Blueprint “New Skills Agenda Steel”: Industry-driven sustainable European Steel Skills Agenda and Strategy (ESSA)

Piloting and Implementing the Blueprint

Report on the piloting and sustainable implementation of the Blueprint framework /strategy, tools and measures

Deliverable D6.2

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Content

Executive Summary

"Piloting and Implementing the Blueprint" explored the Blueprint application and execution. During this process a stable and reliable governance and coordination within the industry's existing structures was examined, tested, and implemented: on the European, national and regional level. The piloting and implementation activities were based on the 'Prototype of the Blueprint New Skills Agenda Steel' and the huge and excellent partnership alliance of ESSA (44 partners comprising companies, training providers, European and national steel associations and social partner, and research institutions). The main established governance elements of ESSA are:

1. The European Steel Technology and Skills **Foresight Observatory** as the main European coordination unit, conducting a regular European Steel **Technology and Skills Foresight Panel** (ESSA ETP)
2. The Online Training Ecosystem **"steelHub"**
3. The **European Community of Practice of Steel Regions** (ECoP Steel), connecting and supporting steel related member states and the main European steel regions with a European platform for several **National-Regional Training Ecosystems**: mutual learning by exchanging, initiating, developing, and implementing good practice for skills and training.

The elements are **implemented in the existing governance structures of the European Steel community** and connected with existing European platforms and tools beyond the steel sector, aiming at ensuring constant exchange with the broader European process industry (e.g. within the Large Scale Partnership Energy Intensive Industries, the Clean Steel Partnership, the Process for Planet programme and via the SPIRE-SAIS Blueprint). The governance of ESSA is built on a division of responsibilities, endorsed by the European Steel Associations and social partners ESTEP, EUROFER, and industriALL. Connections with European platforms (e.g. Pact for Skills, Centres of Vocational Excellence) and tools (e.g. ESCO, Europass) are already part of ESSA and its further development of the ESSA strategies, measures and trainings (e.g. related to the steelHub, National-Regional Training Ecosystems). To ensure a stronger integration of Small and Medium Sized Enterprises an "ESSA Task Force SME" was founded, ensuring and integrating the SMEs perspective.

Within the Foresight Observatory continuous and regular monitoring and evaluation of the technological and economic development in the steel industry will be guaranteed by the European Steel Technology and Skills Foresight Panel (ESSA ETP), which will be developed further with a strong cooperation of the ESTEP Focus Groups People and Smart Factories. A steel sector related Repository of Innovation Projects and Recruitment Events will be integrated and continuously updated.

The Online Training Ecosystem "**steelHub**" sets the infrastructure for an open European exchange of training content, integrating inputs from and for steel associations and companies, VET systems, other Blueprints, European tools, and the non-formal and informal learning of individuals. During the implementation and test phase of the steelHub the infrastructure was further developed, more training content was integrated (including measures and guidelines for trainers), the usage was increased, and a business model was established. As a central element of the strategic Blueprint steelHub became a centralized digital platform to facilitate communication, collaboration, and coordination.

Beside the European coordination the ESSA National-Regional Training Ecosystems are strongly connected to the Foresight Observatory and the steelHub. The European-national-

regional coordination will be bundled in a **European Community of Practice of Steel Regions (ECoP Steel)**, including additional national and regional stakeholders via the training ecosystems. Beside the nine pilot regions:

- steel regions in national level in Finland (because there is no specific conglomerated steel region)
- national-regional level in Czech Republic, Germany and Spain (combining national and regional perspectives)
- regional level in UK (Wales), Italy, Poland, Romania, and the Netherlands (concentrated steel regions).

further steel regions especially from France and Austria are foreseen to be integrated.

