Lifelong Learning Course for skills & competences in the Copper sector

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SkiComCu certification programme report

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Description:	The SkiComCu certification programme report (SkiComCu Deliverable D5.2) outlines all actions carried out for the preparation of the certification programme and the key aspects of the SkiComCu target certification programme. The certification programme report comprises the following contents: 1) Executive Summary; 2) Introduction; 3) Scope of the certification programme; 4) Governance of the certification programme; 5) Types of credentials and explanation of the function of microcredentials; 6) Stakeholder support; 7) Requirements for certification; 8) Evaluation and award of credentials; and 9) Conclusions).
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Executive Summary

The present document is the SkiComCu certification programme report. The objective of the report is to prepare the guidelines and principles for the development of the target SkiComCu certification programme. The primary aim is the development and implementation of a micro-credentials-based certification program which will be incorporated into the ready-to-use SkiComCu training materials and tools.

Micro-credentials are a key instrument for modernising education and vocational training systems, enabling fast and flexible validation of competences in response to labour market changes, digitalisation, and the green transition. In the raw materials sector and copper mining, they support the rapid acquisition of technical, digital, environmental, and organisational skills while promoting lifelong learning.

This document presents a micro-credential-based certification programme developed within the SkiComCu project, fully aligned with European frameworks (Council Recommendation 2022, EQF, EQAVET, EDC/Europass). The programme follows a modular structure covering five core competence areas and leads to the award of digital micro-credentials described through comprehensive metadata.

The final certification will be managed under the institutional oversight of EIT RawMaterials via the LearningPoint / EIT SkillsHub platform (target SkiComCu platform). The conclusions indicate that well-designed micro-credentials can form the foundation of a flexible vocational training system for mining and heavy industry, provided that high standards of quality, interoperability, and sectoral recognition are ensured.

Objectives, and EIT Impact Framework and KIC Impact

Objectives

Objective	Description	Status
Objective of this deliverable is to prepare the guidelines and principles for the development of the SkiComCu certification programme.	This deliverable articulates a micro-credential-based certification programme developed within the SkiComCu project, fully aligned with European frameworks. This deliverable highlights the conditions to achieve the market value of the issued SkiComCu micro-credentials.	Achieved

EIT Impact Framework and KIC Impact

The SkiComCu course certification programme report provides verifiable evidence of learner participation, completion, and certification in raw materials–related education activities. The programme is fully aligned with European frameworks. It directly contributes to EIT RawMaterials education and human capital KPIs under the EIT Impact Framework and EITRM, supporting workforce upskilling, innovation capacity building, and alignment with KIC strategic objectives.

The SkiComCu certified course will serve as a strategic enabler for knowledge dissemination, workforce development, and innovation adoption within the European copper value chain. Its modular structure, technological capabilities, and focus on open accessibility support multiple dimensions of impact across EIT and KIC priorities. To address the shortages of human resources in the Cu sector in EU, SkiComCu aims to develop a lifelong learning course for current and future professionals in the EIT RIS countries.

Impact on EIT RM strategic objectives:

1. The provision of upskilled and reskilled personnel through the training curriculum will allow for achieving greater efficiency in the functioning of the Cu-industry, thereby leading to higher production levels and less EU dependency on imported raw and advanced materials, thereby contributing to EIT SO1 – securing raw materials supply.

2. The provision of skills about state of the art technologies, industry 4.0 & 5.0, green transition & circular economy as well as the reorientation of training methodologies to satisfy the needs of and attract young people (with a special focus on encouraging the incorporation of women and vulnerable social groups) in the sector is expected to indirectly increase the social acceptance of the raw and advanced materials extraction and production, thereby contributing to EIT SO1 – securing raw materials supply and SO3 – closing materials loops.

3. The emphasis of the programme to the whole life cycle of the Copper production, from mining to manufacturing and recycling, as well as the continuous updates in the training programme to be achieved by WP2 will assist the EU Cu-sector to maintain the mining of copper and the design & production of advanced materials, components and products that enable the transition to a carbon neutral Europe, thereby contributing to EIT SO 2 - designing materials solutions.

Impact on EIT RIS KPIs:

The elaborated SkiComCu certification programme based on a modular training structure covering five core competence areas and leading to the award of digital micro-credentials described through comprehensive metadata influences the achievement of core EIT RIS KPIs:

- EITHE08.1 – Participants in non-labelled education activities
- EITHE02.4 – Innovations launched on the market
- KICN01–11 – Improving gender balance in education and training

Strategic Contribution to the EIT Impact Framework:

• Enhancing innovation capacity and talent development in the raw materials sector

• Fostering digital transformation and sustainability

• Reducing skills mismatches and improving industry-academia cooperation

• Reinforcing educational excellence in EIT RIS regions as well as de-siloing and integration of the raw materials ecosystem

• Replication and scalability potential

• Enabling long-term capacity building

This deliverable successfully supports the hybrid modular training that meets the strategic goals of SkiComCu and sets the stage for certified, high-impact educational delivery within the European copper sector.

Introduction

This report is the result of work carried out as part of the SkiComCu project, WP5, Task 5.5, which aimed to prepare the development and implementation of a certification programme.

The 5 key aspects of the certification programme are as follows:

1. PREPARATION OF THE SKICOMCU CERTIFICATION PROGRAMME
   - Analysis of European guidelines on certification and definition of criteria for assessing the competences of participants and the effectiveness of the training
   - Defining the structure and procedures of the certification programme (registration of training participants, assessment of training completion, etc.)
2. KEY ASPECTS OF THE CERTIFICATION PROGRAMME
   - Defining the principles for granting certificates / micro-credentials
   - Development of individual elements of the micro-credential description, e.g. data of the training participant, data of the institution issuing the microcredential, form of participation in training, scope of the training, etc.
   - Consideration of personal data protection in accordance with the GDPR(EU General Data Protection Regulation)
3. CERTIFICATION REQUIREMENTS
   - Development of basic guidelines for obtaining the SkiComCu micro-credential / badge
4. TYPE OF REFERENCE
   - Digital badge / certificate of the training completion
5. TRAINING EVALUATION AND GRANTING REFERENCES
   - Proposed satisfaction surveys of participants and employers
   - Issuance of a digital micro-credential as confirmation of completing the SkiComCu training

Objectives

This main objective of this deliverable is to prepare the guidelines and principles for the development of the SkiComCu certification programme.

This deliverable articulates a micro-credential-based certification programme developed within the SkiComCu project, fully aligned with European frameworks.

This deliverable highlights the conditions to achieve the market value of the issued SkiComCu micro-credentials.

1. Preparation of the Certification Programme Based on EU Guidelines

The European labour market is undergoing dynamic changes driven by digital transformation, the automation of industrial processes, the green transition, and demographic shifts. These developments pose significant challenges for education systems, which are required to provide flexible and rapid learning pathways. According to OECD forecasts, by 2030 approximately 14% of jobs worldwide will be automated, while a further 32% will undergo substantial transformation. This implies the necessity to acquire new competences both in highly specialised sectors and in traditional industries such as mining.

In Poland, these challenges are particularly pronounced. Available data indicate that currently only 44% of citizens possess basic or higher digital competences, while adult participation in lifelong learning remains low - on average around 20% across the European Union.[2] In Poland, this indicator is below the EU average, which hinders the effective alignment of qualifications with labour market needs.

Traditional forms of diplomas or long-term educational programmes are often too slow to respond to labour market demands. Micro-credentials enable the validation of specific learning outcomes achieved through short educational modules, available both within formal and non-formal learning pathways.

1.1. Analysis of European Guidelines on Certification

The purpose of this review is to collect, organise, and assess the current EU frameworks and guidelines concerning micro-credentials and related certification mechanisms and digital credentialing of qualifications. The report focuses on: key framework documents and standards (Council of the EU, European Commission, EQF, EDC/Europass, EQAVET, ETF, Cedefop), practical guidelines for credential-issuing institutions, aspects of interoperability and cross-border recognition, as well as policy linkages and funding mechanisms (Pact for Skills, European Commission initiatives 2023-2025).

