D11.5 "SKILL STRATEGIES PLANNING"

Acronym:
NEO-CYCLE

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

Grant Agreement No:
101138058

Call:
HORIZON-CL4-2023-TWIN-TRANSITION-01

NEO-CYCLE has received funding from the European Union under grant agreement No 101138058.

Funded by the European Union

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Deliverable 11.5	**Skill strategies planning**
Associated WP11	**Communication, Dissemination and Exploitation I**
Associated Task(s) 11.7	**Skills strategy and training activities per specific sector**
Due Date	**31/12/2024**
Date Delivered	**24/12/2024**
Prepared by	**AEI**
Partners involved	**AEI, CONFA, IDE**
Authors	**Ivan Kulchytskyy**
Reviewers	**Macarena García Ayala, María González-Moya**
Deliverable Version	**1.0**
Dissemination Level	**PU**
Keywords	**Training, education, skills, labour, strategy, online, course**

DOCUMENT REVISION HISTORY

Version	Date	Description of change	List of contributor(s)
0.8	10.12.2024	First draft	AEI
0.9	20.12.2024	Update	AEI
1.0	24.12.2024	Final version	AEI, IDE

DISCLAIMER

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

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1. Abstract

This deliverable 11.5, "Skill strategies planning", is a part of Task 11.7. "Skills strategy and training activities per specific sector" (M1-M18).
The project grant agreement foresees the development of 13 training courses (6 presence courses and 7 online courses) targeting soft and technical skills to promote inclusion and new jobs in the value chains.

The deliverable describes the skills strategy and the plan for the project's training activities. This strategy targets current gaps, enhances interdisciplinary collaboration, and prepares stakeholders for emerging recycling and sustainable technology trends.

The deliverable analyses the recommendations of the European Agenda for Skills, Pact4Skills, analytical materials, conclusions and proposals of UNIDO, OECD, UN, World Economic Forum, World Bank, as well as various well-known think tanks.

The deliverable presents the new skills needed by the project contents and how training will be accessible, light, and efficient. The training activities were designed and planned based on a strong scenario analysis in 2030 (short term) and in 2040 (medium term) thanks to the experience collected in previous EU projects and the Pact4Skills initiative driven by the EU Commission.

This skills strategy plan will empower the consortium to effectively execute the NEO-CYCLE project, drive innovation, and contribute to Europe's green transition while setting a benchmark for future sustainable projects.

The deliverable consists of four sections and three annexes.

Expected Outcomes of training activities NEO-CYCLE project:

- Improved technical and process-related skills for sustainable and efficient recycling of NdFeB magnets.
- Enhanced interdisciplinary collaboration between consortium partners and stakeholders, improving the exchange of knowledge and experience.
- Better understanding European policies and regulations, ensuring project outputs sustainability.
- Expanded entrepreneurial and innovation capacities men and women to support the development and market introduction of new recycling technologies.
- Supporting the development of new soft skills to improve the performance of the waste management sector.

2. Analysis of skills needs for the labour market by 2030-2040

Forecasts of changes in the labour market are closely linked to forecasts of changes in the economy and society. Technological competition is intensifying between the world's leading countries, which directly impacts economic development, security and the well-being of citizens.

When analysing the labour market needs, we considered the recommendations of the European Skills Agenda, Pact4Skills, analytical materials, conclusions and proposals of UNIDO, OECD, United Nations, World Economic Forum, World Bank, as well as various well-known think tanks and analytical centres.

We also consider it appropriate to consider the following key points of the Horizon Europe strategic plan for 2025-2027[1] and Mario Draghi's report "The future of European competitiveness"[2]

Among the publications on the Internet, we would like to highlight Global Green Skills Report 2023[3] The report identifies trends at the intersection of the workforce and sustainability, based on the activity of more than 930 million LinkedIn users worldwide. This report includes critical questions that policymakers, business leaders, and others might explore as they seek to develop regulations, programs, and policies that foster green skills development and create pathways for workers to transition into jobs that help green the planet.

The labour market landscape from 2030 to 2040 is poised for dramatic evolution, shaped by rapid technological advancements, climate action imperatives, demographic changes, and the need for global resilience in the face of pandemics and conflicts.

The labour market between 2030 and 2040 will demand a multifaceted set of skills that extend beyond technological experience. Workers will need to be digitally fluent, environmentally conscious, adaptable, and equipped with strong soft skills to be succeed. These requirements highlight the need for targeted policies and partnerships between educational institutions, governments, and industries.

[1] European Commission: Directorate-General for Research and Innovation, *Horizon Europe strategic plan 2025-2027*, Publications Office of the European Union, 2024, https://data.europa.eu/doi/10.2777/092911
[2] https://commission.europa.eu/topics/strengthening-european-competitiveness/eu-competitiveness-looking-ahead_en#paragraph_47059
[3] https://economicgraph.linkedin.com/research/global-green-skills-report

2.1. Impact of major technological changes

The most significant changes in the labour market are expected to come from using new solutions based on artificial intelligence technologies. Already, some companies have laid off some employees and transferred some functionality to artificial intelligence.