Beside the Dutch Regional Training Ecosystem (which was used as a kind of reference model) rollout workshops within ESSA's Regional Training Eco-System (RTS) took place in eight countries: Germany (national rollout with focus on Rhein-Ruhr-Area), Czech Republic (national rollout with focus on Moravia-Silesia), Spain (national rollout with focus on Siderex ((Basque Country) and Polo del Acero (Asturia)), United Kingdom (South Wales region), Italy (Friuli Venezia Giulia region), Poland (Silesia region, but also on the national basis), Belgium (National rollout) and Romania (with a focus on the Galatia region). Although the processes of the RTS were very different (depending on the actors and the specific regional topics and skills demands) some common topics arose challenging for the European steel industry as such for years: image and recruitment, difficulty of attracting well-educated, young applicants. Especially the negative image of the steel sector is problematic in this context, as the industry is perceived as old economy, with outdated working conditions and unattractive job profiles. Partly, the discussions of the rollout workshops also show a perceived disconnection between formal training and the requirements of companies. The often-poor connections between companies, universities and public administrations further exacerbate the problem. The stakeholders emphasised the need for a new narrative for the steel sector emphasising the sectoral efforts on the topics of sustainability and digitalisation.

In addition, to many commonalities, the rollout workshops also highlight major differences - not only between different states, but also within states, between individual regions; as well as between individual companies. For example, emigration is seen as a major challenge in some countries, while other countries benefit from immigration and thus gain new potential workers. At the same time, there are major differences within individual countries with regard to the challenges in rural regions compared to metropolitan regions. Labour shortages are particularly pronounced in rural regions, also because potential applicants and workers often emigrate to metropolitan regions. It is also evident that the challenges of small and medium-sized enterprises are very different from those of large corporations. Against this background, targeted measures for SMEs are also necessary.

Alignment with the VET system via a VET system analysis and a national VET related occupation matrix was elaborated. Connections with European Alliances and Programs led to an increasing and improving reliable ground for a steel sector cooperation by involving companies, training and VET providers, science, policy, social partners. During the implementation phase the ESSA partnership was further extended by the national-regional rollout participants (more than 100 additional stakeholders were involved) and sustainable aligned with the main existing European steel sector alliances ESTEP, EUROFER, industriALL, and the Sectoral Social Dialogue Committee on Steel (SSDCS).

ESSA is a serving a Blueprint and Skills Agenda **of the Steel Industry for the Steel Industry**. With them core coordination units the following activities are foreseen after the project duration from July 2023 on:

Foresight Observatory:

- Establishing a yearly regular technology and skills foresight survey leading to a Steel Skill Index
- Yearly validation by an expert workshop
- Identification of new job profiles
- Integration of skills for industrial symbiosis and energy efficiency
- Project repository: integration of the existing database in the ESSA homepage, steelHub
- Image and recruitment repository: events, materials etc.

steelHub:

- New content, publishers, users
- Translation of training modules
- Integration of further ESSA tools: self-assessment, national-regional platforms
- Further job profiles, occupations selection and integration
- Train the trainer, teacher measures

ECoP Steel:

- Yearly Roadmap
- National-regional platforms integrated in the steelHub
- Integration of further regions, member states
- Yearly workshops (in the regional ecosystems, European exchange)

Concerning the **Large Scale Partnership Energy Intensive Industries,** under the Pact for Skills the European Steel Skills Alliance and Agenda ESSA and the Skills Alliance for Industrial Symbiosis SPIRE-SAIS, could be seen as the founders. Based on a Memorandum of Understanding the two Blueprints will merge under a common umbrella with two specific foci first:

- SAIS = cross-sectoral and **industrial symbiosis skills** specific blueprint
- ESSA = example of a **specific sector (steel)** related blueprint including an incremental upskilling of representative job profiles (t-shaped skills: technical and transversal skills (green, digital, social, individual, and methodological)).

Main activities planned:

- Roadmap development
- Integration, merging topics/challenges to be solved
- Integration of further partners
- Support for ESSA/SPIRE-SAIS Workshops
- New proposal for the Pact for Skills call spring 2024

1. Introduction

This deliverable "Piloting and Implementing the Blueprint" is summarising the established stable and reliable governance and coordination structures of ESSA, piloted and implemented on the European and national/regional level. With its governance elements grounded in and aligned with the main existing European and national steel sector structures the Alliance will be sustainably running and continuously generating impact.