UNESCO and Cedefop emphasise that qualification frameworks (NQF, EQF) should encompass all forms of learning-formal, non-formal, and informal-so that micro-credentials can be effectively integrated into the system. In the mining sector, where technological and regulatory changes occur dynamically, short courses and credentials are of particular value. The industry is experiencing growing demand for competences related to the operation of advanced automation systems, environmental sensors, and safety systems, while skills shortages are becoming a barrier to development.

For heavy industry-particularly mining-micro-credentials have strategic importance. The sector faces challenges related to automation, occupational safety, environmental protection, and shortages of digital competences. Short, modular courses allow for a faster response to these needs, while a certification system based on European quality standards (ISO 21001, EQAVET, ISO 17065) ensures the credibility and recognition of credentials. Micro-credentials therefore represent a response to these needs, enabling rapid and recognised validation of acquired skills within short, modular courses. The Council Recommendation of 22 June 2022 emphasises that micro-credentials should support lifelong learning and professional mobility, as well as contribute to the inclusiveness of education systems. In Poland, in 2023, the Ministry of Education and Science (MEiN) issued guidelines on the use of micro-credentials, pointing to the need to develop uniform standards and to integrate these forms of learning into the national higher education system.

Main EU Documents and Initiatives

Council of the European Union Recommendation (2022) - A Common Approach to Micro-credentials

In June 2022, the Council of the EU adopted the Recommendation on a European approach to micro-credentials for lifelong learning and employability. The document defines micro-credentials as descriptions of learning outcomes achieved through a "small amount of learning", specifies standard metadata elements (e.g. identification, learning outcomes, workload, EQF level, assessment methods), and highlights the need to ensure quality and interoperability. The Recommendation encourages Member States and institutions to implement frameworks and legal facilitations to promote recognition and mobility.

European Digital Credentials for Learning (EDC/Europass)

The European Commission has provided the infrastructure and EDC (Europass) standard enabling the creation, issuance, storage, and verification of digital credentials (including micro-credentials). EDC implements a seal, i.e. an electronic signature and metadata compliant with EU guidelines, facilitating secure exchange and interoperability between institutions and EU countries. The adoption of EDC is crucial for the widespread issuance of digital credentials.

ETF Guidelines and Cedefop Work (2023-2024)

The ETF published the practical Guide to design, issue and recognise micro-credentials, providing detailed design recommendations, including the construction of learning outcomes, metadata, validation models, and recommendations for international recognition. Cedefop analysed the specific characteristics of micro-credentials in VET (with particular emphasis on the practical component), identifying scenarios for their use and risks related to the fragmentation of training provision. Both documents constitute legal and operational complements for countries and providers.

Related Instruments and Policies: EQF, EQAVET, Pact for Skills, European Year(s) of Skills, DG EMPL VET Actions

The EQF and EQAVET frameworks remain the primary reference points (level assignment, quality indicators). The Pact for Skills and European Commission initiatives (European Year of Skills 2023–2024 and subsequent DG EMPL actions related to VET reforms) create the political and financial context for the accelerated implementation of micro-credentials. In practice, this includes the mobilisation of sectoral partnerships, access to funding programmes (Erasmus+, ESF+, InvestEU), and the dissemination of best practices.

1.2. Certification Programme Standards

The micro-credential certification programme covers short educational formats concluded with the issuance of a digital credential confirming competences and lifelong learning, delivered in both formal and non-formal modes. These may take the form of: online training courses, workshop-based courses, practical modules, and hybrid courses.

Certification applies to both hard competences (e.g. operation of technologies, knowledge of digital tools, sector-specific qualifications) and soft competences (e.g. cooperation, communication, team management).

Unlike traditional diplomas, micro-credentials allow for:

- rapid closing of competence gaps,
- modular construction of an educational pathway,
- flexible combination of different credentials into broader qualifications (e.g. within the ECTS/EQF system).

The certification programme has an open character - it may be applied in higher education, vocational education and training, as well as within initiatives of employers and sectoral organisations.

For a micro-credential certification programme in the area of heavy mining, it is particularly important to include competences such as:

- **digital technologies and automation** – operation of monitoring systems, analysis of operational data, IoT applications, SCADA systems, failure prediction;
- **occupational safety and risk management** – training in OHS procedures, international standards, emergency response, risk assessment, environmental standards;
- **environmental protection and the green transition** – competences related to emission reduction, land reclamation, energy efficiency, new energy sources, waste management;
- **soft and organisational competences** – cooperation in interdisciplinary teams, adaptability, technical communication, change management.

Due to the often highly advanced technical environment and the high cost of errors, certification in mining requires a strong practical component—such as exercises in conditions close to real ones, simulations, practical tests, and implementation audits.

However, it should be noted that micro-credentials do not replace traditional diplomas or professional licences, but rather complement them, creating a flexible system for competence development.

1.2.1. Management of the Certification Programme

Effective implementation and management of the certification programme require a management system based on partner cooperation, including multi-level governance mechanisms, which should cover:

- Institutional oversight – entities issuing micro-credentials must have clearly defined validation and accreditation procedures; the task leader coordinates the work, prepares the report, collects feedback from partners, and ensures compliance of activities with regulations.
- Stakeholder involvement and regulatory aspects - employers, higher education institutions, research organisations, and regulators participate in defining learning outcomes and certification procedures, which enables integration with national qualifications frameworks and linkage with European tools (EQF, EDC/Europass).
- Quality assurance - the programme must include quality assessment procedures, teaching audits, post-training evaluation, and international benchmarks, in line with European standards.
- Technological aspect - the applied digital systems should enable interoperability and verification of the authenticity of micro-credentials (e.g. blockchain, EDC, Open Badges).
- In the mining sector, governance additionally requires the involvement of sectoral institutions, such as the Central Mining Institute, the State Mining Authority, or safety committees.

1.2.2. Recognition of Micro-credentials

For a micro-credential to be recognised, it should meet the following conditions:

1) Minimum duration - e.g. from 5 to 30 hours of learning workload.
2) Description of learning outcomes - verifiable and measurable.
3) Assessment method - at least one practical component (e.g. simulation, project-based task).
4) Reference level to European qualification standards - e.g. levels 3-6 in the case of vocational training.
5) Digital credential - containing metadata that enable verification and recognition.
6) Update mechanism - the course and the micro-credential must be updated in a cycle of, for example, 2-3 years, especially in mining, where regulations and technologies change.

Most importantly, the confirmation of course completion and, at the same time, the confirmation of acquiring a given set of knowledge or skills is not the graphical badge itself, but the metadata embedded within it.

Metadata are information that characterise and describe other data, helping to search for them, understand them, and manage them, without the need to open the underlying data set.

The metadata, rather than the graphical badge alone, that determine recognition. Therefore, providers must design micro-credentials from the outset with a complete set of metadata in order to enable subsequent interoperability and recognition (e.g. through the use of EDC/Europass). Europass EDC has gained wide acceptance as the preferred format for digital credentials, and these tools are provided by the European Commission for large-scale issuance, which is essential for interoperability and verifiability.

The Council Recommendation and ETF recommend that each micro-credential include a standard set of metadata:

a) identifier,
b) title,
c) issuer,
d) date,
e) learning outcomes,
f) workload (hours/ECTS where possible),
g) EQF/NQF level,
h) assessment method,
i) participation requirements,
j) quality assurance mechanism,
k) information on stackability.

