



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

## Exploitation Plan for the Blueprint Strategy

Deliverable D6.3

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## 1 Framework

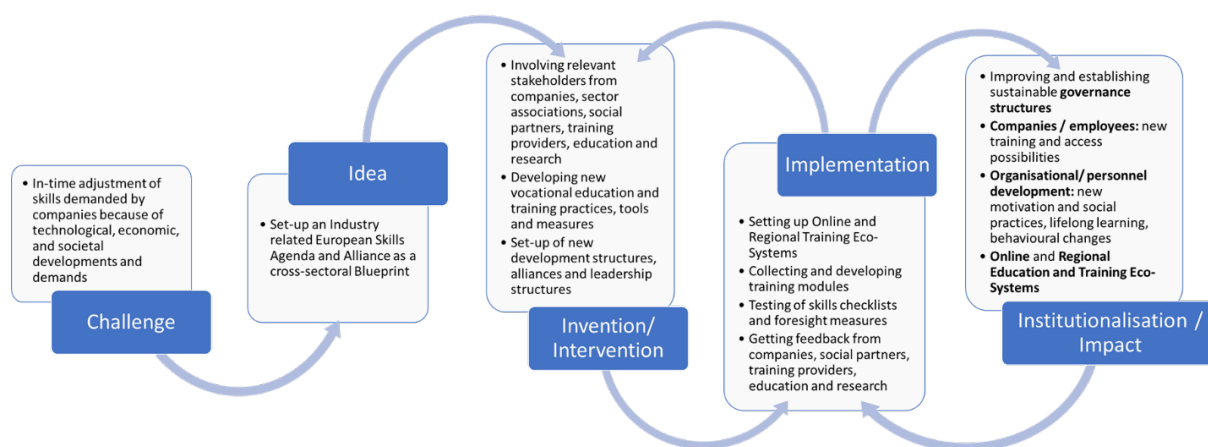
The exploitation of SPIRE-SAIS is based on the already institutionalised Skills Alliance, the Blueprint (D5.3, Schröder et al. 2024a) and the results of its framework, strategies, tools and measures (D6.2, Schröder et al. 2024b). The test phase focused on possible ways to implement a SPIRE-SAIS governance structure, with a special emphasis on four pillars: 1) advocacy for uptake of the Blueprint, 2) assess feasibility and bottlenecks for implementation, 3) funding support measures, and finally 4) to ensure the connectivity between the EU level and the sectoral/national/regional level needs.

SPIRE-SAIS was already from its early stages conceptualised as a social innovation process *by the industry for the industry* integrating all the relevant and willing stakeholders on the European, sectoral, national and regional levels. In line with the developed European governance structure of SPIRE-SAIS, this exploitation plan is outlined with its main elements: Foresight Observatory (Skills Intelligence Hub), Training Framework (SKILLS4Planet online training platform), and the sectoral-national-regional rollout. Additionally, the alignment with European activities, programs, projects and structures completes the exploitation plan.

The implementation and institutionalisation of SPIRE-SAIS has already taken place to a large extent, thanks to its development as a social innovation process. The exploitation plan based on the findings and results of the SPIRE-SAIS project and its final Blueprint (Deliverable D5.3, Schröder et al. 2024a) has the objective of guaranteeing a smooth transition phase to the further implementation, dissemination, running and development of the European Skills Alliance for Industrial Symbiosis. Right from the beginning of the project, starting with the proposal phase, the sustainable implementation of SPIRE-SAIS and its Skills Alliance was part of the work programme. As an activity **of the industry for the industry** all the relevant stakeholder groups of the project (companies, training providers, research institutions, and associations / social partners) were integrated in the Blueprint developments. A significant partnership of 24 partners and 13 associated partners (all willing to participate at their own costs) indicates a strong level of engagement and urgency of the industry for re- and upskilling and attracting, recruiting and retaining talents for the future energy-intensive industries. In the Final Conference, it was stressed that the grounds for a sustainable running and further development of the SPIRE-SAIS skills alliance are given, supported and welcomed by all the stakeholders to go on beyond the project's funding period.

The process of developing and further running the SPIRE-SAIS Blueprint organised as a social innovation process has integrated relevant and intrinsically motivated stakeholders of different areas and provinces right from the beginning in the consortium. Starting with the **challenge** of adjusting skills needs, because of new technological and economic developments, the **idea** of a sectoral Blueprint of the Erasmus+ program was taken up. This led to the SPIRE-SAIS **intervention** and the setting up of the European Skills Alliance for Industrial Symbiosis with interested stakeholders from companies, training providers, social partners, testing the developed Blueprint during an **implementation** phase, and setting the basis for **institutionalisation** and **impact** right from the beginning. In the planning of the project, **iterative and cyclical feedback loops** were planned and conducted, ensuring the upgrading of the interventions and implementation of the Blueprint due to new developments and necessities during the period of the project (see Figure 1).

## Skills Alliance and Strategy Building as a Social Innovation Process



**Figure 1:** SPIRE-SAIS Development as a Social Innovation Process

This kind of development process will continue to be applied in the ongoing Skills Alliance beyond the project's funding period. However, the point of no return has been already reached leading to new constellations by integrating the European Steel Skills Alliance (ESSA) and SPIRE-SAIS in the Large Scale Partnership Energy Intensive Industries (LSP EII), increasing the scope of skills demands and training solutions.

## 2 Exploitation Concept: Combining and Boosting Existing Forces with the LSP Energy Intensive Industries

The exploitation concept is very much in line with the integration of SPIRE-SAIS activities in existing European-sectoral-national-regional governance structures, such as A.SPIRE, Processes4Planet (P4Planet) co-programmed partnership, A.SPIRE's Advisory and Programming Group (APG) and Permanent Working Group 6 Societal Innovation and others (see chapter 5 in detail). In addition, a big step forward was done by founding the **Large Scale Partnership Energy Intensive Industries (LSP EII)** under the Pact for Skills, pushed and established by SPIRE-SAIS in May 2023. With the LSP EII, a **common all Energy Intensive and Process Industries comprising framework and alliance** was created based on the alliances and results of the two Blueprints SPIRE-SAIS (cross-sectoral and industrial symbiosis skills specific blueprint) and ESSA as a specific (steel) sector-related blueprint including an incremental up-skilling of representative job profiles (t-shaped skills: technical and transversal skills (green, digital, social, individual, and methodological)). The LSP EII is not only ensuring the exploitation of SPIRE-SAIS (and ESSA) results, measures and tools, but also bringing the development forward to a higher level by compiling synergies of both blueprints and extending the focus to additional sectoral and regional in-depth trainings, rollouts, and marketing activities. Additionally, both online training platforms steelHub (ESSA) and SKILLS4Planet (SPIRE-SAIS) will be linked, opening training courses for each other and connected further under a common umbrella HUB5.0 with additional learning solutions, the development of micro-credentials and extended support possibilities.

Additionally to the A.SPIRE sectors (Steel, Water, Chemicals, Ceramics, Cement, Minerals, Non-ferrous Metals, Engineering, Pulp and Paper, and Refinery) the LSP EII is open for new

sectors, integrating so far additionally RawMaterials, Welding, Logistics and Glass (in consideration). Besides the partners of the SPIRE-SAIS project, new members applied for the LSP EII as well.

With a cross-sectoral exchange strategy and alliance, the LSP EII will dynamically detect and adjust future skills demands in line with the ambitions of the Process Industries European Strategies (e.g., P4Planet's Strategic Research and Innovation Agenda, ESTEP Strategic Research Agenda and Clean Steel Partnership CSP). Alignment with other European programs and activities will ensure the integration of the EIIs skills perspective (esp. Erasmus+, Horizon Europe, P4Planet, CSP calls and projects). Possible complementarities with the Raw Materials Academy managed by the EIT Raw Materials will be explored to identify new areas for skills-focused actions. Rollout to the different sectors, member states, selected regions (esp. through Hubs4Circularity Community of Practice, sector related clusters, Centres of Vocational Excellence) is planned to be done by the members of the Pact for Skills through different means (e.g., platforms, events, workshops). This can be done in collaboration with European Communities of Practice, the Pacts for Skills Support or other.

Within this framework, the further exploitation and development of SPIRE-SAIS will guarantee the sustainable running and rolling out of the Blueprint on the European, sectoral, national and regional levels. The exploitation strategy has a double aim:

- (1) transferring the Blueprint to national and regional decision makers and other sectors;
- (2) convincing and integrating more end-users in the further social innovation development process (esp. companies, education and training providers and workers/learners) to integrate new trainings and to implement common strategies.

Furthermore, synergies with other Blueprints and Ecosystems of the Pact for Skills will be continuously considered, such as the Hydrogen for VET Teachers onsite training<sup>1</sup> but also the alignment and support of the ChemSkills Blueprint (<https://www.chemskills.eu/>). Besides the existing skills approaches (ESSA: t-shape skills combining technical with transversal skills, SPIRE-SAIS: skills for industrial symbiosis and energy efficiency) and depending on the existing resources and funding possibilities the integration of further cross-sectoral skills demands for other and new challenges (e.g., decarbonisation, hydrogen usage) are under consideration.