AI technologies are penetrating all sectors of the economy and social life. Regulating the use of these technologies is on the agenda. However, the development of artificial intelligence technologies will undoubtedly bring about significant changes in the intellectual labour market as early as 2030.

The Fourth Industrial Revolution is characterized by a fusion of technologies that blur the lines between physical, digital, and biological spheres. From AI-driven automation to the expansion of digital infrastructure, technology continues to redefine work and life. The workforce of 2030-2040 will need:

- **Advanced Programming and Data Science**: Proficiency in advanced coding languages and data science will be crucial as data-driven decision-making becomes mainstream. Skills in AI, machine learning (ML), and neural network development will be essential for designing and managing intelligent systems across industries.
- **Cybersecurity Expertise**: With the expansion of digital assets comes the increasing risk of cyber threats. Cybersecurity specialists who can design and implement robust security protocols will be highly sought after, ensuring the safety of data and systems.
- **Digital Project Management**: Understanding digital workflows, project management tools, and software development methodologies will be key to managing complex projects that incorporate remote and hybrid teams.

The European Skills Agenda emphasizes that these technical skills must be nurtured through comprehensive digital education and training programs, ensuring inclusivity so that workers from various backgrounds can participate in the digital economy.

Developed countries are already making changes to their secondary and higher education programs to ensure that new technology industries have the right employees in 2030-2040. For example, the STEM approach[4] is of great importance. STEM is an acronym for Science, Technology, Engineering and Math education. The need for a workforce proficient in science and technology extends beyond traditional engineering roles and touches multiple sectors based on an interdisciplinary approach.

[4] https://school-education.ec.europa.eu/en/learn/courses/stem-education

The United Nations recognizes that educational disparities in STEM fields need to be addressed to ensure equitable access to these growing opportunities. This requires strategic investments in education systems that encourage STEM learning from an early age.

2.2. Green Skills and Sustainability Expertise

Environmental sustainability is no longer an option but a necessity. The global shift toward sustainable practices across industries requires skills that support the transition to a green economy. Key competencies include:

- **Sustainable Engineering and Renewable Energy Technology**: Engineers and technicians will need to design and implement energy-efficient solutions. Knowledge in renewable energy sources, smart grid technologies, and sustainable materials science will drive progress toward climate targets.
- **Environmental Impact Assessment**: The ability to analyse and minimize environmental impacts will be crucial for compliance and sustainability reporting. Professionals skilled in conducting life cycle assessments and implementing eco-friendly production methods will be in high demand.
- **Circular Economy Practices**: Understanding circular economy principles—where resources are reused and waste is minimized—will be vital. Workers will need to be familiar with processes that facilitate recycling, upcycling, and sustainable resource management.

UNIDO and OECD reports underscore the urgency of equipping the workforce with these green skills to meet global commitments, such as the Paris Agreement, and to drive sustainable economic growth.

2.3. Soft Skills and Adaptability

The complexity of the modern work environment necessitates a workforce adept in both technical and soft skills. The *OECD* highlights that the ability to adapt, think critically, and communicate effectively will remain critical in navigating workplace challenges. The most prominent soft skills include:

- **Problem-Solving and Critical Thinking**: Employees will need to synthesize information from multiple sources, make informed decisions, and develop innovative solutions to complex problems. This is especially relevant in roles involving data analysis, strategic planning, and project management.
- **Emotional Intelligence and Leadership**: As work becomes increasingly collaborative, the ability to manage interpersonal relationships judiciously and empathetically is invaluable. Leadership will require not just authority but also the capacity to inspire, motivate, and manage diverse teams.

- **Agility and Flexibility**: Workers must be prepared to shift roles, adapt to new technologies, and engage in cross-functional tasks. This capacity to embrace change will be central in a world where disruptions—whether technological, economic, or environmental—are frequent.

The Pact4Skills initiative advocates for cooperative efforts between governments, educational institutions, and businesses to promote these soft skills and ensure workers can pivot effectively as roles evolve.

Future workers will need to develop expertise that crosses traditional boundaries, facilitating collaboration across disciplines to drive innovation and problem-solving. This interdisciplinary approach will include:

- **Integration of Technical and Social Sciences**: A blend of technological, economic, and social expertise will enable workers to contribute more meaningfully to solving complex challenges, from urban planning to global health.
- **Commitment to Lifelong Learning**: To keep pace with the rapid evolution of skills needs, lifelong learning will be an imperative. This will require the development of continuous education and professional development pathways that are accessible, flexible, and tailored to diverse learning preferences.

The OECD suggests that governments and private sectors should work collaboratively to create policies and programs that support these pathways, ensuring that workers can refresh their skills throughout their careers.