The main elements of the implementation and piloting phase of the European Steel Skills Alliance and Strategy have been:

- Integration of **ESSA governance** (namely **Foresight Observatory, Community of Practice of Steel Regions**) in existing European steel sector structures in cooperation with the European steel associations and social partners
- Formalisation and improvement of the **steelHub** infrastructure and content, development of a business model, integration of further trainings and train the trainer instructions
- Establishment of the **Task Force Small and Medium Sized Enterprises** (SME), integrating SME topics and measures
- **ESSA Rollout**:
  - Elaboration and formalisation of a Regional Ecosystem Concept and Framework
  - Selection of pilot steel regions and conduction of Round Tables and Workshops in the regions
  - Development of the Community of Practice of Regional Training Ecosystems
  - Checking transfer to other regions and their integration.

The outline following is summarising the results of these elements within the established governance structure. The pilot measures, strategies, tools and methods of the ESSA Blueprint generated a sustainable structure beyond the project life span as an industry driven and sector running skills adjustment framework and alliance **with the industry and for the industry**.

Starting from Deliverable D5.2 – “Prototype of the Blueprint New Skills Agenda Steel” (Schröder, 2020) and against the Implementation Plan (D6.1 (Schröder, Branca, Colla, et al., 2021)) and the first Piloting and Implementing the Blueprint outline (D6.2 Version 1 (Schröder, Branca, & Muract, 2021)) different actions have been undertaken for implementing the Blueprint. In particular:

- Elaborating useful parameters for a sustainable integration in existing European and national/regional structures;
- Establishing an interrelated Alliance and Leadership;
- Promoting joint Blueprint activities;
- Preparing the ground for the national/regional roll-out.

During the pilot implementation and transfer of the Blueprint Prototype we also developed related policy recommendations (see D7.1 Policy Recommendations and Practice Guidelines, ESSA, 2023) and cooperation activities with relevant European Programs (Pact for Skills, European Year of Skills 2023, Processes for Planet, and other sectoral Blueprints, esp. DRIVES and SPIRE-SAIS).

Considering the final governance structure and related activities of ESSA, this report is structured on behalf of the main elements of the Blueprint governance: (1) Implementing the

ESSA governance structure with (2) the Foresight Observatory, (3) Online Training Platform “steelHub” and the rollout to (4) National-Regional Training Eco-system workshops. Furthermore, the alignment and integration in the (5) national VET systems and in (6) European alliances, programs, and other activities is outlined as a backbone for (7) the further ESSA roadmap and ongoing activities after the project duration.

2. Implementing the ESSA Governance Structure

Piloting and implementation of the ESSA Blueprint Prototype followed the principle of a smart, sustainable and forward-looking integration of a proactive skills adjustment in **existing governance structures of the European and national steel industry**. This allowed a direct connection of social, people related innovation in the regular activities of the steel sector’s stakeholders and integrate continuously the skills (and in a broader sense non-technological and social) perception in upcoming technological developments. Connecting technological development with skills demand helps to unfold the innovation potential with the competences, experiences of the workforce at the workplace. The skills perspective became an indispensable and visible part of the steel sector's running and supporting structures and institutions (ESTEP, EUROFER, industriALL, Clean Steel Partnership, and the Sectoral Social Dialogue Committee Steel) on the European level and via the rollout activities to the main national-regional stakeholders and training ecosystems (see chapter 4) - mutually developing and supporting technological and social innovation.

The ESSA Blueprint Prototype (Deliverable D5.2) was setting the frame and ground for an interrelated European, national and regional roll-out and cooperation of the European Steel Skills Agenda and Alliance. Piloting and implementation were conducted against the results of the current and future technological and economic development in the steel industry (WP2), the related company skills requirement (WP3) and the VET system framework to support the skills adjustments (WP4) (see final version of the related Deliverables D2.1 (Murri et al., 2023), D3.2 (Bayón et al., 2023), D4.5 (Antonazzo et al., 2023)). Against this backdrop, the following core elements of the Blueprint were initialised and tested, and finally accepted (see Figure 1 below):

1. The European Steel Technology and Skills **Foresight Observatory** as the main European coordination unit, conducting a regular European Steel **Technology and Skills Foresight Panel** (ESSA ETP)
2. The Online Training Ecosystem **"steelHub"**
3. The **European Community of Practice of Steel Regions** (ECoP Steel), connecting and supporting steel related member states and the main European steel regions with a European platform for the different **National-Regional Training Ecosystems**: mutual learning by exchanging, initiating, developing, and implementing good practice for skills and training.