Exploitation has already been done **during the project lifespan** by dissemination and rollout activities of the partners, focusing on their sectors and regions. Each type of partner (e.g. companies, education and training providers, social partners) performed their specific exploitation activities (due to their main roles in the project, see chapter 4). Key activities were:

- Reflection and assessing the Blueprint strategies, measures and tools,
- Integrating the selected job roles and skills classification into their skills programs,
- Informing trainers and training bodies,
- Assessing existing trainings in relation to their relevance and integration in Industrial Symbiosis and Energy Efficiency modules,

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<sup>1</sup> The Hydrogen VET forum in Spa was launched by the Automobile Club de l'Ouest, the FIA World Endurance Championship, the MissionH24 and its partners Automotive Skills Alliance (<https://automotive-skills-alliance.eu/>), GreenSkillsforH2 (<https://greenskillsforhydrogen.eu/>) and Skills Alliance for Industrial Symbiosis SPIRE-SAIS, as part of the 2024 FIA World Endurance Championship 6 Hours of Spa-Francorchamps. The Hydrogen VET forum in Spa gathered current and future teachers and trainers to share ideas and good practices, work together and deepen their knowledge about the hydrogen ecosystem.

## SPIRE-SAIS: Deliverable D6.3 Exploitation Plan

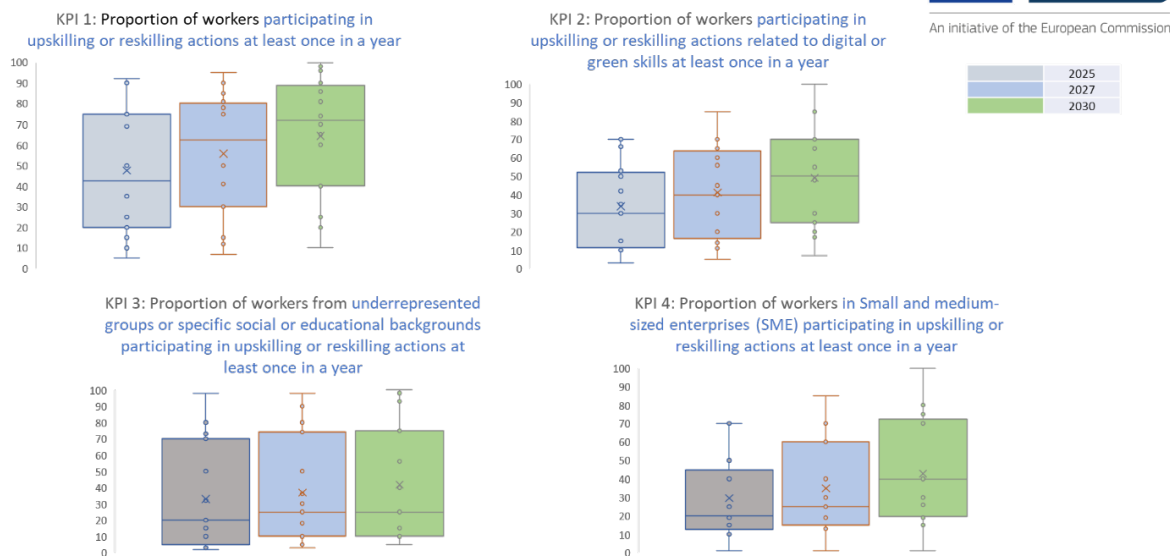
- Developing own sector specific trainings,
- Dialogue with policymakers to facilitate the rollout of the blueprint.

Based on these activities, exploitation **after the project** will be integrated in the A.SPIRE and Processes4Planet activities and most of all, within the scope of the Large Scale Partnership Energy Intensive Industries under the Pact for Skills. The focus will be much more on the sectoral, national-regional skills demands, integrating more and other stakeholders and end-users as well as incorporating further regions and member states (beyond those represented by the project and in the rollout activities so far) as well as cooperating with other sectors and networks. Key activities will be:

- Further implementing and adjusting the sustainability structures
- Further extending SKILLS4Planet: new contents, skills and trainings, providers and end-users
- Pursuing additional financial support from other supporters or donors,
- Exploiting and connecting further with existing and upcoming networks and platforms (such as the CoP Industry 5.0, the BRIDGES 5.0 Platform, the H4C Community of Practice)
- Multiply the results based on good practice examples collected during and after the project (see Deliverabl D2.1, Branca et al. 2024)
- Continuing dialogue with European, national and regional policymakers to facilitate continuous support and rollout of the blueprint.

To monitor the exploitation, related performance indicators are covered already via the yearly evaluation reports (Deliverables D8.2, Almeida et al. 2020-2024). However, as they were developed to ensure the quality and outreach of the project, the further assessment of the performance of the SPIRE-SAIS activities will be led by the Key Performance Indicators of the LSP EII. With this, a general European joint framework commitment will be complemented by sector specific actions or sub commitments. The LSP has committed to promoting the aim of involving 50% of the workforce in upskilling and reskilling across the ecosystem each year by 2030. However, this target differs depending on the sector and stakeholder assumption leading to a broad range (see results of the LSP partner questionnaire 2024 in Figure 2).

## LSP EII Quantitative Cross-sectoral KPIs



**Figure 2:** LSP EII Cross-sectoral KPIs

Other quantitative and qualitative KPIs are:

- Engaged sectors (number of involved sectors, and their institutions)
- Involved stakeholders (number of companies, associations, research and education organizations, civil society organizations, public authorities)
- Involved member states and regions with energy intensive industries (number of sector specific clusters/regions, H4Cs, industry parks, etc.)
- Number of related job profiles, skills identified, and related trainings
- Number of projects combining technological development with the skills demands and training (skills integration in new projects) by integrating this topic in regular observations and surveys (e.g., within the reporting of Clean Steel Partnership and Processes4Planet).

Ongoing exploitation takes the form of a "take over" from a funded project to day-to-day management and activity integration in the European Energy Intensive Industry structures and procedures. This is done by an incorporation of the SPIRE-SAIS exploitation in existing European sector governance structures and programs (A.SPIRE, Processes4 Planet, Clean Steel Partnership, Pact for Skills and the Large Scale Partnership Energy Intensive Industries, Research Fund for Coal and Steel). This approach includes also an engagement in recent and forthcoming European innovation activities, namely New Skills Agenda, Industry 5.0, and the New European Innovation Agenda (NEIA).

Background for the exploitation and sustainability of SPIRE-SAIS is the already existing involvement of the European Energy Intensive Industries community and the related huge partnership as well as the ongoing activities within the established SPIRE-SAIS and LSP EII governance:

- Foresight Observatory
- Online training platform SKILLS4Planet
- Sectoral-National-Regional Training Ecosystems and a related European Community of Training Practice.

### 3 European Governance

SPIRE-SAIS has developed a Blueprint and Alliance for a European agenda and strategy concerning skills needed in Energy Intensive Industries related to cross-sectoral Industrial Symbiosis and Energy Efficiency. Adjusting these skills continuously in short-term and assisting the wider implementation and exploitation of Industrial Symbiosis and Energy Efficiency across the energy intensive industrial sectors is the main objective also after the project funding period. SPIRE-SAIS focuses on existing and future qualifications and skills for Industrial Symbiosis and Energy Efficiency. It looks at 10 different sectors (Steel, Water, Chemicals, Ceramics, Cement, Minerals, Non-ferrous Metals, Engineering, Pulp and Paper, and Refining), identifies existing gaps and anticipates future skill needs. The SPIRE-SAIS project involves around 40 different entities (as project or associated partners) from different areas within a quadruple helix ecosystem of: 1. Companies, 2. Education and training providers, 3. Sectoral associations, 4. Trades unions, and 5. Civil society organisations. The most important job profile gaps and skills demands for Industrial Symbiosis and Energy Efficiency have been identified through such a stakeholder collaboration. Specific strategies and tools for training, qualifications and recruitment for the different sectors were developed, refined and will be further deployed in the course of ongoing rollouts, taking into consideration the specific challenges of the individual sectors, member states and specific regions.