The future of work must prioritize inclusivity, fostering a diverse and equitable workforce. This focus includes:

- **Diversity and Inclusion Training**: Understanding how to work in multicultural and diverse teams will be necessary to foster a positive and productive work environment.
- **Ethical AI and Bias Mitigation**: Professionals who understand how to design and manage AI systems that are free of bias will be crucial in promoting fairness in technology. This includes building algorithms that respect diversity and uphold ethical standards.
- **Social and Civic Competence**: Workers will also need to contribute to a fairer society by supporting initiatives that bridge gaps and support community well-being.

The United Nations emphasizes that social skills should be part of a comprehensive strategy that links human rights, economic development, and environmental sustainability to job creation.

2.4. The skills needed by the NEO-CYCLE project content.

The main goal of **NEO-CYCLE** is to bring to the EU a sustainable (*techno-economically* viable matching products supply vs demand and integrating digitalisation, *socially* profitable and accepted, *environmentally friendly*, and developed taking into account the *regulations and legal development)* process for the upcycling of EoL NdFeB magnets from HDDs, managing to create novel, inclusive and democratic business models, with social benefits in all population sectors

The NEO-CYCLE project focuses on the upcycling of EoL NdFeB magnets for green applications, involving a consortium of stakeholders with diverse backgrounds in research, industry, technology, policy, and sustainability.

The project will create and test in practice new technological solutions for the recycling of waste Electrical & Environmental Equipment (WEEE). To maximise the project's potential and ensure effective use of the results, it is necessary to provide the project target groups with new technological knowledge and new business models for the use of new waste recycling technologies in the economy and to involve citizens in waste collection and recycling actively.

The main needs for technological knowledge and soft skills related with project activities:

- State-of-the-art knowledge and practices related to material recovery and chemical processing.
- The digital capabilities needed for advanced recycling technologies and data-driven decision-making.
- Comprehensive understanding and practical application of sustainability principles.
- The ability to integrate new technologies into existing operations for improved efficiency and sustainability.
- Innovative thinking and entrepreneurial skills to foster the development and commercialisation of new technologies.
- Awareness of relevant European policies, standards, and sustainability regulations.
- Skills to evaluate the broader impact of recycling processes on the environment and society.
- Interdisciplinary collaboration skills and leadership on stakeholder engagement and public.

Between 2020 and 2024, the European Commission has supported numerous projects to enhance innovation skills and facilitate the green transition. These initiatives have yielded several key recommendations to equip the workforce with the necessary competencies for a sustainable and competitive future. Below are the most significant recommendations that should be considered when planning educational and training activities for the NEO-CYCLE project.

No	Skills	Recommendation	Source
1.	Integration of digital and green skills	Develop integrated training programs that combine digital literacy with environmental sustainability principles	Green Deal Projects Support Office[5]
2.	Adaptation to the rapid pace of technological and environmental changes	Establish accessible lifelong learning platforms and incentivize continuous professional development	European Skills Agenda for sustainable competitiveness, social fairness and resilience[6]
3.	Soft skills such as adaptability, problem-solving, and collaboration are crucial for the green transition	Integrate soft skills development into training curricula	Report "Research and Innovation for Climate Neutrality by 2050: Challenges, Opportunities and the Path Forward"[7]
4.	The transition to a circular economy requires new skills in design thinking, lifecycle analysis, and resource optimization	Integrate circular economy principles into higher education and professional training programs.	New Circular Economy Action Plan[8]
5.	Fostering entrepreneurial skills for green innovation	Implement entrepreneurship education programs focused on sustainable business practices, eco-innovation, and social enterprise	OECD Skills Strategy[9]
6.	Developing cross-cultural and collaborative competencies. The green transition is a global endeavor, there is a need for workers who can collaborate across borders and understand different cultural and regulatory contexts.	Implement international exchange and training programs that promote cross-border cooperation and the sharing of best practices in sustainability.	United Nations Sustainable Development Goals (SDGs)[10]

Table 1. The skills related to the NEO-CYCLE project content

[5] https://projects.research-and-innovation.ec.europa.eu/en/strategy/strategy-2020-2024/environment-and-climate/european-green-deal/green-deal-projects-support/green-deal-resources/going-green-and-digital-upskilling-eu-competitive-future
[6] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0274
[7] https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/new-report-research-and-innovation-climate-neutrality-2050-challenges-opportunities-and-path-forward-2024-03-04_en
[8] https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en
[9] https://www.oecd.org/en/topics/sub-issues/skills-strategies.html
[10] https://www.un.org/sustainabledevelopment/

3. NEO-CYCLE project consortium as source of knowledge and experience for training activities

NEO-CYCLE consortium is a multidisciplinary team of 23 partners from 12 countries to be able to demonstrate the technical, economic, and social feasibility of the developed solution and bring it to the next level paving the market uptake.