Certification Requirements

Certification requirements include:

1. **Precise, clearly defined learning outcomes** - in line with the European Qualifications Framework, national qualifications frameworks, and the ECTS system.
2. **Transparent validation criteria** - clear assessment methods (exam/test, portfolio, project, practical task).
3. **Quality assurance** - institutional accreditation and compliance with European and national guidelines. The guidelines emphasise quality assurance systems, including institutional QA procedures, provider accreditation, audits, and outcome evaluation mechanisms (including EQAVET-compliant KPIs). ETF and Cedefop recommend the application of the PDCA (plan-do-check-act) cycle and the implementation of ex post monitoring (e.g. transfer of skills to the workplace).

4. Interoperability and technological accessibility - issuance in digital form, using blockchain or Open Badges, and the possibility of recognising and transferring micro-credentials across different contexts (higher education institutions, employers, EU countries). Europass EDC provides the technical standard and infrastructure for the secure issuance of digital credentials with an electronic signature. European Commission recommendations and practical tools (Online Credential Builder, APIs) facilitate process scaling and integration with LMS/LXP systems.
5. Compliance with national law - it is recommended to reference micro-credentials to EQF/NQF levels where possible, in order to facilitate comparability. Cedefop and OECD reports emphasise that linkage to qualification frameworks increases employer trust and facilitates the accumulation of credentials. In Poland, certification programmes must comply with the Act on Higher Education and Science.
6. Sectoral and industry references - guidelines emphasise that, particularly in VET and high-risk sectors (e.g. heavy industry, mining), micro-credentials should be designed with the involvement of employers and should take into account sector-specific standards (OHS, technical standards). NFT/sectoral frameworks and partnerships within the Pact for Skills serve as mechanisms for linking market demand with training provision.

Summary of Certification Requirements	
Clearly defined learning outcomes	criteria compliant with European and national qualifications frameworks and the ECTS system
Transparent validation	clear assessment methods (e.g. test/exam, project, practical task)
Metadata	design of micro-credentials with a complete set of metadata in order to enable subsequent interoperability and recognition (e.g. use of EDC/Europass)
Quality and accreditation	integration of quality assurance (QA) procedures and preparation of audit documentation, including assessment policies, implementation trials, and evaluations
Interoperability and technological accessibility	implementation of EDC as a technical priority of certification programmes (blockchain solutions are often indicated as an additional safeguard, but EDC/EU standards ensure a higher level of scalability and are the preferred solution)
Recognition and linkage to EQF/NQF	definition of the EQF level (or equivalence) in metadata and preparation of RPL mechanisms (Recognition of Prior Learning), enabling credit transfer of achievements
Sectoral and industry references (stackability, sectoral frameworks)	design of micro-credentials with the involvement of employers, as well as consideration of sectoral standards (OHS, technical standards)

Figure 1. Summary of Certification Requirements

Based on good practices, the requirements for micro-credentials in the mining sector should take into account:

1. A strong practical component: tests under real working conditions, exercises in simulators, the possibility of verification in a mine or processing plant, and practical operational tasks.
2. Sector-specific standards and regulations: compliance with national and EU mining regulations, occupational health and safety (OHS), and environmental protection requirements; inclusion of industrial standards and sector-specific norms (e.g. ISO standards, machinery quality and safety standards).
3. Very precisely defined learning outcomes, supported by metadata: specification of which specific tools and systems the candidate will operate, which emergency procedures they will be familiar with, and which environmental standards they will understand and apply.
4. Validation of prior experience: in mining, many competences are acquired through practice; therefore, an integral part of the programme should be a system for the recognition of prior learning or professional experience.
5. Duration and its units: although micro-credentials are short, the practical component may require a significant number of working hours; therefore, units must be realistic and appropriately calculated, for example as ECTS credits or equivalent units (where possible).

Evaluation and Award of Credentials

The process of evaluation and awarding micro-credentials includes the following stages:

- Validation of learning outcomes - verification of whether the participant has achieved the intended competences.
- Course quality assessment - monitoring of the teaching process and assessment procedures.
- Issuance of the credential - in digital form with a unique identifier, using EDC standards and blockchain technology to ensure authenticity.
- Registration in national and European systems - e.g. integration with Europass, POL-on, and institutional information systems.
- Monitoring - periodic evaluation of the effectiveness of the programme and its adjustment to labour market needs.

In mining, the use of simulations and exercises under conditions close to real ones is recommended as elements of assessment.

For example:

a micro-credential for a mining machinery operator may require passing a simulation of work in a VR environment as well as an OHS knowledge test.

Cedefop and ETF have demonstrated growing interest in micro-credentials within VET, but they also warn against the "inflation" of non-measurable credentials, as strong emphasis is placed on the practical component and linkage to the EQF. Implementation practices show that credentials accepted by industry (e.g. within the Pact for Skills framework) have significantly higher market value.

1.3. Overview of Platforms for Managing Certification and Accreditation

A wide range of platforms for managing digital credentials, certification, and accreditation is available on the European market. Below is an overview of selected platforms, based on a comparative framework including: the functions of the platform, the format of the micro-credential, key features, strengths, limitations, and a brief assessment of suitability for micro-credential projects.

Table 1. Overview of Selected Platforms for Managing Digital Credentials, Certification, and Accreditation (author's own elaboration).

Platform	Format	Description of activity	Key features	Strengths	Limitations	Suitability
European Digital Credentials for Learning (EDC/Europass) - public EU infrastructure EDC https://europass.europa.eu/en	EDC	Official European infrastructure and specification for the creation, issuance, and verification of digital credentials (EDC).	Metadata standard compliant with the Council Recommendation (2022), electronic seal/signature, interoperability between national systems, integration with the Europass Wallet.	Official EU status, high credibility, harmonised metadata (facilitates recognition), free tools and APIs for issuers.	Not a "commercial" platform; limited marketing functions; often requires technical integration and IT support.	Highly rated for VET and vocational training; recommended as the primary credential issuance format in EU-funded projects.
Credly (Pearson) - global digital badge issuance platform https://info.credly.com/	Open Badges/ proprietary	Commercial platform for creating, issuing, and managing digital badges and skills analytics (large employer ecosystem).	Issuance automation, badge catalogue, reporting, integrations with HR/LMS systems, strong analytics (workforce insights).	High market recognition, wide employer network, good UX for recipients.	High cost, closed ecosystem (own network), required verification of EDC compliance (possible conversion/metadata mapping).	Well rated, especially if the priority is immediate visibility among employers and in extensive reporting.
Accredible - large-scale certificates and badges https://www.accredible.com/	Certificates + badges	Commercial platform for producing and mass issuance of certificates and badges; supports automated issuance.	Branding, delivery tracking, integrations with payments and "pathways".	Convenience, strong marketing features, automation.	Commercial model and significant cost; EDC compliance requires verification.	Solid solution for large training programmes with sufficient budget.
Parchment (Canvas Credentials) - badge platform with broad interoperability https://www.instructure.com/parchment?domain=badgr	Open Badges 3.0	Platform for issuing Open Badges and managing collections of credentials.	Integration with Canvas, Open Badges 3.0 support, regional data hosting.	Strong ecosystem (higher education and VET), good support for Open Badges 3.0.	Corporate and analytical features may be less advanced than in Credly/Accredible.	Well rated for higher education institutions and VET providers using Canvas or requiring Open Badges compatibility.
Open Badge Factory - European, specialized solution Open Badges	Open Badges 3.0	European platform for designing and issuing Open Badges 3.0.	Advanced metadata editor, Badge Passport.	Open Badges 3.0 support,	Limited HR/marketing features.	Good for projects requiring

https://openbadgefactory.com/en/				Strong metadata control, open standards. .		metadata control.
Badgecraft / Awero https://www.badgecraft.eu/	Open Badges	European platform originating from Erasmus+ projects.	EU ecosystem focus, multilingual support, Badge Wallet integration.	Free/local options, educational focus.	Less developed corporate features.	Good for NGOs and small VET providers.
BCdiploma, Digitary / Parchment - „official academic records" solutions https://www.parchment.com/en-gb/	Blockchain credentials	Platforms for issuing official academic records and diplomas.	Full verifiability, e-delivery, blockchain-based.	High authenticity assurance.	High cost and integration complexity.	Best for official diplomas and certificates.
Managing accreditation platforms/ QA Processes (Jetpack, Creatrix, Accurate etc.) https://www.capterra.com/	Accreditation mgmt	Systems in the "accreditation management" class support accreditation agencies and institutions in managing accreditation processes, self-documentation, reporting, and audits.	accreditation workflows, document management, site-visit planning, benchmarking, reporting.	Facilitate compliance with ESG/EQAVET requirements and automate audit processes.	Do not perform accreditation themselves; instead, they support accreditation processes and integration with credentialing platforms; may require additional development work..	Relevant for national agencies or large programme providers that aim to manage accreditation in an auditable manner.