The main objectives are:

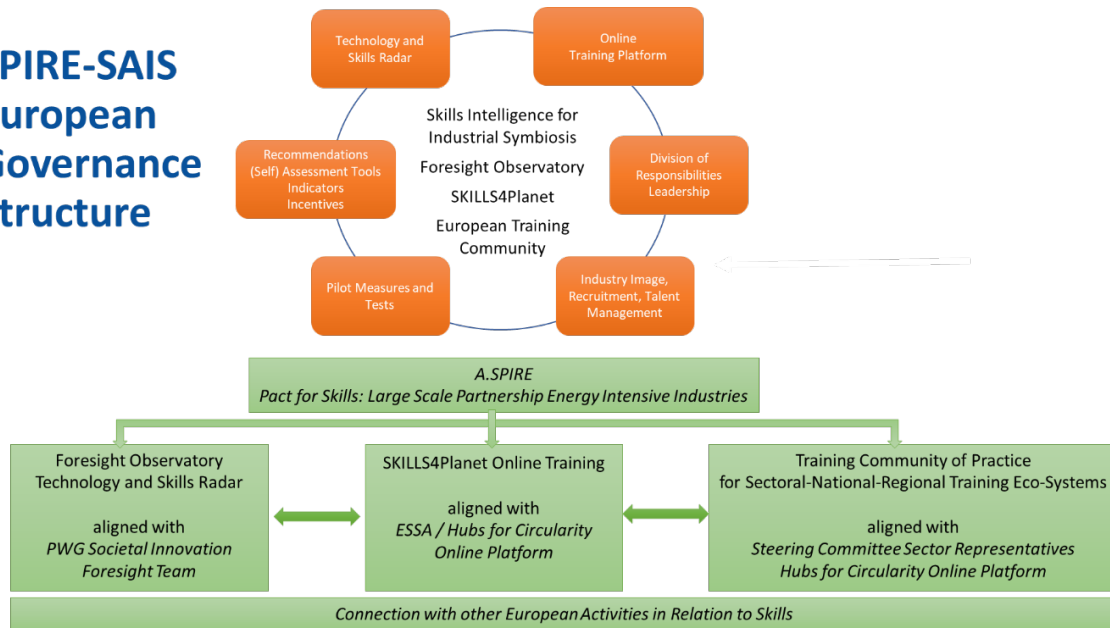
- Proactive identification of gaps in skills both in companies and in VET and Higher Education and training institutions
- Identify, develop and promote successful industry strategies for recruitment, training and qualification
- Create a database of industrial occupations, specific roles in jobs and skills needs
- Detect measures to secure political support
- Engaging European and global industries confronted with challenges stemming from economic, technological and business developments as well as increasing demands for energy efficiency and environmentally sustainable products/services.

This requires for a timely adaptation and anticipation of existing competences, knowledge and skill profiles of the workforce. Within the SPIRE-SAIS partnership and cooperation, a common approach to cross-sectoral skills needs and challenges is provided, focusing in particular on the skills required for Industrial Symbiosis and Energy Efficiency. Concrete and practical strategies and training programmes (modules and tools) in light of the skills and recruiting needs of the industries are developed. Building on the already existing A.SPIRE coordination, projects and activities, a cross-sectoral industrial symbiosis approach is designed covering ten energy-intensive sectors and combining European, national and regional perspectives on industrial symbiosis.

Building on identified gaps and needs, a Blueprint (Deliverable D5.3, Schröder et al. 2024a) was developed, encompassing a European governance structure with the following main elements (see Figure 3):



**SPIRE-SAIS  
European  
Governance  
Structure**



**Figure 3:** SPIRE-SAIS European Governance Structure

The SPIRE-SAIS Blueprint is answering the industry skills demands with the establishment of (1) a **Foresight Observatory** with a Technology and Skills Radar, (2) the **Online Training Platform SKILLS4Planet**, and (3) a **European Training Community for Industrial Symbiosis**, including Image and Recruitment concepts. All three elements feed the **Skills Intelligence for Industrial Symbiosis** continuously with new insights on skills demands.

Within this governance structure:

- Technology and skills foresight will be done within a Foresight Observatory on a regular basis, e.g. via a (bi-)annual survey "Industrial Symbiosis Technology and Skills Radar".
- Technological and economic development and skills-related projects will be listed in a Project Repository, continuously updated.
- Recommendations, self-assessment tools, indicators and incentives will be developed pushing the focus on qualifications, competencies and skills for Industrial Symbiosis and Energy Efficiency.
- Pilot measures and test options for IS and EE skills adjustments will be supported and fostered, including looking for (European and national) funding schemes.
- The **Online Training SKILLS4Planet Platform** is giving immediate answers to the industry skills demands (see in detail section 3.2).
- Industry image campaigns for recruitment and talent attraction will be supported focusing on IS / EE skills and qualifications (see in detail section 3.3).
- Leadership is defined in an Open Coordination way, dividing responsibilities between the main and willing actors.

The Central Coordination unit will be A.SPIRE and the LSP EII. Under this umbrella:

- The Foresight Observatory and Technology and Skills Radar will be aligned with the PWG Societal Innovation and the Foresight Team of the A.SPIRE Advisory and Programming Group (APG)
- The Online Training Platform SKILLS4Planet will be run by worldsteel on the basis of an existing business model (aligned with the steelHub and the ECoP H4C platform)

- Based on the results of the sectoral and regional rollout workshops a European Training Community for Industrial Symbiosis is under construction. Together with the European Sector Representatives and the ECoP Hubs4Circularity we aim at establishing sectoral-national-regional training ecosystems or the integration of our skills perspective in existing Hubs for Circularity, Centres of Vocational Excellence, Smart Specialisation Regions and others.

### **3.1 Foresight Observatory**

The Foresight Observatory for Industrial Symbiosis will feed the SKILLS4Planet training platform and the European Industrial Symbiosis Training Community. It comprises the following elements:

- Technology and skills foresight on a regular basis, e.g. via a (bi-)annual survey "Industrial Symbiosis Technology and Skills Radar"
- Technological and economic development and skills needs in related projects listed in a Project Repository, continuously updated and run
- Identification of cross-sectoral job profiles and skills for Industrial Symbiosis and Energy Efficiency.

Already running and further executed activities:

- Training Framework improvements, including new sector and regional perspectives,
- Policy recommendations, indicators and incentives pushing the focus on qualifications, competencies and skills for Industrial Symbiosis and Energy Efficiency,
- Pilot measures and test options for skills adjustments, including looking for European and national funding schemes,
- Industry image measures for recruitment and talent attraction focusing on Industrial Symbiosis and Energy Efficiency skills and qualifications,
- Leadership and coordination within the Skills Alliance in an Open Coordination way, dividing responsibilities between the main and actors willing to contribute actively in the roll out.

The main objective of the Blueprint is to develop an *industry driven pro-active skills strategy* reflecting the technological and economic strands (recent and past) and builds on the upcoming technological and economic developments, as well as the results and requirements of the companies and their integration in the VET systems. The Observatory puts the Blueprint into action by incorporating the following aims:

- Identify in proactive ways, rather than reactive, skills demand of the industry related to Industrial Symbiosis and Energy Efficiency, considering skills gaps and shortages and forecasts of training supply and demand
- Propose training and curricula requirements, including ways to implement new vocational education content in immediate and effective ways, within both companies and education and training institutions
- Improve and update training modules, for more immediate impact and guarantee a high quality in new training programs, measures and arrangements (using new digital possibilities), as well as programs to keep trainers up to date with new skill needs (as key elements for the new skills agenda)

- Identify and promote successful sectoral upskilling schemes (including exchange of existing tools, best/good practice exchange and knowledge) and efficient knowledge management
- Improve the image and attractiveness of the Energy Intensive Industries and careers for talented people (recruitment and retention), including identifying strategies to overcome recruitment difficulties and widening the talent pool for a more diverse workforce.

As image and recruitment are important topics arising in the rollout workshops and several discussions in the project collected activities and campaigns are part of the repository placed at the SPIRE-SAIS homepage or SKILLS4Planet that will be enriched further after the project duration and enhanced with additional functionalities. Ultimately, image and recruiting are only one pillar in talent acquisition, company binding and retention play an equally important role. Accordingly, it is all the more important that the efforts of companies go beyond image campaigns and that requirements of applicants are actually met.

In further steps, SPIRE-SAIS aims to present four categories related to image and recruitment on the project's own homepage and possibly also in the SKILLS4Planet platform. Further rollout will be an important measure to identify best practice examples and strategies as well as experts and stakeholders:

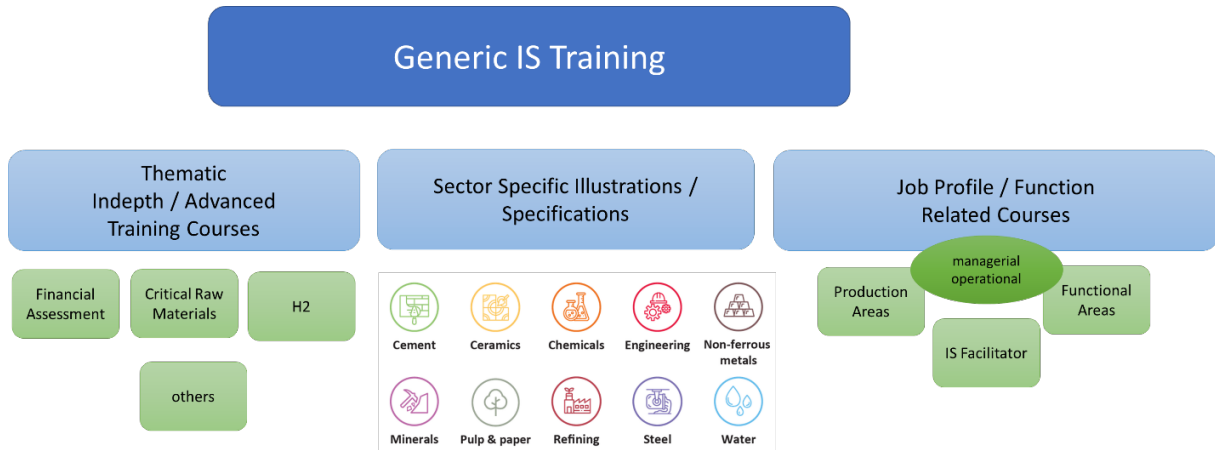
- EU Recruitment Events for Energy Intensive Sectors
- Image and Recruiting Materials (such as films and links, best practice examples)
- Job Advertising
- Talent Management (this point also includes applicant requirements).