Each of them contributes to a core activity to the consortium and interacts with other partners in a direct way. The consortium is composed of 2 WEEE recycler SME companies, 4 public and non-public research organisations, 6 universities, 4 end-users that will demonstrate the viability of the upscaled processes as well as the validation of the obtained upcycled products, 1 SME company focused on sustainability assessments, 1 expert cluster in stakeholders' engagement in materials value chains, 2 SME companies dealing with social participation, communication, dissemination and 2 NGOs for skills development and standardisation. Additionally, a public authority (Lombardy Region) is also associated partner.

The project will envisage close cooperation between the partners, interrelation between the partners, increasing knowledge transfer and working together to achieve the common purpose.
The kick-off meeting in Seville on 5 September 2024 demonstrated that all project partners understand the importance of sharing knowledge and experience to achieve the project's goals.

3.1. Brief description of the NEO-CYCLE project partners

Below is a short description of the partners' experience and their potential contributions in the preparation of education and training materials and participation in training events as experts:

1. **Idener Research & Development Agrupacion de Interes Economico (Spain)**
    - *Expertise*: Specializes in industrial process optimization, systems engineering, and the integration of innovative technologies. The company is the project coordinator and has a wide experience in EU research, with a portfolio of 59 funded projects within the last 10 years.
    - *Contribution*: Will lead the development of efficient, scalable processes for the electrochemical decomposition of waste NdFeB magnets, ensuring integration with existing industrial systems. The company will conduct a demonstration campaign on the use of new waste recycling technologies at a pilot plant.
2. **Technische Universität Bergakademie Freiberg (Germany)**
    - *Expertise*: Renowned for research in materials science, metallurgy, and recycling technologies.

- *Contribution*: Will provide advanced methodologies for material recovery, focusing on the extraction of rare earth elements from electronic waste.

3. **Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (Germany)**
   - *Expertise*: Europe's leading organization for applied research, with extensive experience in bridging academic research and industrial application.
   - *Contribution*: Will offer applied research solutions, particularly in developing and validating technologies for material upcycling.
4. **Universitat Politècnica de Catalunya (Spain)**
   - *Expertise*: Focuses on engineering and technology research, with strengths in sustainable processes.
   - *Contribution*: Will contribute to the design and optimization of sustainable engineering solutions for the recycling process.
5. **Politecnico di Torino (Italy)**
   - *Expertise*: Known for research in engineering and applied sciences, including materials engineering.
   - *Contribution*: Will assist in developing innovative materials and processes for the synthesis of catalysts from recovered elements.
6. **Flamma S.p.A. (Italy)**
   - *Expertise*: A chemical manufacturing company with experience in producing pharmaceutical intermediates.
   - *Contribution*: Will provide industrial-scale chemical processing capabilities, facilitating the transition from laboratory research to commercial application.
7. **Politechnika Warszawska (Poland)**
   - *Expertise*: Engaged in developing leading-edge green technologies, particularly in catalyst synthesis for ammonia production.
   - *Contribution*: Will leverage catalytic expertise to develop a new generation of ammonia synthesis catalysts using recovered elements, aiming for properties comparable or superior to existing systems.
8. **RMF Tech GmbH (Germany)**
   - *Expertise*: Specializes in technology development and innovation, particularly in recycling technologies.
   - *Contribution*: Will provide technological solutions and innovations pertinent to recycling and material recovery, enhancing the project's technological framework.
9. **Vytauto Didžiojo universitetas (Lithuania)**
   - *Expertise*: Conducts multidisciplinary research with a focus on environmental sciences and sustainable development.
   - *Contribution*: Will contribute research on environmental impact assessments and sustainable practices within the recycling processes.
10. **L'Urederra Fundación para el Desarrollo Tecnológico y Social (Spain)**

- *Expertise*: Focuses on technological development and social innovation, promoting sustainable technologies.
- *Contribution*: Will develop technologies with social impact, relevant to sustainable recycling practices, and facilitate community engagement.