The examples presented in the table above represent only a selection of the available solutions. The market also includes many smaller as well as specialised providers offering various forms of micro-credentials, such as Open Badges 3.0, blockchain-backed verification, white-label solutions, or API-based issuance. The choice of a specific solution depends on the requirements of the course.

EIT RawMaterials also offers its own educational platforms and a cooperation ecosystem (EIT Campus, EIT Digital courses, EIT Label, EIT SkillsHub), including capabilities for managing certification processes and awarding the EIT Label, as well as supporting networks of educational and industrial partners. A key component of this educational ecosystem is the **LearningPoint Platform**, particularly in the raw materials and heavy industry domain. Its operation is clearly embedded in European competence development priorities, including the approach to micro-credentials, modular learning pathways, and transparent systems for the validation of qualifications.

As emphasised by EIT RawMaterials, the training offer made available is modular in nature, addressed to different target groups, while the courses themselves are flexible, short-term, and focused on real labour market needs. This is consistent with the understanding of micro-credentials as compact learning units enabling rapid upskilling and reskilling. The offered modules cover technical, digital, environmental, and transversal skills - all of which are critical for the contemporary raw materials industry and mining sector. The structure of the offered courses aligns with European requirements and adopted standards: short, clearly defined courses focused on specific learning outcomes, with a workload of 20-48 hours, which can be combined into broader learning pathways. In addition, EIT RawMaterials cooperates with audited certification bodies.

The educational materials developed within the SkiComCu project will be accessible to the interested parties through the **Learning Management System (LMS)** provided by EIT. From the perspective of the future potential of micro-credentials in the raw materials sector, the EIT portfolio has all the prerequisites to be recognised as a robust micro-credentials platform. Given the nature of the SkiComCu project - its educational scope, intended use, and formal requirements - the courses developed within the project will be made available via the platform **https://learningpoint.eitrawmaterials.eu/ (the second option is EIT SkillsHub platform)**, through which both the learning process and the management of the certification programme within SkiComCu will be carried out.

2. Types of References and Functions of Micro-credentials

2.1. References

Within the certification system, several types of credentials can be distinguished:

- Traditional certificates and diplomas - confirming the completion of full cycles of education.
- Sectoral credentials - issued by professional organisations, confirming authorisation to perform specific activities.
- Micro-credentials - documenting the achievement of specific learning outcomes with a limited educational workload.

With regard to micro-credentials, in line with European guidelines (Council Recommendation 2022, EDC/Europass, EQAVET, ETF), the following types of references can be distinguished:

a) Certificate of training completion (for participants)

This is the most common form of micro-credential reference. It constitutes proof of the achievement of learning outcomes, confirmed by the training institution. According to European guidelines, it:

- is a key element of micro-credential metadata,
- must include: learning outcomes, workload, assessment methods, EQF level (where applicable),
- should be issued in the EDC format (Europass Digital Credentials).

This reference serves the learner - it confirms that the participant has completed the training and met the assessment requirements.

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b) Accreditation of the training institution

This is an institutional reference and does not relate to an individual participant.

It constitutes confirmation that the training provider meets defined quality standards, such as:

- EQAVET (VET quality assurance),

- national accreditations,
- sectoral industry standards,
- ISO 21001 (educational organisations).

According to EU guidelines, institutional accreditation increases the credibility of micro-credentials but does not replace their metadata.

This reference constitutes the foundation of trust—it demonstrates that the institution is reliable and subject to oversight.

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c) Trainer competence credential

This refers to the person delivering the training or conducting the assessment. It may include:

- formal qualifications,
- sectoral certificates,
- professional experience,
- confirmation of pedagogical competences (e.g. in line with standards).

The Council Recommendation emphasises that the competence of assessors is a quality element of micro-credentials. EQAVET indicates that trainers and examiners must possess documented competences.

This reference ensures that learning outcomes were assessed by competent professionals.

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d) Evaluation reports on training effectiveness

Evaluation reports constitute evidentiary references demonstrating the quality and effectiveness of the training programme. In line with EQAVET, they include, among others:

- completion rates,
- learner satisfaction,
- employer satisfaction,
- effectiveness of skills transfer to the workplace,
- safety-related data (in high-risk sectors).

Within the EU, evaluation reports support continuous programme improvement and serve as evidence of quality during audits.

This reference confirms that the micro-credential is not merely "paper-based" but delivers real practical value.

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e) Certificate of compliance of the training programme with European standards

This is a programme-level reference, independent of the individual participant's certificate. It may relate to compliance with:

- the Council Recommendation 2022,
- the EQF (level alignment),
- EQAVET (quality cycle),
- EDC (digital format),
- European sectoral standards (e.g. occupational safety).

It is often linked to an external audit or an internal declaration of compliance (self-declaration of compliance).

This reference constitutes formal evidence that the training programme has been designed in accordance with European standards of quality and transparency.

The above types of references, in relation to European guidelines, can be grouped into several categories of micro-credential references:

- **individual references** (certificate of completion),
- **institutional references** (accreditation),
- **staff-related references** (trainer competences),
- **quality-related references** (evaluation reports),
- **system compliance references** (compliance with EU standards),

where each of them fulfils a different function:

- increases credibility,
- enhances transparency,
- enables international recognition,
- builds trust among employers and institutions.

2.2. Functions of Micro-credentials

According to the definition of the Council of the European Union, micro-credentials describe learning outcomes that a learner has achieved with a limited amount of learning, assessed on the basis of transparent criteria. They may be standalone or combined into larger credentials. The function of micro-credentials therefore consists in:

- supporting flexible learning pathways (modularity and the possibility of accumulation),
- responding quickly and flexibly to labour market needs,
- promoting lifelong learning,
- increasing transparency and mobility of qualifications in Europe.

Good practice recommends that the metadata of a micro-credential include:

- learning outcomes,
- duration,
- assessment methods,
- EQF level,
- issuing institution and information on interoperability.

Stakeholder Support

The implementation of a certification programme requires the support of multiple stakeholder groups:

- **Employees and participants** - workers, students, adult learners, who gain confirmation of their competences.
- **Educational institutions** - universities, vocational schools, research institutes, which integrate micro-credentials into their educational offer and are able to respond more rapidly to market needs.
- **Employers** - gaining access to reliable and verified information on candidates' competences.
- **Public authorities and regulators** - creating legal frameworks and recognition systems.
- **Technology providers** - ensuring infrastructure for managing micro-credentials, including their storage and validation (e.g. DoxyChain).

In the case of specific sectors, the involvement of dedicated sectoral institutions should also be taken into account. For mining and the extractive industry, such specific stakeholders include:

- **Mines and extractive enterprises** - providing data on competence needs, sponsoring training and micro-credentials, and potentially offering financial and technological support.

