication of methods, shared learning and durable stakeholder alignment across Europe.

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