11. **Laser Consult Muszaki-Tudomanyos Es Gazdasagi Tanacsado Korlatolt Felelossegu Tarsasag (Hungary)**
    - *Expertise*: Provides technical and economic consultancy services. The company has a strong background in knowledge and IPR management, the exploitation of research results, technology transfer, technology marketing and communication, and business planning.
    - *Contribution*: Will offer consultancy on the economic feasibility and scalability of the recycling processes, ensuring financial viability and support communication strategy.
12. **Non-governmental Agency of European Innovations (Ukraine)**
    - *Expertise*: Promotes innovation and technology transfer across Europe.
    - *Contribution*: Will facilitate innovation dissemination and collaboration among European entities, end users, citizens enhancing the project's reach and impact.
13. **Fraunhofer Austria Research GmbH (Austria)**
    - *Expertise*: Engages in applied research and development, focusing on industrial applications.
    - *Contribution*: Will offer applied research services, focusing on industrial applications and process improvements, bridging research and industry.
14. **Asociația de Standardizare din România (Romania)**
    - *Expertise*: Specializes in standardization and quality assurance.
    - *Contribution*: Will ensure that project outcomes align with European standards and quality benchmarks, facilitating regulatory compliance.
15. **Confederazione Generale dell'Agricoltura Italiana (Italy)**
    - *Expertise*: Focuses on agricultural development and policy.
    - *Contribution*: Will provide insights into sustainable practices and policies, potentially applicable to bio-based materials and recycling processes.
16. **Holistic And Ontological Solutions For Sustainability, Lda. (Portugal)**
    - *Expertise*: Offers sustainability consulting and solutions.
    - *Contribution*: Will provide holistic approaches to sustainability challenges, integrating environmental, social, and economic aspects into the project.
17. **Ecoreset SA (Greece)**
    - *Expertise*: Specializes in environmental solutions and waste management.
    - *Contribution*: Will offer expertise in eco-friendly waste management and recycling technologies, enhancing the project's environmental sustainability.
18. **Stena Recycling Srl (Italy)**
    - *Expertise*: Engages in recycling and resource management.

- *Contribution*: Will bring practical experience in recycling processes and resource recovery, facilitating the implementation of upcycling methodologies.

19. **Università degli Studi di Pavia (Italy)**
    - *Expertise*: Conducts scientific research and higher education, with strengths in materials science.
    - *Contribution*: Will contribute academic research in materials science and environmental sustainability, supporting the development of new materials.
20. **Clúster Nacional para la Minería Sostenible y Servicios Asociados de la Península Ibérica (Spain)**
    - *Expertise*: Focuses on sustainable mining and associated services.
    - *Contribution*: Will provide insights into sustainable extraction and processing of raw materials, relevant to the sourcing of materials for recycling.

21. **EcoCastulum (Spain)**
    - *Expertise*: Specializes in ecological sustainability and conservation practices.
    - *Contribution*: Will contribute experience in implementing eco-friendly and conservation-oriented processes, helping to align the recycling methods with best practices for environmental preservation.
22. **Casale SA (Switzerland)**
    - *Expertise*: An established player in chemical engineering and process technology, known for designing and constructing chemical plants and providing innovative solutions in chemical processes.
    - *Contribution*: Will provide high-level chemical engineering expertise, contributing to the design of efficient chemical processes for material recovery and upcycling. This includes developing advanced techniques for handling rare earth elements and ensuring that processes are both effective and scalable for industrial application.
23. **Regione Lombardia (Italy)**
    - *Expertise*: A regional governance body with experience in policy-making and regional development initiatives.
    - *Contribution*: Will support the project by providing insights into policy implementation and regional strategies for scaling up the recycling processes. This includes facilitating regulatory approvals and promoting best practices in environmental and industrial policies across the region.

3.2. Synergy and cooperation between partners in educational and training activities

The NEO-CYCLE consortium is composed of a diverse mix of stakeholders with specialized expertise across various sectors. Their combined experience is vital for addressing the complex challenges of upcycling NdFeB magnets into valuable resources for green applications. The following highlights summarize their potential contributions in educational and training activities:

- **Academic Institutions**: The consortium includes six leading universities from Germany, Spain, Italy, Poland and Lithuania). They provide the scientific foundation for developing new materials and methods that support sustainable recycling and upcycling. Universities have a wide range of teaching methods and tools. The results of the project will be used to create new undergraduate curricula for PhD training and for short-term courses for different target groups of students. In the course of the project, representatives of the universities will be involved not only in the preparation of the 13 planned courses but will also conduct separate offline and online seminars on their premises.
- **Research Organisations**: Renowned institutes like Fraunhofer-Gesellschaft and Fraunhofer Austria Research GmbH act as a bridge between theoretical research and practical, industrial applications. Their expertise in applied research ensures that innovative recycling methods can be tested, validated, and scaled. We expect these institutes to provide information and demonstration materials for use in the project's educational and training activities.
- **Industry Players**: Companies such as Flamma S.p.A., Stena Recycling Srl, and Casale SA bring extensive experience in chemical processes, large-scale recycling, and resource management. Their participation ensures that the project outcomes are feasible for industrial applications and meet economic and environmental benchmarks. The description of the practical use of recycling technologies in real industrial environments will be very useful for conducting educational and training activities of the project.
- **Standardization Body**: Asociația de Standardizare din România provides the necessary regulatory, policy, and standardization expertise to ensure that the project outcomes comply with EU regulations and are adaptable for broader implementation within the European framework. The coverage of standardisation issues is important for all educational and training activities of the project.
- **Cross Cutting Consultancy Experts**: Stakeholders such as Ecoreset SA and Holistic And Ontological Solutions For Sustainability, contribute deep knowledge in sustainable practices and environmental management, ensuring that the project remains aligned with eco-friendly principles and maximizes its positive impact on the environment. Specialised clusters and associations like the Clúster Nacional para la Minería Sostenible and Confederazione Generale dell'Agricoltura Italiana offer niche knowledge in mining and sustainable extraction, crucial for sourcing raw materials in an environmentally responsible manner. These organisations can adapt the project's training materials to the needs of their members.