### **3.2 Online Training Platform SKILLS4Planet**

Central element of the Blueprint and the governance of SPIRE-SAIS is the SKILLS4Planet online platform (see in detail Deliverable D5.1, Muract et al. 2024). This platform integrated the identified job profiles affected by Industrial Symbiosis and Energy Efficiency and the skills classification. Based on or integrated in a generic training module SKILLS4Planet is setting the scheme to manage and act for IS and EE by:

- thematic in-depth and advanced training courses (e.g. for an assessment of financial benefits, hydrogen, critical raw materials),
- sector specifications and illustrations (ensuring the practical workplace integration and perspective), and
- job profile and function-related courses.

With this framework, the skills and qualifications in line with the specific needs and interests of the learners/companies will be delivered.



**Figure 4:** SPIRE-SAIS Training Framework

Against this backdrop, SKILLS4Planet in cooperation with the ESSA steelHub established a platform not only to deliver and exchange training (modules) but to facilitate communication and collaborative partnership between the stakeholders of the training ecosystem. SKILLS4Planet is an open system, integrating all the interested stakeholders: training providers, companies, associations, VET system players, research centers, equipment and service providers.



**Figure 5:** SKILLS4Planet Ecosystem

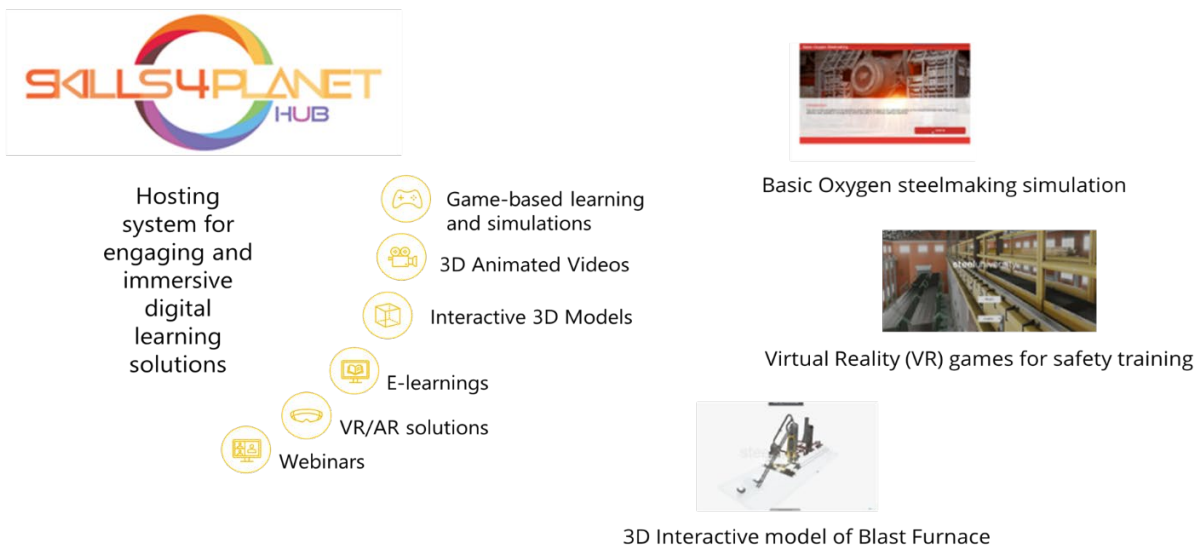
The main elements of SKILLS4Planet (see Figure 6) are the Directory of relevant skills, the Capability Assessor for an individual assessment of the current and needed skills level, the Learning Solutions provided and (under construction) micro-credentials for the recognition of acquired skills and qualifications.



**Figure 6:** SKILLS4Planet Infrastructure (Central Elements)

SKILLS4Planet takes advantage of all new (digital) learning arrangements such as simulations, 3D animation, E-learning, virtual and augmented reality offering a lively and interactive learning experience.

## SKILLS4Planet Online Training Platform



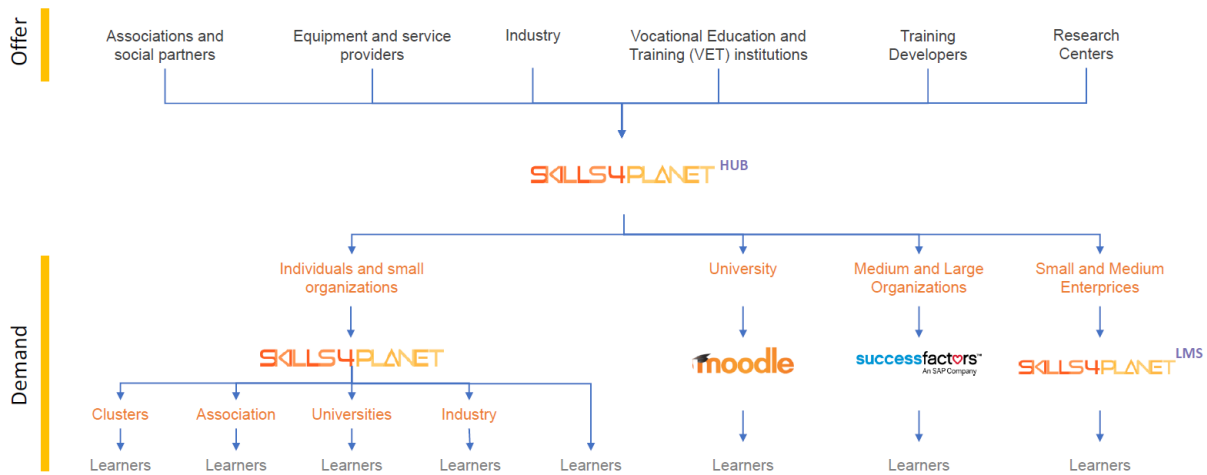
**Figure 7:** SKILLS4Planet Digital Learning Solutions

From an exploitation perspective, it is important to underline the transfer of the already existing business model of the steelHub to SKILLS4Planet. This means that there are training modules for free (e.g. financed projects by the European Union) and others where the publishers ask for a (mostly moderate) fee or royalty fee for the sales, including a percentage for worldsteel thru their training program steeluniversity for running the platform. Worldsteel is a non-for-profit organization and will use the percentage collected to maintain the platform with a structure that covers the following activities, i) Learning and Development, ii) Learning Technology, iii) Client and Publisher relationship and iv) Marketing and Communication. These activities are required to ensure the operability in the future. Nevertheless, further funding is needed and applied for

to develop the platform further (especially for the development and integration of a micro-credential infrastructure as well as Artificial Intelligence and Cybersecurity).

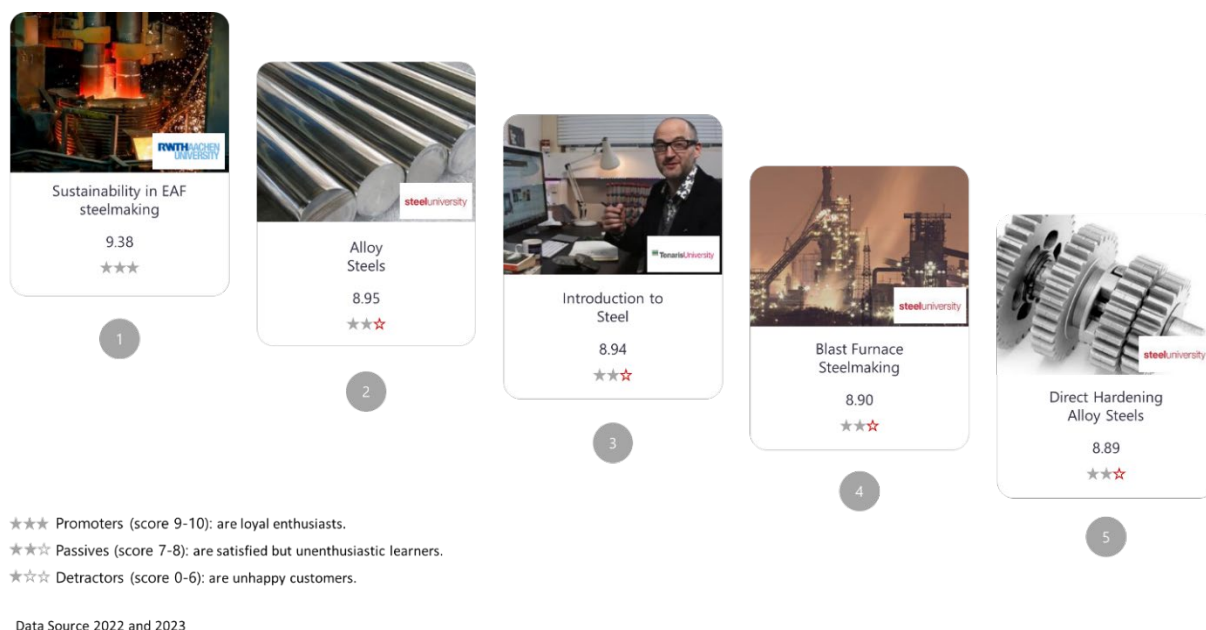
As already mentioned, SKILLS4Planet is an open system for all publishers / offers and learners / users. It is a partnership with stakeholders of the talent development ecosystem to develop a collaborative, flexible and affordable learning solutions directory in the framework of a market-place business model to upskilling/reskilling workforce and attract new talents to enable the digital and green transformation of the industries. The developed learning solution directory is open for training offers from all the ecosystem partners and is channelling the (technical) accessibility for any kind of users: for individual learners and small organisations via the SKILLS4Planet surface and connection, for universities, medium and large organisations as well as for small and medium enterprises there is the possibility to integrate SKILLS4Planet training modules in their own Learning Management Systems (LMS) (see in detail Figure 8).