Through this structure, the demand side (skills requirements) and the supply side (training offers and exchange, industry image and recruitment activities) as well as an exchange and piloting / testing sphere for innovative solutions is given. Additionally, it serves a ground for a European - Steel Regions interplay by a European Open Coordination as a **Community of Practice of Steel Regions**, integrating relevant national and regional stakeholders and their national-regional skills and training ecosystems.

During the implementation and testing phase this European governance structure was already implemented and accepted by the related main steel industry actors on the European level: ESTEP, EUROFER, and industriALL Europe. The core coordination unit taking over the ESSA Blueprint and Strategy is the Focus Group People of ESTEP which has agreed to run the Foresight Observatory and Panel and to establish a European Community of Practice of Steel Regions (National-Regional Training Eco-systems). EUROFER is supporting ESSA via its Social Affairs Committee (SAC) and industriALL via the Sectoral Social Dialogue Committee on Steel (SSDCS).

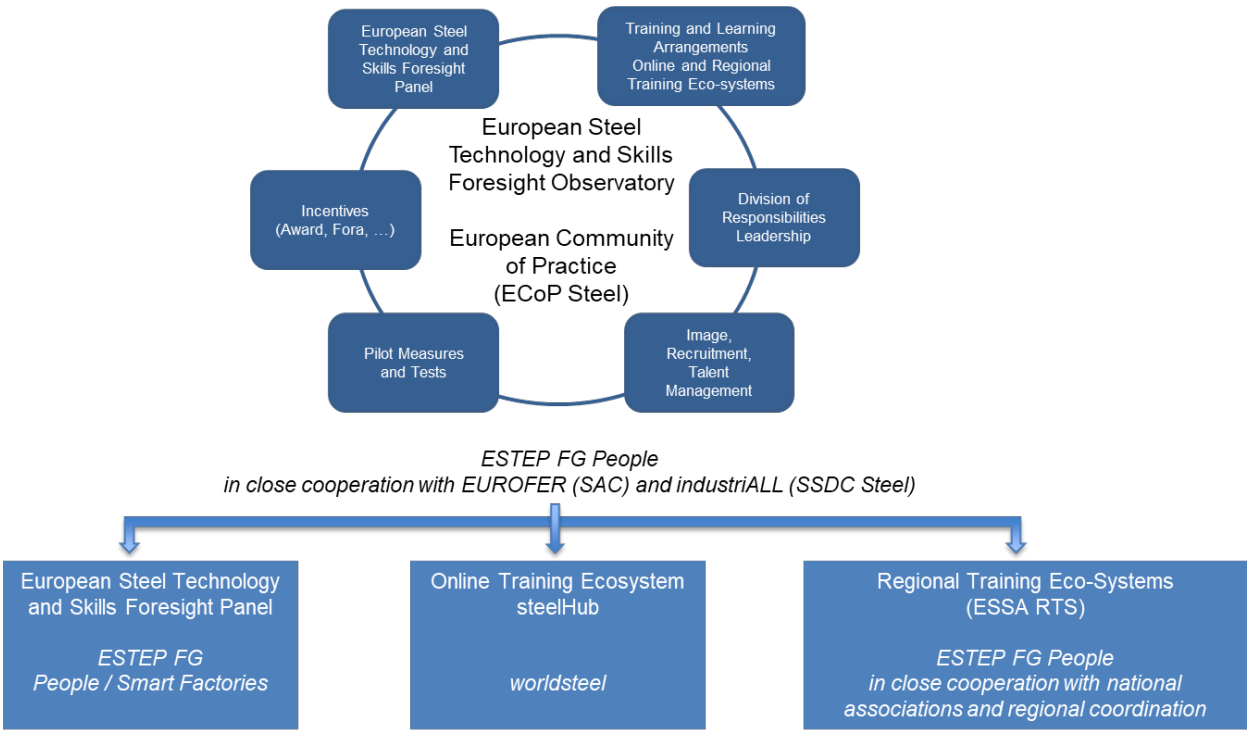


Figure 1: ESSA Governance Structure

The Observatory, steelHub, and the European Community of Practice are now part of the European Steel Community, connected with present European platforms and tools beyond the steel sector, ensuring exchange with the broader European process industry (e.g. within the Process for Planet programme of A.SPIRE and via the Skills Alliance for Industrial Symbiosis (SPIRE-SAIS), where steel is part of). The governance structure of ESSA is built on a division of responsibilities, clarified and checked with the European Steel Associations and social partners ESTEP, EUROFER, and industriALL. Connections with European platforms beyond the steel sector (e.g. Pact for Skills, Centres of Vocational Excellence) and tools (e.g. ESCO, Europass) are part of the ESSA strategy, measures and training (esp. in the steelHub and the Regional Training Ecosystems).