- **Sectoral institutions and mining associations** - e.g. industry unions, safety committees, standardisation bodies (e.g. GIG - Central Mining Institute).
- **Regulatory and environmental monitoring bodies** - state authorities responsible for mining, environmental protection, and occupational safety.
- **Equipment and technology providers** - manufacturers of machinery, monitoring systems, and automation solutions, who often require users of their technologies to hold specific qualifications.

The support of these groups is crucial, both through participation in defining learning outcomes and practical tests, and through the recognition of micro-credentials by employers, including mining enterprises. Examples of good practice indicate that micro-credential programmes have the greatest value when they are developed in close cooperation with employers and when credentials are accepted by sectoral institutions.

3. Scope of the SkiComCu Certification Programme

European guidelines form a coherent, albeit multidimensional, ecosystem comprising: legal definitional frameworks (Council 2022), practical design guidelines (ETF), analyses of the VET sector (Cedefop), the EDC digital infrastructure (Europass), and partnership and funding mechanisms (Pact for Skills, European Commission/DG EMPL). The effective implementation of micro-credentials requires parallel action in the areas of metadata design, quality assurance, digital infrastructure, and cooperation with employers. From the perspective of training institutions and projects financed under EU programmes (e.g. EIT+), priority should be given to the use of EDC, the full completion of recommended metadata, the inclusion of practical components, the preparation of QA procedures compliant with EQAVET, and active cooperation with sectoral partners within the Pact for Skills framework.

Given the nature of the SkiComCu project - its educational scope, intended use, and formal requirements - the courses developed within the project will be made available via the platform https://learningpoint.eitrawmaterials.eu/ (or EIT SkillsHub), through which both the learning process and the management of the certification programme within SkiComCu will be carried out.

3.1. Programme Structure

Project objective and scope

The SkiComCu project aims to offer the copper sector innovative lifelong learning courses developed on the basis of competence gaps identified within the framework of the project among current and future employees of the copper sector. The project responds to the urgent need for reskilling and upskilling within the European copper value chain, and the training courses offered address the real needs of various groups of workers, making them attractive and in demand for enterprises from EIT RIS countries.

SkiComCu provides a hybrid modular lifelong learning course that combines asynchronous and in-person training supported with eXtended Reality (XR) tools. The educational materials developed within the project will be accessible to the interested parties through the Learning Management System (LMS) provided by EIT. The modules are addressed to professionals across different qualification levels, corresponding to Levels 3–7 of the European Qualifications Framework (EQF), ensuring alignment with the EU classification of skills and competences.

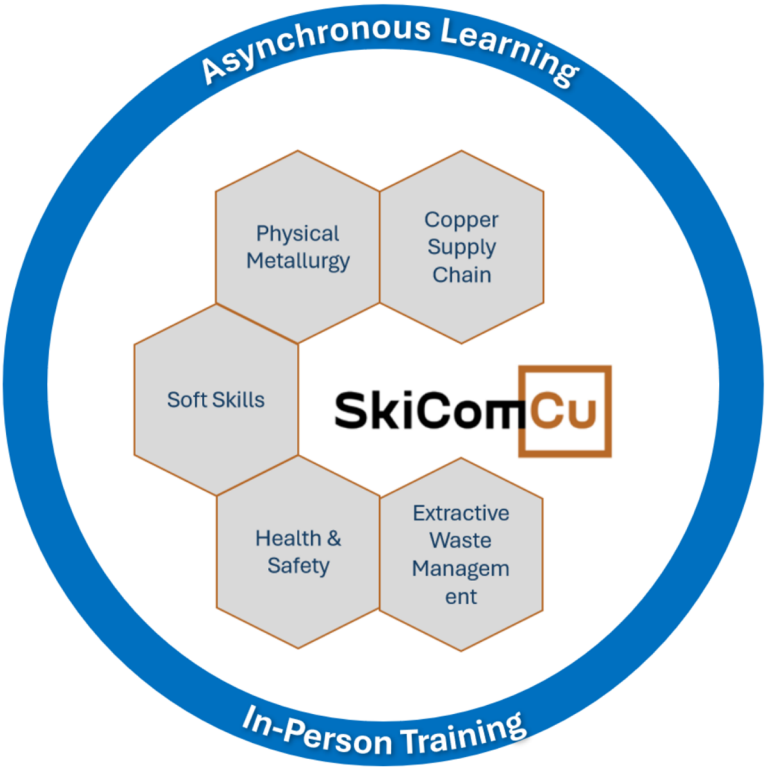

Figure 2: SkiComCu Modules and Learning delivery

Learning outcomes

The courses delivered within the SkiComCu project are based on competence-based education, ensuring that all participants who successfully complete these learning activities will be able to apply new technologies and sustainable practices in real industrial contexts.

Learning objectives are structured in accordance with the revised Bloom's taxonomy, supporting a gradual progression from basic understanding to solving complex problems: remembering, understanding, applying, analysing, evaluating, and creating.

Table 2. Structure of the SkiComCu Programme Modules

Module	**Learning outcomes**	**Prerequisites / Required Skills**
Copper Supply Chain	• Describe the main stages of the copper supply chain, from resource extraction and beneficiation to refining, recycling, and end-use applications. • Differentiate between primary and secondary copper resources, explaining their global distribution, extraction methods, and relative contributions to supply. • Explain ore beneficiation and scrap recycling techniques, including flotation, leaching, and other separation processes. • Analyze the principles and applications of pyrometallurgical and hydrometallurgical routes for copper production. • Identify key by-products and copper compounds generated through the supply chain, and assess their economic and industrial significance. • Evaluate the environmental impacts of copper production, including mining tailings, slags, off-gases, and leaching residues, and discuss mitigation strategies. • Interpret global market trends, production data, and substitution challenges to understand the strategic importance of copper in the clean energy transition.	Participants are expected to have a basic understanding of industrial processes, materials, or resource management. Prior exposure to mining, metallurgy, or environmental management is beneficial but not required.

	• Assess the role of Environmental, Social, and Governance (ESG) practices in ensuring sustainability, ethical sourcing, and stakeholder engagement throughout the copper supply chain.	
Extractive Waste Management	• Analyze the legal and regulatory frameworks governing sustainable management of Cu extractive waste within the EU. • Evaluate the physical and geochemical properties of Cu extractive waste and assess their relevance to classification and management strategies. • Examine disposal systems used for Cu extractive waste and identify associated site-specific risks and stabilization measures to ensure physical and chemical integrity • Explore and assess leading technologies and best practices for recycling, reuse, and reclamation of Cu extractive waste and legacy disposal facilities.	Participants should have a general awareness of mining or metallurgical operations and environmental protection principles. Familiarity with EU environmental legislation or industrial waste management practices is desirable but not essential.
Physical Metallurgy	• Identify and explain the fundamental crystal structures of metals, with emphasis on copper and its alloys. • Analyze how atomic bonding, dislocations, and grain structures influence the mechanical and physical properties of metals. • Interpret phase diagrams to predict microstructural evolution during solidification and processing. • Correlate the microstructures of copper alloys, as observed through	The asynchronous course has builds on a basic curiosity for materials science. A physics background (e.g., physics, engineering) is recommended. No prior experience with computational modeling tools is required.

	microscopy, with their processing history and performance. • Apply principles of casting, solidification, and thermal treatments to optimize copper alloy microstructures and properties. • Evaluate processing defects and propose corrective measures based on metallurgical principles. • Recognize the role of computational and digital tools (e.g., FEM, phase-field modelling, AI-based analysis) in supporting design and process optimization. • Assess the role of physical metallurgy in the copper value chain and adapt knowledge for Industry 4.0 and sustainable manufacturing practices.	
Health & Safety	• Understand occupational-safety principles and environmental risk management. • Identify workplace hazards and recommend preventive measures. • Demonstrate proper response during simulated emergencies. • Promote leadership and communication for promoting safe behavior.	No specific technical background is required. Participants should have prior experience in industrial or laboratory environments and a general understanding of workplace safety principles.
Soft Skills	• Understand the importance of effective communication. • Identify various communication techniques and approaches. • Develop and promote a teamworking environment.	No technical prerequisites are required. Participants are encouraged to have prior work experience within teams or industrial settings to contextualize communication, leadership, and collaboration activities.

