



Skills Alliance for Industrial Symbiosis:
A Cross-sectoral Blueprint for a Sustainable Process Industry (SPIRE-SAIS)

Cross-Sectoral Skills Matrix

Deliverable D4.3

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Introduction

The SPIRE-SAIS project, “Skills Alliance for Industrial Symbiosis: A Cross-Sectoral Blueprint for a Sustainable Process Industry”, aims to develop a comprehensive skills framework to support the sustainable transformation of the European energy-intensive industries. As part of this project, deliverable 4.3 “Cross Sectoral Skills-Set Matrix” is a tool/ result of Work Package 4 (WP4) that contributes to enable this transformation.

The work developed on WP4 builds on the foundational work of previous packages, particularly WP2 and WP3. The work done on Work Package 2 involved assessing the current state of industrial symbiosis (IS) and energy efficiency (EE) within European energy-intensive industries, studying the adoption of the circular economy paradigm, and projecting a future scenario for a sustainable process industry cluster in Europe. The insights gained from WP2 provided the basis for identifying the current and future industry skills requirements, which were further refined in WP3. WP4 focused on specifying new skills and training needs, comparing these needs with those in all industrial sectors related to the SPIRE-SAIS project, ensuring workforce adaptation to new requirements, and improving recruitment processes.

The three tasks of WP4 included (1) the mapping the current Vocational and Education Training (VET) provision in selected countries (Germany, Italy, and Portugal) (D4.1), (2) the creation of a European framework for cross-sectoral skills applicable to Energy Intensive Industries (EIs) and their relevant occupations (D4.2), and (3) the digitalisation and integration of the Cross Skills Matrix into the project platform, the SKILLS4PLANET (D4.3). This skills matrix is intended to be integrated into existing national and European VET systems. Through the SKILLS4PLANET platform, stakeholders and workers can access reports comparing industry needs with national qualifications, facilitating targeted improvements in their VET provision and fostering a sustainable, skilled workforce for the future of Europe’s EIs.

SKILLS4PLANET is a platform developed as part of the project, featuring the SKILLS4PLANET HUB. This hub includes three main sections:

- Learning Solutions Directory: This section provides a variety of educational resources, such as courses, simulators, and 3D interactive models, designed to enhance skills across different roles.
- Skills Directory: This tool assists users in identifying and developing the necessary competencies for their positions, thereby promoting digital transformation and sustainability within the industry.
- Qualifications Section: In this section, users can access detailed descriptions of various qualifications and their connection to the skills needed by the EIs, summarising, is where is possible to find the digitalised version of the matrix.

This deliverable supports platform users in making the most out of the Skills Matrix. In particular, it aims to guide them in using it to further improve IS and EE skills of the workforce in EIs industries across Europe.