To ensure a stronger integration of Small and Medium Sized Enterprises (SME), an "ESSA Task Force SME" was founded, ensuring and integrating the SMEs perspective. Small and Medium Sized Enterprises (SMEs) are integrated mainly via the Cold Rolling Mill association CIELFFA. With the "**ESSA Task Force SME**" a strong focus on the SME perspective was ensured in phase, leading to SME related policy recommendations (see Deliverable D7.1 (ESSA, 2023)) and integrating SMEs in the national-regional rollout strategy and activities.

With its **multi-stakeholder cooperation,** the ESSA Partnership and Alliance includes and will include continuously the main European Steel Sector stakeholders, integrating large (multi-national) steel companies, education and training providers, associations and social partners,

and research institutions: a consortium of 24 relevant steel industry stakeholders enhanced by a growing number of associated partners (20 up to now) are already ensuring a sound ground for sustainability since the start of the project:

- integrating already an ecosystem of stakeholders (companies, training providers, education and research institutions, and social partners)
- reflecting the European, national and regional level (European and national associations, unions, regional placed global companies).

The ESSA Blueprint **dissemination and collaboration** was and is, moreover, very much aligned with the steel industry organisations' regular activities and annual meetings: At the European level, e.g. the European Steel Technology Platform ESTEP, the Sectoral Social Dialogue Committee Steel SSDCS (including EUROFER and industriALL), and the SME based cold rolling association CIELFFA; on the national level via the national steel platforms and associations such as Federacciai, Wirtschaftsvereinigung Stahl, OS KOVO, UNESID. Additionally, an extensive cooperation took place with the Steel Sector Careers project (funded by EASME/COSME) completed by first collaborations and agreements with other industry related Blueprints (esp. SPIRE-SAIS).

Against this backdrop the implementation and piloting of the ESSA Blueprint framework, strategy, tools and measures was done in line with European steel sector related support structures and alliances, establishing the ground for an ongoing Foresight Observatory (chapter 3) with a Steel Technology and Skills Foresight Radar (chapter 3.1), the online platform steelHub (chapter 4), and the European Community of Skills and Training Practice (chapter 5).

3. ESSA Foresight Observatory

The European Steel Technology and Skills Foresight Observatory has become the central European coordination unit and takes over the leadership of the ESSA Alliance beyond the project duration. This includes the governance of the *Steel Technology and Skills Foresight Panel (ESSA ETP)*, the *steelHub* platform, and the *European Community of Practice* of national/regional skills and training ecosystems (ECoP Steel).

Within the already implemented task ESSA+ as part of the ESTEP Focus Group People the Observatory will cooperate closely with the existing associations and platforms, mainly ESTEP, EUROFER, SSDCS, and industriALL.

Within the Observatory we will ensure activities (see Figure 2) to:

- Develop and exchange new training and learning arrangements within the online and regional training eco-systems
- Adjust responsibilities and ensure reliable leadership
- Develop incentives for excellent skills development, e.g. by a European Skills Award and Online Fora (e.g. discussing the recent results and demands of the regular Foresight Panel ESSA ETP)
- Develop pilot measures and test (experimental platforms, specific tasks, support for acquiring funding, etc.)
- Improve the image of the sector, supporting recruitment, retaining and talent management by EU-wide communication campaigns, advertise and promote job

opportunities and good working conditions, image and awareness-raising campaigns (including underrepresented groups, such as women and migrants).