## Learning Solution Delivery



**Figure 8:** SKILLS4Planet Infrastructure

With this technical and economic system, not only the sustainability of the SKILLS4Planet platform is ensured but also the timely integration of new training solutions. The training solutions will be assessed and rated by the learners using a Net Promoter Score Methodology (NPS from 1 -10), rates below 7 are modules that could be deleted because they are of low quality, relevance, outdated, and for other reasons (see Figure 9).



**Figure 9:** SKILLS4Planet Training Module Assessment by the Learners

The already developed and integrated training modules are a basis to improve awareness and knowledge about Industrial Symbiosis. As this was mentioned as a central lag within the rollout workshops, besides the general IS and EE training modules especially the trainings for sectoral newcomers could help interested company representatives to understand much more about possible other sectors and how to start thinking of concrete measures of industrial cooperation. And for sure, they are also good measures to attract new talents for the Energy Intensive Industries. Besides collecting new training content, the further developments of the SKILLS4Planet platform are mainly dedicated to the integration of Artificial Intelligence (AI) as a training content and a means for new learning arrangements and possibilities. Additionally, the recognitions and accreditation of training results via micro-credentials needs to be integrated in the platform. **Artificial Intelligence (AI)**. Emerging technologies, particularly **AI**, are revolutionising learning and development by enhancing the delivery of training as well as evaluating the competencies. AI-powered platforms can offer personalized learning experiences by analysing individual learners' strengths, weaknesses, and preferences, thereby tailoring content to meet their specific needs. This personalized approach ensures that learners receive the most relevant and effective training, optimizing their skill acquisition and retention.

Moreover, AI enables the creation of interactive and engaging training materials, such as virtual simulations, augmented reality experiences, and intelligent tutoring systems, which can significantly improve the learning process. These technologies provide immersive, hands-on training that can replicate real-world scenarios, allowing learners to practice and refine their skills in a safe and controlled environment.

AI also enhances the evaluation process by providing more accurate and comprehensive assessments. Automated grading systems can evaluate written and practical assignments with a high degree of precision, offering detailed feedback that helps learners understand their mistakes and improve. Additionally, AI-driven analytics can track learners' progress over time, identifying patterns and predicting future performance, which allows for timely interventions and support.

On relation with translation, in Europe represent a big challenge to its multilingual diversity, the usage of Artificial Intelligent can play a significant role to solve this problem. AI algorithms,

particularly those utilizing neural machine translation, can understand context and nuances better than traditional methods, resulting in more precise translations. AI can process large volumes of content quickly, ensuring timely updates and scalability for diverse learning materials. Additionally, AI adapts and improves over time through machine learning, becoming more effective with continued use. This leads to more accessible and inclusive learning environments, breaking language barriers and allowing learners from different linguistic backgrounds to benefit from high-quality educational content.

Overall, the integration of AI in learning and development not only makes training more efficient and effective but also ensures that evaluations are thorough and insightful, fostering a culture of continuous improvement and lifelong learning.

Therefore, it is required to include in SKILLS4Planet and steelHub the following features.

- A **search engine** for the Learning Solution Directory using artificial intelligence (AI) would leverage advanced algorithms and techniques to provide an intelligent and efficient way for users to find relevant courses. Using AI can provide a more intelligent, personalized, and user-friendly experience for learners, making it easier for them to discover and engage with relevant educational content.
- Developed an **AI Virtual Tutor** trained with learning solutions in SKILLS4Planet and steelHub and using the knowledge domain defined in the Skill Directory for a specific job. An AI virtual tutor for a specific job position strives to deliver a flexible, personalized, and cost-effective training experience that improves learner engagement and competence. This aligns with organizational aims of developing a skilled, knowledgeable, and adaptive workforce.
- **Translation** of all the learning solutions in multiple languages to enable a vulnerable workforce segment in Europe to change career paths and adapt to a dynamic environment by offering learning solutions in their native languages.

Additionally, **Micro-Credentials** for the acknowledgement and accreditation of learning results are of high importance. The European Commission introduced the concept of micro-credentials in the learning and development sector to address skills gaps and promote lifelong learning in a rapidly evolving job market. Micro-credentials offer flexible, targeted education, enhancing employability and enabling individuals to upskill and reskill efficiently. They support workforce mobility across European countries by standardising skill recognition, fostering inclusivity by making education accessible to diverse learners. Furthermore, micro-credentials align education with industry needs, ensuring that learners acquire relevant, up-to-date skills, ultimately driving economic growth and competitiveness in the region. Integrating the Digital Learning Credentials of Europass into Skills4Planet and SteelHub is crucial for standardising skill recognition, enhancing transparency, and ensuring interoperability across platforms. This integration supports seamless skill validation, boosts employability, and facilitates mobility within the European workforce, driving innovation and growth in the sustainability and steel sectors.

### **3.3 Sectoral-National-Regional Training Ecosystems (European Community of Training Practice)**

Beside connecting, aligning and integrating the SPIRE-SAIS Blueprint in European structures (see Figure 3above), the Blueprint was and will be further rolled out at sectoral, national, and

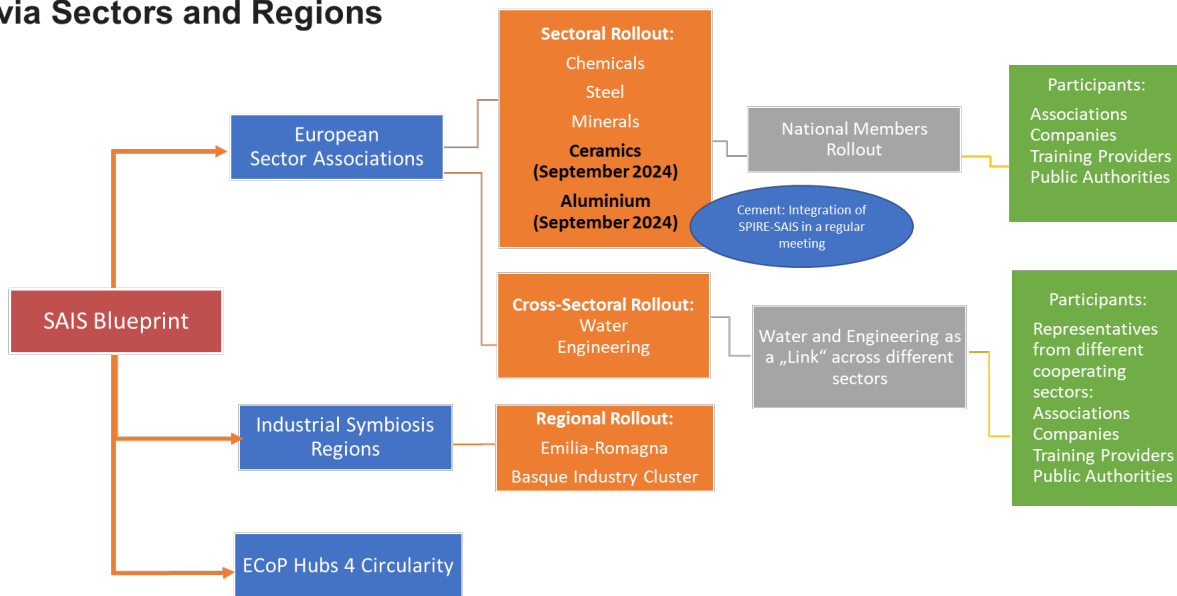


regional level. The rollout started with a sectoral and regional exploitation and specification of the Blueprint, having all process industry engaged member states in focus:

- Sectoral rollout via:
  - European Sector Associations with a focus on integrating and engaging their national members: chemicals, steel, minerals (and planned in autumn: ceramics, aluminium), cement integrated SPIRE-SAIS results in its regular meetings
  - Water and engineering as sectors engaging associations or stakeholders from different sectors under a cross-sectoral symbiosis perspective; defining water and engineering as "links" between the different industry sectors: water in the production process, engineering for connecting different sectors.
- Regional rollout via existing networks:
  - Integrating the skills and training perspective in specific industrial symbiosis regions: The Pact for Skills region Emilia Romagna, the Basque Industrial Cluster.