The diverse expertise among consortium members creates opportunities for robust synergies to develop and implement educational and training activities of the project.
We consider these activities of the NEO-CYCLE consortium partners in a broader context than the 13 training courses specified in the grant agreement.

Nowadays, people can acquire new knowledge and experience from different sources and methods. The quality of basic education in schools and universities is undoubtedly important. Later, personal and professional development depends on the effectiveness of using lifelong learning tools.

The NEO-CYCLE Consortium plans to effectively use modern learning tools for direct and indirect learning based on the content generated by project partners and invited experts (see the next section of the deliverable).

4. NEO-CYCLE educational and training activities

NEO-CYCLE educational and training activities are an important part of all NEO CYCLE project activities.

The project grant agreement foresees the development of 13 training courses (6 presence courses and 7 online courses) targeting soft and technical skills to promote inclusion and new jobs in the value chains.

The different courses for skills will be organised by involving external experts and experts within the consortium; and will be organised by civil-society representative **NGO Agency of European Innovations** (**AEI),** with support of **Confederazione Generale dell'Agricoltura Italiana** (**CONFA)**; both experienced in training activities**.**

The project's education and training activities are part of the consortium's broader and more collaborative activities under the WP11-WP13 Communication, Dissemination, Exploitation and Training work packages.

The new knowledge and experience of the project partners, which they will acquire during the implementation of other project work packages, will also be used for the project's educational and training activities.

4.1. Presence and online training courses

NEO-CYCLE produces highly effective results to support the transition to a circular economy based on advanced recycling technologies and Industry 4.0. Using these results will require new knowledge and skills from professionals working in different industries. NEO-CYCLE also envisages the development of inclusive business models that include tools for engaging active stakeholders, local communities, civil society and the use of various programmes to develop waste collection and recycling skills.

The NEO-CYCLE training courses include technical (hydrometallurgy, electrochemistry, and environmental), essential soft skills, and women's inclusion and leadership in engineering projects. Representatives of NEO-CYCLE project partners and external experts will be invited to speak and train in the courses. Training materials will be illustrated with practical examples, and interactive and other methods will be used to effectively engage the audience in the learning process.

Table 2 below presents the main 13 courses of the NEO-CYCLE project.

No	Course type	Course topic	Responsible partner	Due date
1.	Presence	Course for soft skills development in Brussels	AEI	M12
2.	Online	Basic course on hydrometallurgy for metals dissolution and separation	CONFA	M18
3.	Online	Basic course of electrochemistry for metals dissolution and separation	CONFA	M18
4.	Online	Workshop for women leadership development	AEI	M18
5.	Presence	Course for soft skills development in Barcelona	AEI	M24
6.	Presence	Course in Brussels for inclusion of women in engineering and leading positions	AEI	M24
7.	Presence	Advanced course on hydrometallurgy for metals dissolution and separation	CONFA	M24
8.	Online	Training course for material flow analysis quantification	CONFA	M30
9.	Online	Workshop for women leadership	AEI	M36
10.	Presence	Course for soft skills development in Berlin	AEI	M36
11.	Presence	Advanced course on electrochemistry for metals dissolution and separation	CONFA	M36
12.	Online	Webinar for circular economy – upcycling approaches in the agriculture sector	CONFA	M40
13.	Online	Webinar for environmental energy assessments	AEI	M42

Table 1. The main 13 courses of the NEO-CYCLE project

Technische Universität Bergakademie Freiberg (TUF) and Fraunhofer Institute for Ceramic Technologies and Systems (IKTS) will host technically advanced courses (CONFA, M24 and M36). As part of these courses, visits to laboratories and pilots and invitations to external experts are planned.

4.2 Process of preparing and conducting training courses

This process has three main phases: course preparation, conducting, reporting, and disseminating results.

Course preparation phase:

- Developing the course program and content.
- Identification of the target group of participants.
- Search and recruitment of experts: teachers and trainers.
- Agreeing on the date, place and format of the course.
- Preparation of the information sheet and registration form.

A template for describing the course information is provided in Annex 1

Course delivery phase:

- Posting information about the course on the project website, social networks and information channels of NEO-CYCLE project partners.
- Sending targeted mailings and invitations to potential participants.
- Coordinating financial issues - payment for the necessary services for renting premises, coffee and tea and meals for participants, payment for the work of experts and, if necessary, payment for additional technical services, such as printing necessary materials.
- Conducting the course according to the prepared plan: registering participants, moderating the learning process, and providing technical assistance to trainers and speakers.