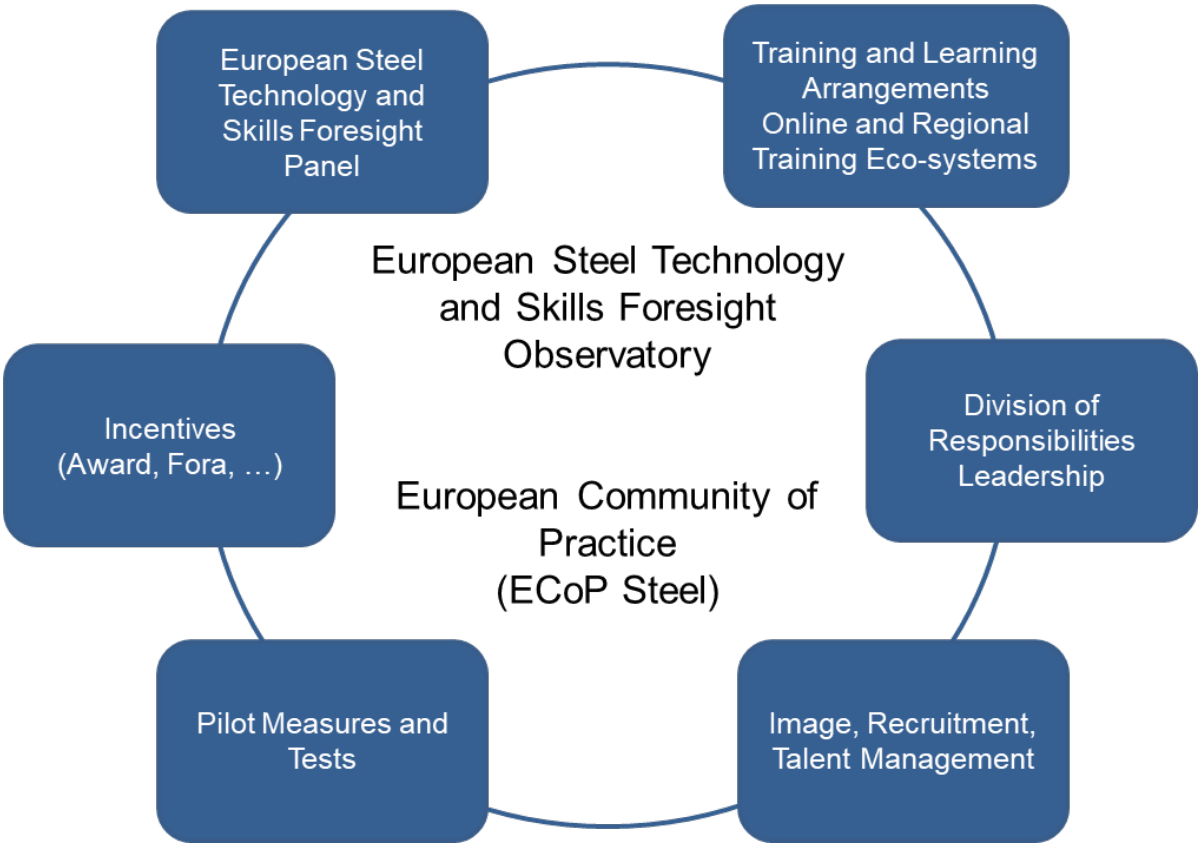


Figure 2: Core Element: European Steel Technology and Skills Foresight Observatory

As a central and continuous element of the ESTEP Focus Group People the Foresight Observatory is foreseen as the leading governance element on the European level and for connecting the steel regions with the Blueprint - bundling in a systematic process all the necessary activities to monitor and evaluate regularly:

- Technological and Economic Development
- Industry Skills Requirements
- and VET Systems Anticipation and Support of Future Skills.

As already mentioned, the three core elements of the Foresight Observatory will monitor and adjust **skills (demand side)** and organise **education and training (supply side)**:

- **Monitor and anticipate** new skills demands of the EU steel industry via the European Steel Technology and Skills Foresight **Panel** (ESSA ETP) (demand side)
- **Provide and promote training in T-shaped skills of the main job profiles concerned** via the **Online Training** Ecosystem "steelHub" (supply side)
- **Connecting Regional Training Ecosystems** (ESSA RTS) (regional demand and supply) within the **European Community of Practice (ECoP Steel)**.

Additionally, the **Repositories of Innovation Projects and Recruitment Events / Measures** were updated and improved during the test phase. The repositories of innovation projects and recruitment events are foreseen to be connected with the competence database of the steelHub. Besides, the front end of this repository might need to be independent of any homepage in order to be disseminated through different channels, like company systems.