Further rollout workshops for aluminium and ceramics are planned in autumn 2024, because of the combination with regular sector events. This shows the interest and continuity of the Blueprint strategy beyond the project funding period.

### Open Coordination of the Rollout via Sectors and Regions



**Figure 10: SPIRE-SAIS Rollout to Sectors and Regions**

Based on a common workshop concept and the engagement of the SPIRE-SAIS sector associations and stakeholders from different countries and societal areas (industry, policy, social partners, training providers, research and education, and civil society) took part in the rollout. The learnings from the rollout workshops are setting the scheme for further SPIRE-SAIS activities:

- **Uptake, cooperation and awareness for IS:** the need to improve the awareness of Industrial Symbiosis and to simplify the “theory” with practical examples while demonstrating applicability. Skills development and training are among the most important tasks with regard to the implementation of Industrial Symbiosis and Energy Efficiency. Identifying the necessary skills is a major challenge for companies and a first step that must be taken before employee training is even possible.

- **Talent attraction and retention** in Energy Intensive Industries. The rollout workshops have underlined the efforts to improve the image of energy-intensive sectors and at the same time show that real change processes are underway in the various sectors. Efforts must continue to improve the perception of energy-intensive industries among young, qualified applicants. In particular, the green and digital efforts of the sectors should be highlighted in order to break away from the status of the old economy. Transformation processes are also taking place with regard to working conditions - away from hard, dirty work towards a more modern way of working and better integration of disadvantaged labour market groups.
- **Support for Industrial Symbiosis collaboration** is needed, SPIRE-SAIS and the SKILLS4Planet online platform could take up this issue.

The further rollout activities should refer to these challenges and integrate the Blueprint in events of the sector associations and national-regional development processes. The Blueprint is no "one size fits all" solution, but a European Framework supporting dedicated sectoral and local/regional demands for the skills of the future.

The other way around, SPIRE-SAIS will use the rollout results for improving SPIRE-SAIS from a bottom-up perspective. This will lead to an elaboration and formalisation of different Sectoral-National-Regional Ecosystem frameworks and developments, covered under a Community of Practice of Sectoral-Regional Training Ecosystems – as already mentioned to be established in close cooperation with the ECoP projects H4C and EUROPE.

Concerning the rollout to regions where cross-company and cross-industry Industrial Symbiosis is already in place, we are looking for a smart integration of the skills and training perspective as it is developed by the SPIRE-SAIS Blueprint. This integration could be done by:

- Integration in the two running European Communities of Practise ECoPs with a focus on Hubs4Circularity and Industrial Parks
- Looking for other possible Industrial Symbiosis regions (known and selected by the SPIRE-SAIS partners, the CORALIS platform <https://www.coralis-h2020.eu/>, Centres of Vocational Excellence, Smart Specialisation Regions, and others).

In this respect, SPIRE-SAIS could:

- **Support the initiation and development** of sectoral/national/regional rollout activities
- **Serve with regular information** on technological development and necessary qualification adjustments (Foresight Observatory).
- **Give access** to the European Training Platform SKILLS4Planet
- **Establish and continuously support** sectoral/national/regional training ecosystems through integration in a European Community of Practice and the European Pact for Skills LSP EII, and others
- **Support skills related proposals** for EU and state funding for the development of (sectoral or national-regional training ecosystems).

**Sectoral/National/Regional Training Ecosystems** should follow the SPIRE-SAIS principles:

- Indicate new learning opportunities and support structures
- Integrate industry demands as a structural principal of the sectoral/national/regional education and training system
- Orientate on learning outcomes (instead of curricula)
- Emphasize the growing demand and challenge for every single employee

- Improve quantitative and qualitative participation of lifelong learning of the workers and inhabitants (national/regional).

Within the further rollout activities, the integration of VET system players should be fostered. Most of the Member States analysed in SPIRE-SAIS do not yet address issues of EE and IS issues, or even the broader concept of “green skills” in national policy documents and strategies (either educational or industrial). However, policymakers and industry representatives at the national level are pushing to incorporate EE and IS concepts and activities into industrial strategies and to reform national education systems to allow for more practice-based training and better integration of “green skills”. National approaches to the VET system design, which provides companies and VET schools with more flexibility in skills delivery, tend to perform better than their centralised counterparts.

Based on these findings, SPIRE-SAIS recommends to:

- Develop the dual VET systems and increase attention to the practical component in VET when it comes to green skills-related training (through either the establishment of dual systems or other means).
- Develop the “green skills”-specific strategic documents through multi-stakeholder cooperation of at least education and environmental ministries/agencies in Member States, where such documents do not yet exist.
- Encourage schools to cooperate with industry organisations not only to promote green skills but also to train teachers, who would be able to provide both theoretical and practical knowledge to students, which is up to date with the current industry standards.
- Incorporate the green skills more deeply into the national secondary education systems both through broad strategic documents (e.g. such as the Portuguese Students' Profile by the End of Compulsory Schooling) as well as operational ones (e.g. subject curricula).
- Develop monitoring and evaluation tools to better assess the existing green skills delivery instruments.
- More extensive documentation of the emerging good practices on skills delivery at the individual VET school level is needed. A particular attention should be paid to good practices in the areas of empowering and engaging young people in developing an appealing curriculum as well as promoting an intergenerational dialogue for exchanging experience among apprentices/ new workers and seniors to ensure transfer of skills and knowledge in companies.
- Better integration of the EE and IS concepts into the skills delivery processes at the national and VET school levels through the development of EE- and IS-specific curricula as well as development of relevant modules and courses by the schools.
- Establish stronger links of industry needs and challenges and amend the existing curricula to address them timely.

#### **4 SPIRE-SAIS and ESSA Partnership**

Not every Blueprint partner signed the LSP EII, but they are still engaged in the ongoing ESSA and SPIRE-SAIS activities, fostering and feeding the Pact for Skills. This is underlined by the continuing activities of the European Steel Skills Alliance (ESSA). For one year without funding (ESSA project was finalised in June 2023) and coordinated by the Focus Group People of ESTEP the main elements of the alliance are further developed: the steelHub has a growing

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number of training providers and learners, the Technology and Skills Radar 2024 is in preparation and will be launched in autumn 2024, the further development and installation of the European Community of Regional Training Ecosystems is on the agenda.

Therefore, beside the LSP EII the already established community partnership of ESSA and SPIRE-SAIS comprising already more than 60 partners forming the ecosystem (companies, education and training providers, associations and social partners, research institutions, and civil society organisations) are central for the SPIRE-SAIS exploitation as well. Via the sector associations all member states with Energy Intensive Industries are covered.



**Figure 11: SPIRE-SAIS and ESSA Ecosystem Covering European Energy Intensive Industry**

The dedicated main roles of the stakeholders for the exploitation are more or less the same as during the project phase:

- **Companies:** defining new skills needs, developing and integrating training tools, good practice exchange, adjusting the blueprint, testing of tools and programmes, involving company related training organisations, roll-out to other company sites.
- **Training providers:** defining new skills demands and answers to it, developing related training tools and strategies for the blueprint, leadership and train the trainer programs, developing new methods and learning arrangements.
- **Sector associations / social partners:** supporting and rollout of the Skills Alliance; feedback, assessment of Blueprint strategies and tools, dissemination, involving national VET organisations, rollout of the Blueprint on the European and national level.
- **Research institutions:** management activities; research on technological, economic, skills development; VET system connection and integration, further strategy development for the Blueprint.
- **External experts:** integration of technological and skills expertise.

This huge partnership is, and will be, engaged in the Skills Alliance in supporting measures for the transfer, implementation, monitoring, cooperation and dissemination (EU and sectoral level) as well as for national-regional roll-out activities (National-Regional Training Ecosystems):

- Companies and social partners (associations and unions) are central and are engaged with aims and objectives for skills needs identification and analysis, and the upskilling of the workforce for the overall contribution to competitiveness, through database and foresight tools as well as training module development.
- Education and training providers contribute to the creation and development of the network and the online training platform SKILLS4Planet by assisting in conducting analysis of existing training and qualifications frameworks and development of new programmes and curricula as well as supporting training modules development.
- The research institutions provide the social and technical basis of the skill needs analysis and contribute to skill requirements and foresight, as well as contributions to analysis of national VET requirements, regulations and systems and Blueprint development, including training and train the trainer modules and the interrelation to existing EU tools like ESCO, EQF, EQAVET, etc.). A contribution to policy recommendations (including collaboration with EU and Member State Stakeholders, national funding institutions) was also done by the research institutes.
- The contribution of sector experts is for integrating their knowledge of areas covered by the project to get sound feedback on Blueprint processes and progress, as well as key contributions to policy recommendations and transfer, implementation and monitoring processes.