1. EU Cross-Sectoral Skills Matrix Overview

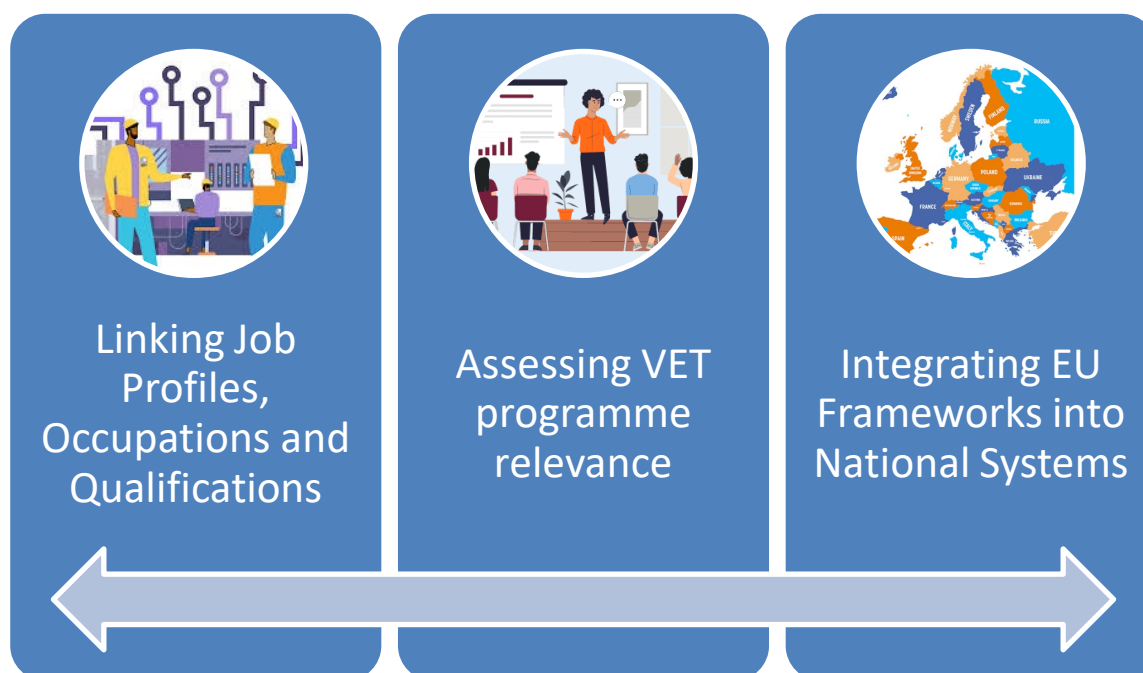
The Skills Matrix was created by integrating strategies from the ESSA Blueprint project and following the European guidelines, such as European Skills, Competences, Qualifications and Occupations (ESCO) and the European Qualification Framework (EQF).

The cross-sectoral matrix was filled with information based on 4 steps:

- **Identify Job Profiles and Skills:** using industry inputs in WP3 10 relevant job profiles and skills for IS and E-related work functions were identified. Four job profiles were selected for the Matrix (Energy Manager, Energy Technician, Waste Manager and Waste Technician) based on their importance/ added value, coverage of IS and EE impacts and sustainability/ feasibility needs of the project (for a more detailed explanation see D4.2);
- **Align with EU frameworks:** industry inputs were translated to “official” terms, using ESCO database for detailed occupation descriptions and codes and skill listings.
- **National Level Descriptions:** analyse how these ‘translated’ job profiles are described in selected three partner countries (i.e. Germany (North Rhine Westphalia), Italy (Emilia-Romagna region) and Portugal), if applicable, looking into Europass certificates and national qualification frameworks;
- **Assess Skills in VET:** evaluate how national VET systems address IS and EE skills demands, assessing qualifications and program content.

This allows the three main functions foreseen:

Figure 1: The three main functions of the EU Cross-Sectoral Skills-Set Matrix.



- **Linking Job Profiles, Occupations and Qualifications:** the matrix connects job profiles (used by industry) to broader occupational and qualification frameworks. This helps employers identify relevant qualifications for job profiles and supports international employee mobility.
- **Assessing VET programme relevance:** it evaluates how well VET programmes meet the industry’s IS and EE skills needs. This supports identifying gaps and strengths in VET programmes, aiding both industry and VET providers in providing directions for improving their training and recruitment.

- **Integrating EU Frameworks into national systems:** the Matrix tracks how well national VET systems align with European frameworks such as EQF, ESCO, and Europass. This facilitates institutions in harmonising relevant VET standards across countries.

This structured approach ensures the Matrix is a comprehensive, future-oriented, and applicable tool across various European countries. Overall, it contributes to improving the alignment of industry needs with VET provisions and fostering international standards in VET.

The real challenge of this deliverable was to convert all this information to the available and interactive online project platform, the SKILLS4PLANET. The digitalisation of the Cross-Sectoral Skills-Set Matrix, as is open and with free access to anyone, is part of the roll-out strategy to disseminate this framework to all countries of Europe.

The national qualifications selected for each country, Portugal, Italy and Germany, were connected to the four job profiles identified and it's possible to verify the associations in Table 1.