Modular Structure of the Programme

Initiatives related to skills development must be balanced in terms of both technical and soft competences. Future employees of the copper sector should be familiar with technological development and digitalisation in this field and be able to benefit from them, as well as understand and apply sustainable development practices. For this reason, the course has been divided into five modules, consisting of individual lessons:

- Module 1: Copper Supply Chain (level A: 12 lessons, level B: 8 lessons)
- Module 2: Extractive Waste Management (level A: 23 lessons, level B: 9 lessons)
- Module 3: Physical Metallurgy of Cu (level A: 31 lessons, level B: 20 lessons)
- Module 4: Health & Safety (level A & B: 7 lessons)
- Module 5: Soft Skills (level A & B: 24 lessons)

Stackability: Learners may complete modules at any time, using progress-tracking features and built-in feedback functionality.

Workload

Table 3. Structure of training modules: duration of Asynchronous and In-person training

Module	Level	Lessons	Module Sections	Duration (hours)	
				Asynchronous	In-person
Module 1: Copper Supply Chain	A	12	7	10	20
	B	8	5	8	12
Module 2: Extractive Waste Management	A	23	5	8	12
	B	9	3	6	7
Module 3: Physical Metallurgy of Cu	A	31	10	10	23
	B	20	8	8	11
Module 4: Health & Safety	A&B	7	-	4	8
Module 5: Soft Skills	A&B	24	7	3	14

Level A, which corresponds to EQF Levels 6-8, is intended for senior managers, middle managers, office personnel, and staff within human resources departments.

Level B, corresponding to EQF Levels 3-4, is aimed at Technical and labour-position personnel.

Teaching Methods and Learning Materials

Mode of delivery: hybrid, modular lifelong learning course combining asynchronous (online) training and in-person (face-to-face) sessions.

Teaching methods: e-learning, case studies, VR, tests.

Types of materials: interactive elements, VR, video content, infographics, reading materials.

Validation and Assessment of Learning Outcomes

Self-Assessment Quizzes: At the end of each section of lessons, and before moving on to the next one, participants complete a short self-assessment quiz to review key concepts and monitor their learning progress.

Form and Scope of the Micro-credential

A separate micro-credential is foreseen for each module, with a scope specific to that module:

Module 1

Name of course: Copper Supply Chain

Certified competences: The participant knows and describes the main stages of the copper supply chain; differentiates between primary and secondary copper resources and explains their global distribution; explains ore beneficiation techniques and scrap recycling methods; analyses the principles and applications of pyrometallurgical and hydrometallurgical methods of copper production; identifies key by-products and copper compounds generated throughout the supply chain and assesses their economic and industrial significance; evaluates the environmental impacts of copper production and mitigation strategies; interprets global market trends related to production and substitution challenges in order to understand the strategic importance of copper in the clean energy transition; evaluates the role of Environmental, Social and Governance (ESG) practices in ensuring sustainability, ethical sourcing, and stakeholder engagement across the copper supply chain.

Level: A (senior managers, middle managers, office personnel, and staff within human resources departments)/ B (technical and labour-position personnel)

Issuance format: badge

Module 2

Name of course: Extractive Waste Management

Certified competences: Analyses the legal and regulatory frameworks governing sustainable management of copper extractive waste in the EU; evaluates the physical and geochemical properties of copper extractive waste and their relevance for classification and management strategies; understands disposal systems for copper extractive waste and identifies associated risks; understands and evaluates leading technologies and best practices for recycling, reuse, and reclamation of copper extractive waste and existing disposal facilities.

Level: A (senior managers, middle managers, office personnel, and staff within human resources departments)/ B (technical and labour-position personnel)

Issuance format: badge

Module 3

Name of course: Physical Metallurgy of Cu

Certified competences: Identifies and explains the fundamental crystal structures of metals (particularly copper and its alloys); analyses the influence of atomic bonding, dislocations, and structures on metal properties; interprets phase diagrams to predict microstructural changes during solidification and processing; correlates the microstructures of copper alloys with their processing history and properties; applies principles of casting, solidification, and heat treatment to optimise copper alloy microstructures and properties; evaluates processing defects and proposes corrective measures based on metallurgical principles; recognises the role of computational and digital tools in supporting design and process optimisation; evaluates the role of physical metallurgy in the copper value chain and adapts knowledge to the needs of Industry 4.0 and sustainable manufacturing practices.

Level: A (senior managers, middle managers, office personnel, and staff within human resources departments)/ B (technical and labour-position personnel)

Issuance format: badge

Module 4

Name of course: Health & Safety

Certified competences: Understands occupational safety principles and environmental risk management; identifies workplace hazards and recommended preventive measures; demonstrates appropriate response during simulated emergency situations; promotes leadership and communication to foster safe behaviour.

Level: A & B (senior managers, middle managers, office personnel, and staff within human resources departments, technical and labour-position personnel)

Issuance format: badge

Module 5

Name of course: Soft Skills

Certified competences: Understands the importance of effective communication; recognises different communication techniques and approaches; creates and promotes environments conducive to teamwork.

Level: A & B (senior managers, middle managers, office personnel, and staff within human resources departments, technical and labour-position personnel)

Issuance format: badge

3.2. Certification Process

The participant registers on the platform https://learningpoint.eitrawmaterials.eu/ (or EIT SkillsHub) and then purchases access to the selected course.

In order to enrol in individual modules, participants are expected to meet the following basic requirements:

a) Module 1: Copper Supply Chain

Participants are expected to have a basic understanding of industrial processes, materials, or resource management. Experience in mining, metallurgy, or environmental management is beneficial but not required.

b) Module 2: Extractive Waste Management

Participants should have a general awareness of mining or metallurgical operations and environmental protection principles. Familiarity with EU environmental legislation or industrial waste management practices is desirable but not essential.

c) Module 3: Physical Metallurgy

The asynchronous course builds on a basic curiosity in materials science. A background in physics (e.g. physics, engineering) is recommended. No prior experience with computational modelling tools is required.

d) Module 4: Health & Safety

No specific technical education is required. Participants should have prior experience in industrial or laboratory environments and a general understanding of workplace safety principles.

e) Module 5: Soft Skills

No technical prerequisites are required. Participants are encouraged to have prior professional experience in teamwork or industrial environments in order to contextualise activities related to communication, leadership, and collaboration.

The participant undertakes the selected course and completes it in accordance with the designed training plan within the chosen thematic area. Each module is divided into short lessons. Learners may complete modules at any time, using progress-tracking features and built-in feedback functionality.

Each module is delivered in accordance with the planned number of learning hours, with reference to the EQF:

Table 4. Structure of training modules: duration and EQF levels

Module	Level	Lessons	Duration (hours)		EQF
			Asynchronous	In-person	
Module 1: Copper Supply Chain	A	12	10	20	6-8
	B	8	8	12	3-4
Module 2: Extractive Waste Management	A	23	8	12	6-8
	B	9	6	7	3-4
Module 3: Physical Metallurgy of Cu	A	31	10	23	6-8
	B	20	8	11	3-4
Module 4: Health & Safety	A&B	7	4	8	6-8; 3-4
Module 5: Soft Skills	A&B	24	3	14	6-8; 3-4

The courses are delivered in a hybrid format, combining asynchronous (online) training and in-person (face-to-face) sessions, using teaching methods such as e-learning, case studies, VR, and tests. Individual tasks take the form of practical assignments (e.g. VR-based tasks), interactive elements, infographics, video materials, and educational reading materials.