The **project repository** devoted to the most important European innovation projects was extended. The main information of each ESSA relevant project has been summarised, by including data identifying the project, objectives and relevance of technological transformation. In addition, projects have been grouped according to the enabling technologies. This allows an easy access and overview concerning technological innovations available or under development as well as a wider dissemination of such information among the steel industry.

In addition, a platform including and updating **recruitment events**, to the aim of attracting people to the steel sector, has been developed. Both the repository and the recruitment platform will be integrated in the ESSA homepage becoming part of the ESSA Foresight Observatory and steelHub.

Thanks to the close collaboration and interaction with the RFCS framework, ESTEP, the Clean Steel Partnership and other European Institutions, both platforms will be continuously updated. In particular, concerning the projects repository, new projects information will be updated and included, by asking support from the projects' coordinators through the collaboration of relevant associations and/or involved agencies (e.g. ESTEP, RFCS, CSP, Process4Planet).

3.1 European Steel Technology and Skills Foresight Radar and Panel (ESSA ETP)

Central element of the Foresight is the European Steel Technology and Skills Foresight Radar and Panel (ESSA ETP). Based on the results of the analysis and surveys of WP2 (Technological and Economic Development Foresight), WP3 (Industry Skills Requirements), and WP4 (VET Systems Anticipation of Future Skills Requirements) two rounds of the survey were conducted and tested. Objective of the surveys was to monitor technological and economic development and the related demand of skills requirements on a regular basis.

Within two pilot surveys (2019 and 2022) this instrument was tested and the results were summarised in Deliverable D3.2 (Bayón et al., 2021; Bayón et al., 2023) and D2.1 (Murri et al., 2023)). The surveys were distributed by the ESSA partnership, EUROFER, ESTEP, industriALL, CIELFFA, national associations and global companies. The experts for the Panel Workshops were selected by these European associations in close cooperation with national associations and the ESSA Regional Training Eco-systems players.

The pilot European Foresight Panel ETP encompassed **two elements**:

1. Standard part technological and economic development and related skills requirements:
   new technologies: current use and future relevance, planned investment, affected company areas and job profiles, barriers and benefits
   skills assessment of selected representative job profiles: technical/professional, digital, green, social, personal/individual, methodological skills
2. Complemented by an Expert Panel (discussing the results of the questionnaire).

Target groups of the survey and workshop were:

- Technological foresight and skills assessment are dedicated to job profile related **workplace experts**: technicians and HR people of the **companies (managers, technicians - HR/Training Centre experts),**
- **Expert Panel** was composed by representatives from different Focus Groups of ESTEP (esp. Smart Factories and Circular Economy), companies, training providers, RTOs and Universities, associations and social partners.

Both questionnaires shared a similar general structure[1]. *Figure 3* shows the structure of the second iteration of the survey. At the beginning, participants were asked about the future of job profiles and technologies in their companies and also for what occupational profiles they considered themselves as experts. Subsequently, for each of the selected profiles, a specific question section related to skill development followed. For this, the ESSA skill categorisation developed within WP3 were used (for details see Deliverable D3.2 (Bayón et al., 2023)). The participants were asked to define the needed current and future levels (0-4) of the selected skills. Moreover, they had an optional question asking if they think any additional skills are needed for the chosen profile. Before the participant evaluated the questionnaire, some further characteristics of the respondent and the organisation (such as type of their organisation, their job title, department, company size, and type of product of their company) were enquired. The questionnaire was programmed using the survey software LimeSurvey and placed online; the link to the survey was distributed through various channels, with a focus on project partners. The aim was not to provide a picture of the European steel sector as representative as possible, but to gain insight into the views of job profile experts from the industry and to generate some assumptions, which were discussed further, e.g. in the Expert Panel.