Table 1: Connection between national qualifications and job profiles and SPIRE-SAIS job profiles

SPIRE-SAIS Job Profiles	Portuguese Job Profiles	Portuguese Qualifications	Italian Job Profiles	Italy Qualifications	German Job Profiles	Germany Qualifications
Energy Manager	Energy and Resources Manager	Energy and Environment Engineering	Manager for energy supply and building construction / energy savings in sustainable construction	Manager for Energy-Saving, Low Environmental Impact Building Constructions	Certified Specialist for Energy Management	Certified Specialist for Energy Management
Energy Technician	Energy Technician	Energy Management and Control Specialist Technician	Higher technician for energy supply and plant construction / management and verification of energy installations / energy saving in sustainable construction	Energy Saving and Renewable Energy Technicians	Electronics Technician Specialist in Energy and Building Services Engineering	Electronics Technician Specialist in Energy and Building Services Engineering
Waste Manager	Environmental Engineer	Energy and Environment Engineering	-	-	Specialist in Recycling and Waste Management	Specialist in Recycling and Waste Management
Waste Technician	Waste Management Technician	Water Treatment Systems Technician	Higher technician for energy supply and plant construction / management and verification of energy installations / energy saving in sustainable construction Junior Technician for the Circular Economy / Industrial Symbiosis	Energy Saving and Renewable Energy Technicians Technicians of the Circular Economy and Industrial Symbiosis	Controller of Liquid Waste Treatment Plants	Specialist for Wastewater Technology

2. SKILLS4PLANET – Qualifications Section

The Matrix was constructed based on the ESCO guidelines, ensuring its adherence to common standards, facilitating mobility, and alignment with labour market needs. Firstly, the partners constructed the Matrix in Excel with the following three main sections:

- **Job and Skills**
 - Job profile: Name of the job delivered by the industry (WP3)
 - Alternative job profile titles: Alternative names of the job delivered by the industry (WP3)
 - Skills needs: Skills relevant for the IS and EE for the particular job profiles as identified by the industry (WP3)
 - Skill level: Current and future (or aimed) level of the skill in order to implement IS and EE, as identified by the industry (WP3).

- **European Level**
 - ESCO group label: the group of narrower occupations
 - ESCO group code: 4 digits number describing ESCO group
 - ESCO Occupation label: an occupation is a grouping of jobs involving similar tasks and which require a similar skills set
 - ESCO Occupation code: 5 digits number describing ESCO occupation
 - ESCO Alternative labels: Alternative labels for the same occupation in ESCO
 - ESCO Skills relevant for IS: result of the analysis of the skills presented in ESCO occupation (skills that are directly related to IS and EE)
 - ESCO Skill alternative labels: ESCO alternative labels for that skill
 - ESCO Skill reusability level: indicates how widely a knowledge, skill or competence concept can be applied (there are 4 levels: transversal, cross-sectoral, sector-specific and occupation-specific).

- **National Level**
 - ESCO group label: Translation of ESCO information to the national language
 - Alternative job label: Translation of ESCO information to the national language
 - Qualification label: Qualification related to the particular occupation
 - National Classification of Occupation: Name/code of the occupation in the National Classification of Occupation
 - National Classification on Framework: Name/code of the qualification in the National Qualification Framework
 - Qualification programmes: List of national VET programmes providing this qualification
 - Duration (in months): Duration of the programme
 - Certificate in Europass Format: Link to the Europass certification for the qualification
 - ISCED Info: ISCED code as identified in the description of qualification
 - EQF: EQF level of the qualification
 - ESCO: Whether the qualification is integrated into ESCO
 - Skills needs: Skills relevant for the IS and EE for the particular job profiles as identified by the industry
 - Skill level: Aimed level of the skill in order to implement IS and EE
 - Whether this skill is sufficiently addressed in the description of qualification?: Fill in this information if no qualification programmes exist for the given job profile
 - How this skill is integrated in the description of qualification? Fill in this information if no qualification programmes exist for the given job profile

- Whether this skill is sufficiently addressed in the particular qualification programme?: Yes/No/Partly
- How this skill is integrated in the particular qualification programme? How the skill is mentioned
- Relevant learning outcomes indicated in the particular qualification programme? For each IS and EE skill check if there are any learning outcomes indicated in the description of the particular qualification programme.