Upon completion of all lessons within a given module, the participant takes a test, which is passed upon achieving a minimum of 80% correct answers. Currently, participants are allowed to retake the test until a passing result is achieved; however, in order to increase the market value of the training completion certificate, it is worth considering limiting this possibility, for example to 2-3 attempts.

Based on a positive test result, the training participant receives a Badge confirming completion of the training. The references embedded in the metadata of such a Badge are described in the further part of this chapter.

3.3. Micro-credential References

In order to confirm the completion of the training, after achieving a positive test result upon completion of the Module, the course participant receives a micro-credential in the form of a Badge. The metadata embedded in the Badge contain all the necessary information about the training as well as the data of the individual who completed it.

3.4. Data Describing the Micro-credential

1) Badge metadata: Copper Supply Chain

a) Lev. A

Title: Copper Supply Chain course (A)

Learning outcomes: Knows and describes the main stages of the copper supply chain; differentiates between primary and secondary copper resources and explains their global distribution; explains ore beneficiation techniques and scrap recycling methods; analyses the principles and applications of pyrometallurgical and hydrometallurgical methods of copper production; identifies key by-products and copper compounds generated throughout the supply chain and assesses their economic and industrial significance; evaluates the environmental impacts of copper production and mitigation strategies; interprets global market trends related to production and substitution challenges in order to understand the strategic importance of copper in the clean energy transition; evaluates the role of Environmental, Social and Governance (ESG) practices in ensuring sustainability, ethical sourcing, and stakeholder engagement across the copper supply chain.

Nature: sector-specific upskilling

Context of use: industry

Category: knowledge, professional competences

Target group: senior managers, middle managers, office personnel, and staff within human resources departments

Workload: 10 h online

Assessment method: test result min. 80%

EQF level: 6-8

Full name of the micro-credential: SkiComCu - Lifelong Learning Course for skills & competences in the Copper sector: Copper Supply Chain course

Micro-credential identification number: XXXXXXXX

Issuer: SkiComCu consortium, via EIT RawMaterials

Date awarded: XX/XX/XXXX

Validity period: XX

b) Lev. B

Title: Copper Supply Chain course (B)

Learning outcomes: Knows and describes the main stages of the copper supply chain; differentiates between primary and secondary copper resources and explains their global distribution; explains ore beneficiation techniques and scrap recycling methods; analyses the principles and applications of pyrometallurgical and hydrometallurgical methods of copper production; identifies key by-products and copper compounds generated throughout the supply chain and assesses their economic and industrial significance; evaluates the environmental impacts of copper production and mitigation strategies; interprets global market trends related to production and substitution challenges in order to understand the strategic importance of copper in the clean energy transition; evaluates the role of Environmental, Social and Governance (ESG) practices in ensuring sustainability, ethical sourcing, and stakeholder engagement across the copper supply chain.

Nature: sector-specific upskilling

Context of use: industry

Category: knowledge, professional competences

Target group: technical and labour-position personnel

Workload: 8 h online

Assessment method: test result min. 80%

EQF level: 3-4

Full name of the micro-credential: SkiComCu - Lifelong Learning Course for skills & competences in the Copper sector: Copper Supply Chain course

Micro-credential identification number: XXXXXXXX

Issuer: SkiComCu consortium, via EIT RawMaterials

Date awarded: XX/XX/XXXX

Validity period: XX

2) Badge metadata: Extractive Waste Management

a) Lev. A

Title: Extractive Waste Management course (A)

Learning outcomes: Analyses the legal and regulatory frameworks governing sustainable management of copper extractive waste in the EU; evaluates the physical and geochemical properties of copper extractive waste and their relevance for classification and management strategies; understands disposal systems for copper extractive waste and identifies associated risks; understands and evaluates leading technologies and best practices for recycling, reuse, and reclamation of copper extractive waste and existing disposal facilities.

Nature: sector-specific upskilling

Context of use: industry

Category: knowledge, professional competences

Target group: senior managers, middle managers, office personnel, and staff within human resources departments

Workload: 8 h online

Assessment method: test result min. 80%

EQF level: 6-8

Full name of the micro-credential: SkiComCu - Lifelong Learning Course for skills & competences in the Copper sector: Extractive Waste Management course

Micro-credential identification number: XXXXXXXX

Issuer: SkiComCu consortium, via EIT RawMaterials

Date awarded: XX/XX/XXXX

Validity period: XX

b) Lev. B

Title: Extractive Waste Management course (B)

Learning outcomes: Analyses the legal and regulatory frameworks governing sustainable management of copper extractive waste in the EU; evaluates the physical and geochemical properties of copper extractive waste and their relevance for classification and management strategies; understands disposal systems for copper extractive waste and identifies associated risks; understands and evaluates leading technologies and best practices for recycling, reuse, and reclamation of copper extractive waste and existing disposal facilities.

Nature: sector-specific upskilling

Context of use: industry

Category: knowledge, professional competences

Target group: technical and labour-position personnel

Workload: 6 h online

Assessment method: test result min. 80%

EQF level: 3-4

Full name of the micro-credential: SkiComCu - Lifelong Learning Course for skills & competences in the Copper sector: Extractive Waste Management course

Micro-credential identification number: XXXXXXXX

Issuer: SkiComCu consortium, via EIT RawMaterials

Date awarded: XX/XX/XXXX

Validity period: XX

3) Badge metadata: Physical Metallurgy of Cu

a) Lev. A

Title: Physical Metallurgy of Cu course (A)

Learning outcomes: Identifies and explains the fundamental crystal structures of metals (particularly copper and its alloys); analyses the influence of atomic bonding, dislocations, and structures on metal properties; interprets phase diagrams to predict microstructural changes during solidification and processing; correlates the microstructures of copper alloys with their processing history and properties; applies principles of casting, solidification, and heat treatment to optimise copper alloy microstructures and properties; evaluates processing defects and proposes corrective measures based on metallurgical principles; recognises the role of computational and digital tools in supporting design and process optimisation; evaluates the role of physical metallurgy in the copper value chain and adapts knowledge to the needs of Industry 4.0 and sustainable manufacturing practices.

Nature: sector-specific upskilling

Context of use: industry

Category: knowledge, professional competences

Target group: senior managers, middle managers, office personnel, and staff within human resources departments

Workload: 10 h online

Assessment method: test result min. 80%

EQF level: 6-8

Full name of the micro-credential: SkiComCu - Lifelong Learning Course for skills & competences in the Copper sector: Physical Metallurgy of Cu course

Micro-credential identification number: XXXXXXXX

Issuer: SkiComCu consortium, via EIT RawMaterials

Date awarded: XX/XX/XXXX

Validity period: XX

b) Lev. B

Title: Physical Metallurgy of Cu course (B)

Learning outcomes: Identifies and explains the fundamental crystal structures of metals (particularly copper and its alloys); analyses the influence of atomic bonding, dislocations, and structures on metal properties; interprets phase diagrams to predict microstructural changes during solidification and processing; correlates the microstructures of copper alloys with their processing history and properties; applies principles of casting, solidification, and heat treatment to optimise copper alloy microstructures and properties; evaluates processing defects and proposes corrective measures based on metallurgical principles; recognises the role of computational and digital tools in supporting design and process optimisation; evaluates the role of physical metallurgy in the copper value chain and adapts knowledge to the needs of Industry 4.0 and sustainable manufacturing practices.

Nature: sector-specific upskilling

Context of use: industry

Category: knowledge, professional competences

Target group: technical and labour-position personnel

Workload: 8 h online

Assessment method: test result min. 80%

EQF level: 3-4

Full name of the micro-credential: SkiComCu - Lifelong Learning Course for skills & competences in the Copper sector: Physical Metallurgy of Cu course

Micro-credential identification number: XXXXXXXX

Issuer: SkiComCu consortium, via EIT RawMaterials

Date awarded: XX/XX/XXXX

Validity period: XX

4) Badge metadata: Health & Safety

Title: Health and Safety course

Learning outcomes: Understands occupational safety principles and environmental risk management; identifies workplace hazards and recommended preventive measures; demonstrates appropriate response during simulated emergency situations; promotes leadership and communication to foster safe behaviour.