The reporting and dissemination phase:

- Preparation of an information report on the results of the course.
- Posting course materials on the project's web resources.
- Obtaining feedback from participants on the effectiveness and quality of the course.
- Preparation of information in the format of input for deliverable D12.2 Report on Training Programs and D13.6 Final report on Training Programs.
- Dissemination of the training course materials among the NEO-CYCLE project target groups.

The evaluation questionnaire template is provided in Annex 2, and the course report template is in Annex 3.

4.3 Organisational, technical and financial support for training courses

NGO Agency of European Innovations (AEI) is responsible for conducting courses on soft skills and women's leadership development.
Confederazione Generale dell'Agricoltura Italiana (CONFA) is responsible for conducting courses on new technologies in hydrometallurgy and electrochemistry and on the practice of using different upcycling approaches in the agricultural sector.

CONFA has a budget to support the training courses. The budget includes payment for the rent of premises for the presence courses and payment for the services of external experts. AEI provides technical support for online courses using a paid ZOOM system version.
The NEO-CYCLE consortium partners are involved in delivering the training courses within their budget for the WP11-WP13 work packages.
To use the project budget efficiently, the time and place of some presence courses will be synchronised with the time and place of the consortium partners' meetings.
Such meetings are held every six months according to the plan agreed with the project coordinator.

While preparing the training courses, AEI and CONFA will hold online meetings with project partners to discuss the details of the course content, select experts and trainers, and develop the course programs. Particular attention will be paid to selecting the skills to be developed within the project's training activities.

In this context, preparing training materials based on the results obtained in executing the WP4-WP10 work packages is important. The universities that are partners of the NEO-CYCLE project can organize local training events using the project's results. The experience of conducting these local training events is important for considering the needs of the project target groups and developing effective training course programs.

5. Annexes

Annex 1. Template for describing the course information

This template will help plan and execute an effective training event, ensuring that all consortium members and stakeholders enhance their collaborative and adaptive capabilities for the successful execution of the NEO-CYCLE project.
Samples of filling in individual items are provided for planning a soft skills development training.
This template is also suitable for planning a training session on developing technological knowledge and skills.

1. Event Overview

- **Title of the Event**: [Name of the training event]
- **Objective**: [A clear statement outlining the purpose of the event, such as fostering communication, collaboration, leadership, and problem-solving skills to enhance the effectiveness of project implementation].
- **Target Audience**: [Consortium members, main stakeholders, project managers, researchers, industry partners, policy advisors, sustainability experts and and representatives of various sectors of the economy].
- **Duration**: [e.g., 1-day workshop, 2-day seminar, 4-week online course]
- **Date and Venue**: [Date, location, or ZOOM virtual platform]
- **Organizing Body**: [Consortium member or organization leading the event]
- **Facilitators/Instructors**: [Names and brief backgrounds of instructors]

2. Objectives and Expected Outcomes

- **Primary Goal**: [Ex. to enhance essential soft skills that improve the collaborative and innovative capabilities of the NEO-CYCLE project team].
- **Key Outcomes**:
    - Improved interdisciplinary communication and collaboration.
    - Strengthened leadership and decision-making abilities.
    - Enhanced problem-solving and conflict resolution skills.
    - Greater adaptability to project challenges and dynamic environments.

3. Event Structure and Agenda [This should be adapted to the theme of a concrete event]

- **Event Format**:
    - Opening Session: Welcome remarks, overview of event objectives.
    - Interactive Workshops: Sessions focused on specific soft skills (e.g., effective communication, teamwork, leadership).
    - Group Exercises: Hands-on activities that foster collaboration and problem-solving.
    - Case Studies: Real-world scenarios and their analysis to build practical knowledge.

   - Panel Discussion: Insights from key stakeholders on the importance of soft skills in the project's context.
   - Networking Session: Time for participants to connect and discuss shared experiences.
   - Closing Remarks and Feedback Collection.
- **Detailed Agenda**: [This should be adapted to the theme of a concrete event]
   - *09:00-09:30*: Welcome and Opening Remarks
   - *09:30-11:00*: Workshop 1 – Effective Communication in Cross-Disciplinary Teams
   - *11:00-11:15*: Break
   - *11:15-12:45*: Workshop 2 – Leadership and Strategic Decision-Making
   - *12:45-14:00*: Lunch Break
   - *14:00-15:30*: Group Exercise – Problem-Solving in Complex Project Scenarios
   - *15:30-16:15*: Panel Discussion – Stakeholder Insights on Collaborative Projects
   - *16:15-16:45*: Networking Session
   - *16:45-17:00*: Closing Remarks and Feedback

4. Content Outline [This should be adapted to the theme of a concrete event]

- **Module 1: Communication Skills**
   - Importance of clear and concise communication.
   - Techniques for effective communication in multi-disciplinary and multicultural teams.
   - Tools for virtual and in-person collaboration.
- **Module 2: Team Collaboration and Conflict Resolution**
   - Strategies for building trust and cooperation.
   - Techniques for managing and resolving conflicts constructively.
   - Best practices for facilitating collaborative meetings.
- **Module 3: Leadership and Decision-Making**
   - Characteristics of effective leadership in project settings.
   - Decision-making frameworks and methods.
   - How to empower and motivate teams in challenging circumstances.
- **Module 4: Problem-Solving and Adaptability**
   - Structured approaches to problem-solving (e.g., design thinking).
   - Techniques to foster adaptability and resilience in project workflows.