This work allowed us to summarize the following information:

Table 1: Matrix information summary.

Job and skills	Description of the job in EU frameworks	Job & Qualification in country	National Frameworks	Integration in EU Framework Categories	IS and EE skills readiness
<ul style="list-style-type: none"> • Job profile alternative • Job profile titles • Skill needs • Skill level 	<ul style="list-style-type: none"> • ESCO group label • ISCO group code • ESCO occupation level and code • ESCO alt. Labels • ESCO skills 	<ul style="list-style-type: none"> • ESCO group label in country • Job labels in country • Qualification label 	<ul style="list-style-type: none"> • National qualification framework labels of occupation and qualification • list of national VET programmes delivering those • duration 	<ul style="list-style-type: none"> • Europass certificate • ISCED info • EQF info • ESCO integration of qualification 	<ul style="list-style-type: none"> • Skill needs • Skill levels • Skills sufficiently addressed by qualification • Integration of skill in qualification, • Addressed in VET programme, learning outcomes indicated

As previously exposed, the process of identifying job profiles and skills that further resulted in the selection of four crucial occupations – Energy Manager, Energy Technician, Waste Manager and Waste Technician- was followed by their association with Europass certificates and national qualification frameworks of the selected three partner countries and beyond. Thus, the national qualifications selected for each country were connected to the four job profiles identified, resulting in the information displayed in Table 1.

The job profiles identified by the Spire Sais project were translated as umbrella terms for the different existing job profiles in each country. For instance, for Energy Manager translate in Energy and Resource Manager in Portugal, for Manager for Energy Supply and Building Construction in the case of Italy and, in Certified Specialist for Energy Management in Germany. The same logic was applied to the national qualifications. The national profiles under the umbrella term for Energy Manager were associated with the existing national qualification that more closely approximates the knowledge, skills and attitudes that a said professional is expected to have in their possession.

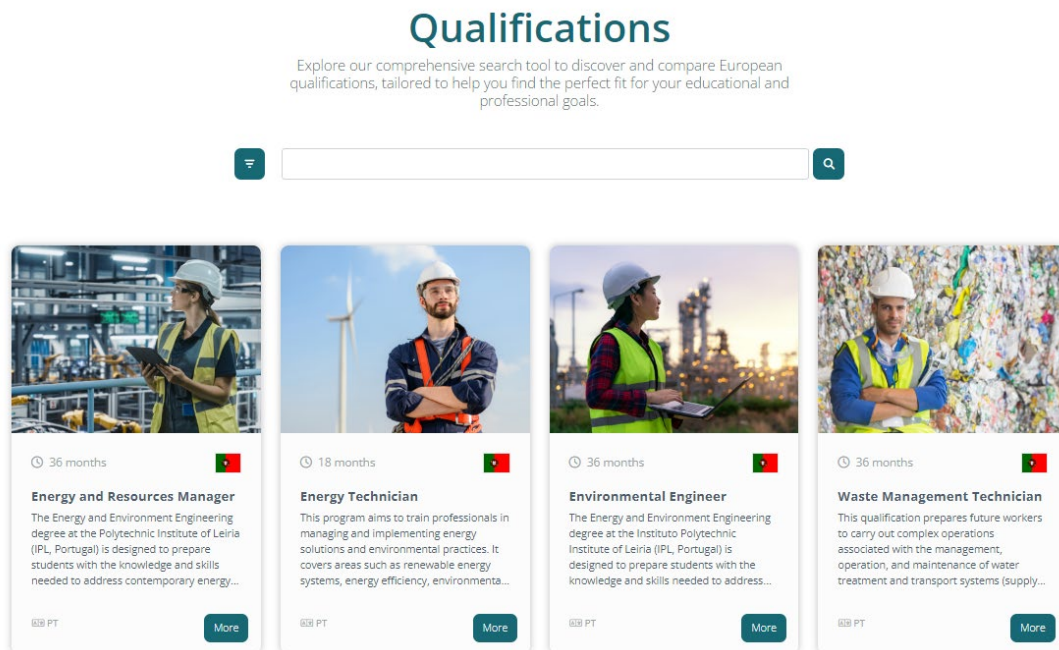
Again, for the case of Energy Manager the qualifications more closely associated with this job profile are Energy and Environment Engineering in the case of Portugal, Manager for Energy-Saving, Low Environmental Impact Building Constructions in the Italian case and Certified Specialist for Energy Management in Germany.