The participating organisations and stakeholders have been selected because each of them is – in different ways – strategically committed to the European energy intensive industry. Key stakeholders, including those directly involved in the project and those to which the project relates, have been integrated and will drive the identification and analysis of the skills intelligence related to the execution of the Blueprint and for the design and development of the network beyond the funding period of the project.

## 5 Alignment with European Activities

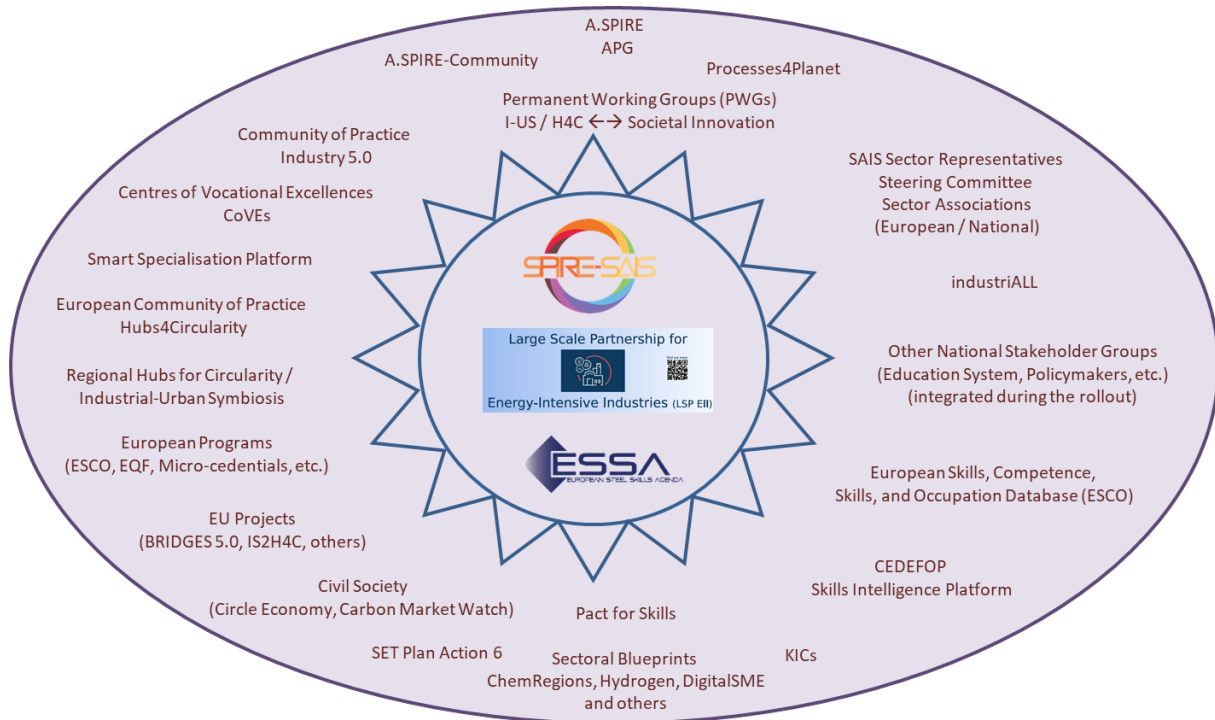
In order to ensure its sustainability, political support, and further funding, the SPIRE-SAIS Blueprint is no stand-alone solution. Its governance is a *European Open Coordination aligned, integrated and linked with existing EU Structures*. The Blueprint strategy is led by a collaborative approach with a division of responsibilities and leadership. Therefore, SPIRE-SAIS is connected with and supports other European programs and activities related to European Energy Intensive Industries (with common workshops, dissemination, inputs, discussions, and others, see Figure 12 below) -just to name some of them:

- Sustainable Process Industry through Resource and Energy Efficiency and its recent activities, explicitly "Processes4Planet" (P4Planet), its Strategic Research and Innovation Agenda 2050, and its governance structures and working groups
- Clean Steel Partnership, Research Fund for Coal and Steel (RFCS)
- The Coordinated Support Action European Community of Practice for Industrial-Urban Symbiosis and Regional Hubs for Circularity and Industrial Urban Symbiosis
- Central stakeholder groups (social partners, sector associations and unions, policy-makers, education system players, etc.)
- European networks and projects: such as the CircLean Network and Circle Economy, the INSIGHT training for establishing the profile/occupation of the Industrial Symbiosis Facilitator

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- European programmes: Pact for Skills, CEDEFOP Skills Intelligence Platform; European Skills, Competence, and Occupation Database (ESCO)

The governance of SPIRE-SAIS, in line with the LSP EII and ESSA activities, reflects these alignments and ensures the further SPIRE-SAIS activities by a Foresight Observatory, a Technology and Skills Radar, the online training platform SKILLS4Planet, National-Regional Training Ecosystems and a European Community of Training Practice. Started as a social innovation process, SPIRE-SAIS has already reached the state of implementation, institutionalisation and impact, ready for further improvement and institutionalisation.



**Figure 12:** Connectivity of SPIRE-SAIS with European Activities (Programmes, Projects, Associations, Communities, etc.)

Further synergies are given by the LSP EII combining elements of SPIRE-SAIS and ESSA with new or advanced tools and measures, e.g. by combining both online training platform SKILLS4Planet and steelHub under an umbrella of a HUB5.0, integrating training platforms of other Blueprints. Here discussions are ongoing on how to align further with the platform of the European Community of Practice for Hubs for Circularity (H4C ECoP and H4C EUROPE: <https://www.h4c-community.eu/>). We are also in consultation with the Hydrogen and Automotive platform how to link existing training platforms with each other.

Concerning further regional rollout the following Centres of Vocational Excellence are in consideration because of existing links to energy intensive industries:

- **3LoE:** Provision of green skills, challenges of energy, climate and environmental protection - <https://netwerk.wijzijkatapult.nl/detail/720/3loe/connect/?lang=en?lang=en>
- **CATALYST:** Contribute to European Green Deal + the new Industrial and SME Strategies through the establishment of CoVEs in 5 countries - <https://netwerk.wijzijkatapult.nl/detail/1234/catalyst/connect/?lang=en?lang=en>

- **Center of Vocational Excellences Water (Baltics / Czech Republic, Mediterranean, South Africa, West-EU):** Water sector – e.g. <https://netwerk.wijzijkatapult.nl/detail/121/civ-water-center-of-vocational-excellence-water-west-eu/connect/?lang=en?lang=en>
- **EULEP:** Innovation-oriented subjects such as artificial intelligence, virtual reality and social innovation - <https://netwerk.wijzijkatapult.nl/detail/1235/eulep/connect/?lang=en?lang=en>
- **GREENOVET:** VET Excellence in Green Innovation, industry representatives are a target group <https://netwerk.wijzijkatapult.nl/detail/716/greenovet-european-vet-excellence-platform-for-green-innovation/connect/?lang=en?lang=en>
- **H2Excellence:** Hydrogen - <https://netwerk.wijzijkatapult.nl/detail/1679/h2excellence/connect/?lang=en?lang=en>
- **Platform of Vocational Excellence Water:** Water - <https://netwerk.wijzijkatapult.nl/detail/415/platform-of-vocational-excellence-water/connect/?lang=en?lang=en>
- **SECOVE:** Sustainable Energy Centres of Vocational Excellence - <https://netwerk.wijzijkatapult.nl/detail/1240/secove/connect/?lang=en?lang=en>
- **SEED** - Sustainable Energy Education - <https://netwerk.wijzijkatapult.nl/detail/1241/seed/connect/?lang=en?lang=en>
- **Talentjourney:** needs of industry 4.0, new era society, IoT - <https://netwerk.wijzijkatapult.nl/detail/673/talentjourney/connect/?lang=en?lang=en>