5. Interactive Components [This should be adapted to the theme of a concrete event, the scenario may be different]

- **Group Exercises**: Teams will collaborate on simulated project challenges to practice real-time problem-solving.
- **Role-Playing Activities**: Participants will role-play scenarios where they need to navigate conflicts and negotiate solutions.

- **Case Studies and Analysis**: Evaluation of past project successes and challenges to highlight lessons learned and best practices.

6. Materials and Resources [This should be adapted to the theme of a concrete event]

- **Preparation Materials**: Pre-event reading materials or videos to provide context.
- **Event Kit**: Worksheets, templates for strategic planning, and guides for communication exercises.
- **Post-Event Resources**: Access to recorded sessions, presentation slides, and further reading material.

7. Assessment and Feedback Mechanisms [This should be adapted to the theme of a concrete event]

- **Assessment Method**: Brief post-event questionnaire or quiz to evaluate understanding and retention of key concepts.
- **Feedback Collection**: A structured feedback form for participants to share their thoughts on the event's content, organization, and applicability.
- **Post-Event Follow-Up**: A report summarizing feedback, key insights gained, and recommendations for future soft skills training.

8. Logistics and Support [This should be adapted to the theme of a concrete event]

- **Registration Details**: How participants can register.
- **Event Support**: Contact information for queries or technical assistance.
- **Technical Requirements**: List of required equipment or software for virtual participation.

9. Budget Outline [This should be adapted to the theme of a concrete event]

- **Estimated Costs**: Itemized list of expenses for organizing the event (e.g., facilitator fees, venue rental, materials, and refreshments).
- **Funding Sources**: Contributions from project budgets, grants, or partner sponsorships.

10. Promotion and Outreach Strategy [This should be adapted to the theme of a concrete event]

- **Communication Channels**: Email campaigns, project newsletters, and consortium meetings.
- **Key Messages**: Highlight the benefits of attending, such as improved project collaboration and personal skill growth.
- **Engagement Strategy**: Interactive invitations or pre-event surveys to pique interest.

11. Risk Management [This should be adapted to the theme of a concrete event]

- **Potential Risks**: Low participation, technical issues, or scheduling conflicts.
- **Mitigation Strategies**: Early registrations, backup facilitators, and alternative schedules.

Annex 2. Template for describing the evaluation questionnaire

SATISFACTION QUESTIONNAIRE

NEO-CYCLE Training event

Date and place

Please take a few minutes to complete the following questionnaire & return it to the organisers' team.
You can provide your contact details at the end of this form if you wish.

EVALUATION OF THE COURSE

How do you rate the course overall? (Please circle)
Excellent Very Good Good Satisfactory Poor

How do you rate the course structure used?
Excellent Very Good Good Satisfactory Poor

What were your expectations from this event? Please list specific objectives:

1)

2)

3)

How do you rate the extent to which these objectives were achieved?
Excellent Very Good Good Satisfactory Poor

How do you rate the course materials (presentations, profiles etc.)?
Excellent Very Good Good Satisfactory Poor

How do you rate the speakers and trainers of the course
Excellent Very Good Good Satisfactory Poor

What was the most beneficial aspect of the course?

What would you suggest improving for future courses?

What other topics or themes are of interest to you for the following events?

____

____

COMMENTS

____

____

____

____

____

____

____

____

Information about the participants
(fill in if you want to receive a personal response)

Your name	
Your organisation	
Organisation type (Please circle)	University NGO Research Institute SME Industry Other (please specify):________________________
Your position	
Your country	
E-mail address	

Annex 3. Template for describing the course report

Key sections of the report

1. GENERAL INFORMATION

Title	Name of the course
Date	
Location	This filled for a presence course
Objectives	.
Scope	
Participants	Number of participants and type of their organisations
Video	This filled for online courses
Materials (Presentations etc.)	Link for publications on the Internet or cloud resource, link to access photos of the course

2.EVENT'S PREPARATION

Describe the process of preparing the course proposed to be conducted in accordance with Annex 1

3. MEETING MINUTES

Present the details of the course, what were the topics, what were the questions of the participants, how the speakers and trainers presented the material.

SUMMARY OF THE EVENT

Brief summary of the course, whether the course objectives were achieved.
Short results of the questionnaires completed by the participants.

ANNEXES

In the annexes, we suggest including: Agenda, Questionnaire for feedback from participants, Participants list.