To answer the aforementioned goals of linking Job Profiles, Occupations and Qualifications; assessing VET programme relevance and integrating EU Frameworks into national systems, this data, together with the skills needs found in WP3, was uploaded to the SKILLS4PLANET, specifically, on the Qualifications page, ensuring open and easy access to the collected information.

Within the Qualifications page of the platform, it is possible to access the different national qualifications that are identified with a country flag. In Figure 2, below, the Portuguese

qualifications selected are presented. Each National qualification includes information such as the title, duration of the programme, language and a brief description.

Figure 2: Print of the national qualifications shown on the platform.



Then, when the user goes to the page of each national qualification, he will find the information recorded in the Matrix, such as ISCO Number, ISCO label, EQF level (see Figure 3).

Figure 3: Print of the National Qualification information on the platform (Qualification

Waste Management Technician

🕒 36 months | 📍 Portugal | 🇵🇹 Portuguese

Qualification details

ISCO Number: 3132.2 | Stage: I-VET

Type: Dual | EQF: 4

Specific Occupational Qualifications: Liquid waste management technician; Liquid & solid waste treatment plant operator

ISCO Label: Incinerator and water treatment plant operators

No Europass Certification Supplement

Curriculum Documentation

details).

By accessing the box “Curriculum Documentation”, the user will further be able to view all the learning outcomes (LOs) of each particular qualification by scrolling down on that page (See Figure 4, below), it is possible to find the IS and EE-related LOs to which the selected qualification responds, along with the surveyed skills needs collected in the context of WP3 that the qualifications sufficiently addresses.

Figure 4: Print of the National Qualification information on the platform (Learning Outcomes).

Learning Outcomes

Energy Data and Analysis	1	▼
Energy Efficiency Process Optimisation	5	▼
Environmental Awareness	4	▼
Environmental Legislation	6	▼
Horizon Scanning	1	▼
Industrial Symbiosis Fundamentals	1	▼
Industrial Symbiosis Process Optimisation	2	▼
IS Sustainable Resource Management	1	▼
Trans-Diciplinary Thinking	1	▼
Wastewater Management	11	▼

The incorporation of the Matrix into the platform, and, specifically, the access to the qualifications page, details and curriculum documentation, serves a three-fold purpose. Firstly, as a collection of educational programmes (available in each country – Germany, Italy and Portugal) that lead to the selected job profiles, it allows students to ascertain each qualification corresponding to European ‘codes’, thus contributing to facilitating their mobility inside the European labour market.

Secondly, the platform could also be of assistance to industry representatives, who could access educational programmes that better align with IS and EE-related skill requirements, thereby facilitating recruitment processes.