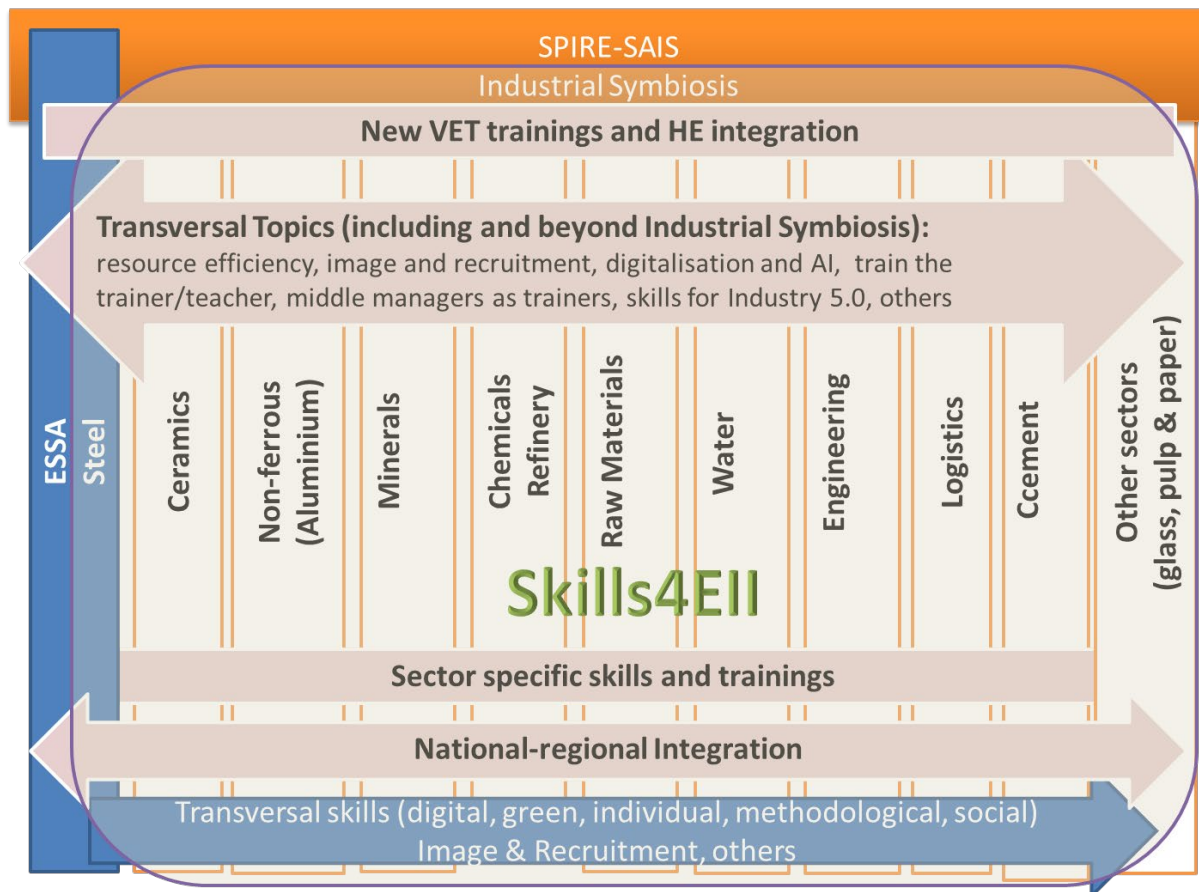
## 6 LSP EII: Further Development of SPIRE-SAIS with Skills4EII

With the partnership of the LSP EII and other Pact for Skills members we submitted a proposal Skills Alliance for the Green, Digital and Social Transformation of the Energy-Intensive Industries (Skills4EII). This was done to use and further expand the already existing ecosystem infrastructure of the ESSA and SPIRE-SAIS for a Europe-wide roll-out, taking advantage of the already established stakeholder relationships and distributed responsibilities in the ESSA and SPIRE-SAIS projects as an ideal basis. The objective is not only to disseminate and discuss the results and the tools developed, but also to continuously assess needs and ensure openness with regard to possible key issues, in order to provide maximum added value to sector representatives and regional stakeholders. Independently from the approval of the proposal, the roll-out and further development of ESSA and SPIRE-SAIS will therefore have a cross-sectoral, a sectoral and a national-regional focus:

- Firstly, a transfer of the ESSA and steel industry sector specific findings to the other sectors (e.g. transversal skills) will be analysed, adapted, modified and further developed. Skills4EII will complement the mainly VET (EQF levels 3-5) oriented Blueprints ESSA and SPIRE-SAIS with higher education strategies, measures and tools (EQF levels 6-8), bearing in mind that from the companies' practical point of view the borders between VET and HE are blurring. Additionally, the existing online training platforms steelHub and SKILLS4Planet will be integrated into an overarching HUB5.0 platform, integrating the new cross-sectoral and sector-specific trainings, micro-credentials and Artificial Intelligence (Translation, Learning/evaluation, Search Engine). In addition, "Game Changer" related new job profiles and related skills as well as key challenges will be integrated: such as human-centricity of Industry 5.0, Artificial Intelligence,

decarbonisation and hydrogen use, talent attraction, and others. The developed Capability Assessor (skills assessment) will be integrated and improved related to the new platform.

- Secondly, a sectoral roll-out is essential to identify the actual skill needs of each sector. Workshops and webinars are planned to gather feedback on the developed (training) solution in order to gain concrete insights into the further demands of the respective sectors. In the roll-out workshops, the project's training programmes developed will be presented and discussed in order to refine the solutions. Depending on the needs and hot topics of each sector, specific topics for the roll-out workshops will be defined and discussed with the participating industry associations, company representatives, and representatives from vocational and higher education.
- Thirdly, national and regional outreach through the to be established European Community of Practice will ensure cooperation and learning between the European, sectoral, national and regional levels. This includes the integration of Hubs for Circularity, Centres of Vocational Excellence (CoVE), the existing regional training ecosystems of ESSA and SPIRE-SAIS, circular economy centres and industrial parks, as well as new regions in underrepresented sectors in the Partnership (e.g. cement).



**Figure 13:** Extending SPIRE-SAIS and ESSA with the LSP EII and Skills4EII

We will interact also with new Blueprints (such as ChemSkills) and projects (e.g. ECoP H4C, IS2H4C, BRIDGES 5.0, BEYOND 4.0, greenSME, RACE) and EU programs (such as Industry 5.0 and the Community of Practice Industry 5.0). Industrial Symbiosis for Hubs for Circularity (IS2H4C) for instance addresses not only the technological, but also the economic and social aspects of Hubs4Circularity. The requirements, interests and needs of all relevant stakehold-



ers will be considered based on the basis of a stakeholder engagement framework. This framework will include the perspective of associations, trade unions, work councils, employees and their perspective on skill needs for a circular economy. Furthermore, citizens will be involved in new H4C solutions when circular solutions in industrial parks are extended to surrounding ecosystems (e.g. use hydrogen for heating in households, use of hydrogen for public transport).

Skills4EII builds on SPIRE-SAIS and ESSA results and findings and consolidates the relationships established between stakeholders to take the next steps towards a sustainable European process industry. The specific challenges for Energy Intensive Industries are in line with the pillars of Industry 5.0:

- They need to become more sustainable to meet the requirements of the European Green Deal and their specific responsibilities as a major player in energy consumption and CO2 emission.
- They need to become more resilient to be less dependent on fragile supply chains that can severely affect production and competitiveness.
- They need to become more human-centric to use the skills developed to harness skills for sustainable growth, increased innovation and competitiveness.

Skills4EII contributes to the European Green Deal and the EU's Twin Transition, as well as to the New Skills Agenda for Europe and the new concept of Industry 5.0. Complementarity and essential input to industry related EU programmes will be ensured through the stakeholders involved: namely Net-Zero Industry Act, Critical Raw Materials Act, Processes4Planet, Clean Steel Partnership, SET Plan Action 6, CoP Industry 5.0. Obviously, skills related engagement with other Sectoral Blueprints (e.g. Hydrogen, Automotive, Advanced Manufacturing, Batteries) and the Pact for Skills is central as well. Cooperation with and contributions to CEDEFOP's Skills Intelligence programme and cross-linking with the ESCO database are key as in the use of skills related results and outcomes from other European projects.

Nonetheless, it has to be mentioned, that all the activities of the Skills Alliance beyond the project funding are depending on existing (in-kind) and future (funding) resources, business models, and personal engagement. We already faced some restrictions in the engagement of our partners due to the pandemic and the energy crisis. During the energy crisis, skills were not high on the agenda of companies struggling for survival on the market.

To ensure the further running and operationalisation of the SKILLS4Planet platform a Memorandum of Understanding is setup by TUDO (project coordinator), A.SPIRE (coordination unit of P4Planet) and worldsteel (running the infrastructure of the platform). Main challenge is that worldsteel (coming from the steel sector, running already the steelHub) cannot manage the further development of training courses of the other sectors due to missing competences, insights and contacts to other industries. This is for sure a disadvantage of such a broad and industry sector overarching Blueprint like SPIRE-SAIS. This has to be considered for the new and related business model.

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## Abbreviations

Abbreviation	Meaning
AI	Artificial Intelligence
CEDEFOP	European Centre for the Development of Vocational Training
CoP	Community of Practice
CSP	Clean Steel Partnership
ECoP	European Community of Practice
ECQA	European Certification and Qualification Association
EE	Energy Efficiency
EIIs	Energy Intensive Industries
EQAVET	European Quality Assurance for Vocational Education and Training
EQF	European Qualification Framework
ESCO	European Skills, Competences, Qualifications and Occupations
ESSA	European Steel Skills Agenda
ESTEP	European Steel Technology Platform
EU	European Union
EUROFER	European Steel Association
FG People	Focus Group People
H4C	Hubs for Circularity
HE	Higher Education
IoT	Internet of Things
IS	Industrial Symbiosis
KPIs	Key Performance Indicators
LMS	Learning Management System
LSP	Large-scale skills partnership
LSP EII	Large-scale skills partnership for energy-intensive industries
NEIA	New European Innovation Agenda
NPS	Net Promoter Score
P4Planet	Processes for Planet
RFCS	Research Fund for Coal and Steel
SET Plan	Strategic Energy Technology Plan
SME	Small and medium-sized enterprises
SPIRE-SAIS	Skills Alliance for Industrial Symbiosis
SSDCS	Sectoral Social Dialogue Committee on Steel
VET	Vocational education and training