Nature: sector-specific upskilling

Context of use: industry; workplace environment

Category: knowledge, professional competences, social competences

Target group: lev. A & B (senior managers, middle managers, office personnel, and staff within human resources departments, technical and labour-position personnel)

Workload: 4 h online

Assessment method: test result min. 80%

EQF level: lev. A: 6-8; lev. B: 3-4

Full name of the micro-credential: SkiComCu - Lifelong Learning Course for skills & competences in the Copper sector: Health and Safety course

Micro-credential identification number: XXXXXXXX

Issuer: SkiComCu consortium, via EIT RawMaterials

Date awarded: XX/XX/XXXX

Validity period: XX

5) Badge metadata: Soft Skills

Title: Soft Skills course

Learning outcomes: Understands the importance of effective communication; recognises different communication techniques and approaches; creates and promotes environments conducive to teamwork.

Nature: professional upskilling

Context of use: workplace environment

Category: professional competences, social competences

Target group: lev. A & B (senior managers, middle managers, office personnel, and staff within human resources departments, technical and labour-position personnel)

Workload: 3 h online

Assessment method: test result min. 80%

EQF level: lev. A: 6-8; lev. B: 3-4

Full name of the micro-credential: SkiComCu - Lifelong Learning Course for skills & competences in the Copper sector: Soft Skills course

Micro-credential identification number: XXXXXXXX

Issuer: SkiComCu consortium, via EIT RawMaterials

Date awarded: XX/XX/XXXX

Validity period: XX

3.5. Badge Design

The designed badges form a visually and conceptually coherent system for identifying training modules, strongly rooted in the aesthetics of heavy industry while clearly referencing the realities of Industry 4.0+. Their form is based on massive, circular emblems resembling medals or technical competency insignia, which emphasizes the certifying nature of the micro-credentials and their tangible professional value. The use of the circle as the dominant shape reinforces associations with process continuity, material circulation, and a systemic approach to managing production, the environment, and safety.

The entire set is maintained in an industrial “premium” style that combines the rawness of heavy industry with modern, abstract technological symbolism. Metallic frames with visible rivets, abrasions, and patina effects evoke associations with metallurgy, industrial installations, and technical infrastructure, while simultaneously conveying durability, solidity, and high status. As a result, the badges do not appear decorative but function as visual equivalents of real, hard-earned competencies.

The color palette is consistent throughout the set and strongly linked to the themes of copper and the extractive and processing industries. Dark browns, graphite tones, and blacks dominate, complemented by shades of copper, aged gold, and brass, often enhanced with oxidation or wear effects. This palette directly references the world of metals and technological processes while avoiding an overly corporate or synthetic aesthetic. Color accents serve a semantic function: green appears in the context of waste management and sustainability, glowing oranges and golds highlight physical and energy-intensive processes, while lighter metallic tones emphasize quality, certification, and expertise.

The iconography used in the individual badges is formally consistent yet semantically differentiated, allowing each module to retain its own distinct identity. The copper supply chain symbolism relies on abstract circular forms and the “Cu” sign, clearly communicating the idea of material flow, process integration, and modern logistics management. In the extractive waste management module, the recycling symbol and environmental protection motifs are employed, deliberately avoiding explicit contamination or degradation imagery in order to emphasize governance and responsibility rather than problematization. The physical metallurgy badge uses

atomic networks, diagrams, and molten metal imagery, clearly referring to the scientific foundations of technological processes and materials engineering. In the health and safety module, classic OHS symbols such as the helmet and cross are embedded within networked and geometric structures, giving them a modern, systemic character aligned with digital safety management. The soft skills badge presents collaboration, communication, and teamwork through a technical and structured visual language, avoiding pastel or coaching-style aesthetics and positioning soft skills as fully legitimate industrial competencies.

The typography used across the badges is bold, legible, and styled to resemble metal embossing, reinforcing impressions of durability and professionalism while ensuring readability even at smaller sizes. The consistency of form, materiality, relief depth, and recurring compositional elements ensures that the entire set functions as a unified visual system rather than a collection of unrelated graphics. This coherence allows the badges to be presented seamlessly as a complete competency pathway, aligned with the expectations of the industrial sector and with European micro-credential standards.

As a result, the final badge set achieves a high level of aesthetic and communicative quality, combining the tradition of heavy industry with a modern approach to technology, sustainability, and future-oriented competencies, while maintaining the credibility and seriousness expected in engineering and industrial environments.

The individual badge has been designed for each module. The 2nd option for the badge design is to include the SkiComCu Project logo and EIT RawMaterials logo at the bottom of the badge.

Figure 3: SkiComCu Badge for the Module: Copper Supply Chain

Figure 4: SkiComCu Badge for the Module: Extractive Waste Management

Figure 5: SkiComCu Badge for the Module: Physical Metallurgy of Cu

Figure 6: SkiComCu Badge for the Module: Health & Safety

Figure 7: SkiComCu Badge for the Module: Soft Skills

3.6. Management of the Certification Programme

From the perspective of the future potential of micro-credentials in the raw materials sector, the EIT portfolio has all the prerequisites to be recognised as a robust micro-credentials platform. Given the nature of the SkiComCu project - its educational scope, intended use, and formal requirements - the courses developed within the project will be made available via the platform https://learningpoint.eitrawmaterials.eu/ (or EIT SkillsHub), through which both the educational process and the management of the certification programme within SkiComCu will be carried out.

Fulfilment of Regulatory Requirements

Institutional Oversight

Due to the nature of the SkiComCu project and its supervision by EIT RawMaterials, EIT will perform institutional oversight of the certification programme and will therefore act as the issuing body for micro-credentials via its platform, in accordance with adopted procedures and principles that meet the highest

quality standards. The project consortium coordinates the work and ensures compliance of activities with applicable regulations.

Stakeholder Involvement and the Regulatory Aspect

The definition of learning outcomes and certification procedures involves consortium members whose representatives include employers, higher education institutions, and research organisations. The work is carried out under the supervision of EIT, in line with European regulations, with reference to national qualifications frameworks and applicable tools.

Quality Assurance

The SkiComCu certification programme includes quality assessment procedures and post-training evaluation, in accordance with quality standards adopted across Europe.

Technological Aspect

The entity providing access to the SkiComCu project courses is EIT, which - through its platform - enables interoperability and verification of the authenticity of micro-credentials.

Conclusions

Micro-credentials constitute a key element in the transformation of education and vocational training systems towards greater flexibility, accessibility, and transparency. These systems can not only be strengthened, but - through the application of micro-credentials - can respond rapidly to changing market needs. Their implementation enables better alignment of workforce competences with the requirements of the Economy 4.0+ while simultaneously supporting the concept of lifelong learning. In mining and heavy industry, micro-credentials enable the rapid acquisition of digital, technical, and environmental competences that are essential for the safe and efficient performance of work.

From a project perspective, micro-credentials make it possible to create an integrated, multi-level certification programme that engages higher education institutions, employers, regulators, and technology providers. The key success factors of such a programme include stakeholder cooperation, rigorous certification boundary conditions, interoperability, quality assurance, and recognition by the sector. As a result, micro-credentials can become the foundation of a flexible vocational training system, supporting employability, innovation, and the competitiveness of national mining and heavy industry. By adhering to European and national standards, it is possible to ensure interoperability, quality, and the recognition of micro-credentials across Europe. In the case of the SkiComCu project, in order to enhance the market value of the issued micro-credentials, it is worth considering the implementation of a limited number of attempts to pass the examination after the completion of each course module.