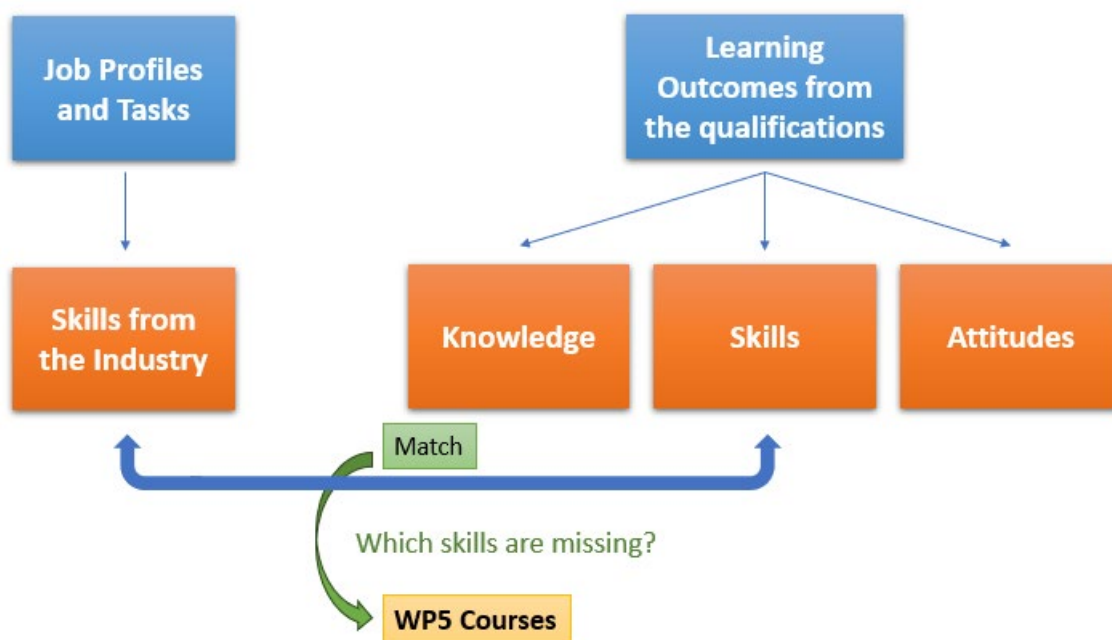
Finally, the platform facilitates the identification of gaps in VET programmes concerning the provision of IS and EE-related skills by establishing a relationship between the WP3 results, which are the current and future skills needs of EII industries, and the expected learning outcomes of each selected qualification. This enables VET representatives and other education stakeholders to assess the capacity of VET programmes to meet the current needs of the EII labour market. By identifying the gaps where these programmes are not fully capable of addressing the current labour market demands, this Matrix ensures a close relationship between education and the labour market. It allows education providers to not only identify the unmet current skill demands and work to address them, but also to identify the skills needs that could become relevant in the near future.

As the platform continues to support more training courses and more users, it will be possible to visualise on the page for each qualification the “related courses” section within which everyone can acquire new skills, knowledge and attitudes, according to what each professional is looking for. Also, it is verified in the “related occupations” section the other job profiles identified in the SPIRE-SAIS project. Once you enter the SKILLS4PLANET platform, it is easy to navigate and find the relevant information.

3. Improvements to the Matrix and Qualification Section of SKILLS4PLANET

The work carried out throughout WP4 on the national EQF qualifications related to IS and EE is extremely relevant to the situation of European EILs as it has allowed us to understand the current state of skills acquisition and what can be done to improve this situation, at the European level.

Figure 5: Summary of the work carried out in Task 4.3.



The project aimed to develop a blueprint for EILs, and this is a cumulative endeavour developed by other projects in the field, the various institutions and companies and all the players who work in each of the sectors every day.

Therefore, the SPIRE-SAIS project's outcomes alone cannot offer a singular and definitive solution to the challenges faced by EILs, as they must be complemented by all the research and practical work that has been carried out by all relevant stakeholders and, moreover, the results that users of the platform will generate.

As industrial and educational national policies align more closely with the European Commission's strategic objectives, anticipated changes in legislation will drive the evolving needs of companies and influence VET provision that will contribute positively to the development of green skills in the EILs workforce. In addition to these efforts, it is suggested the development of a tutorial video for this section of the platform. This video would provide users with clear, step-by-step guidance on how to navigate and use the platform effectively, ensuring they can fully benefit from its features and contribute to its ongoing improvement.

In conclusion, we hope that the work carried out under the SPIRE-SAIS project will continue to be further refined and updated throughout the fine-tuning of the EILs Blueprint. This ongoing process will provide valuable insights into new skills, job profiles, training offers, and the emerging needs of the different EILs sectors. The collaboration and continuous input from all EILs

stakeholders will ensure that the blueprint remains relevant and effective in fostering a skilled and adaptable workforce capable of meeting future sustainable challenges.