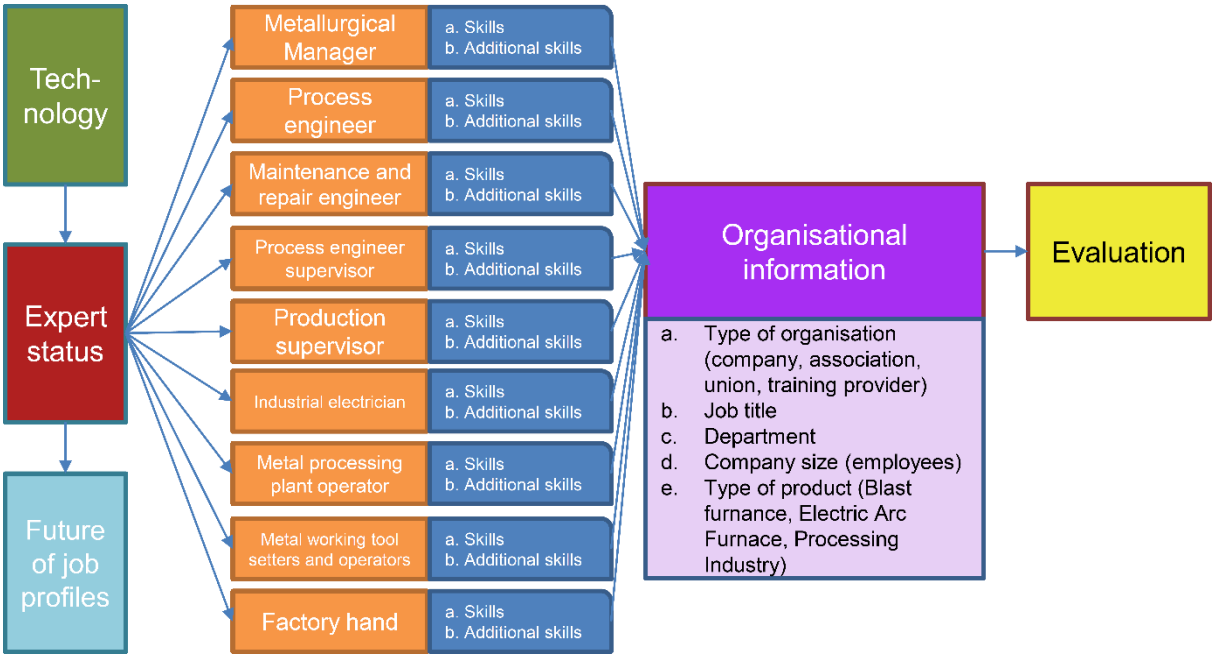


Figure 3: ESSA ETP structure

While 33 persons participated in the first iteration of the survey, 40 persons participated in the second iteration. The English questionnaire was translated also into Spanish, Italian, Czech, Polish, and German. The most of them used the English questionnaire (13), the Spanish questionnaire (11) and the Czech questionnaire (9)[2]. In average each of the participants assessed 3.6 job profiles, resulting in 144 job profile assessments. The participants were predominantly employed by large companies with over 1,000 employees (25/40)[3] and mostly worked in the human resources / training department (24/40)[4].

[1] These results and a more detailed analysis can be found Deliverable D3.2.
[2] Further languages: German (3), Italian (3), and Poland (1)
[3] 11 participants came from companies with 251 to 1,000 employees, 4 from companies with 51 to 250 employees.
[4] Further departments: Management (5), Technical department (6).

The participants also evaluated the survey. First, they indicated their agreement with six statements on their experience with the survey (see Figure 4). Understanding of job profile names, skill categories, skill levels as well as technology names was given (between 73 and 83 percent of the participants agreed with these statements). At the same time, however, about one in ten had problems understanding the names of the technologies. Lower approval rates were obtained when evaluating the duration of the survey. Only slightly more than the half of the participants agreed with the statement that the time it took them to complete the questionnaire was reasonable, while almost 3 out of 10 participants disagreed with these statements.

In addition, only a minority of the participants said they could evaluate the current and (especially) future skill levels for the job profiles without problems. Relatively many participants were undecided about these questions. These values show the complexity of a skills foresight survey: While there is an understanding of the skill levels, skill categories and job profiles, the actual evaluation of the skill requirements proofed to be challenging. This could also be related to situations in which the participants lacked of detailed knowledge of the skill requirements in specific job profiles, despite often being positioned in the human resources department. In addition, the design of the survey requires a certain ability to abstract: from specific tasks in job profiles to needs in skill categories and levels.

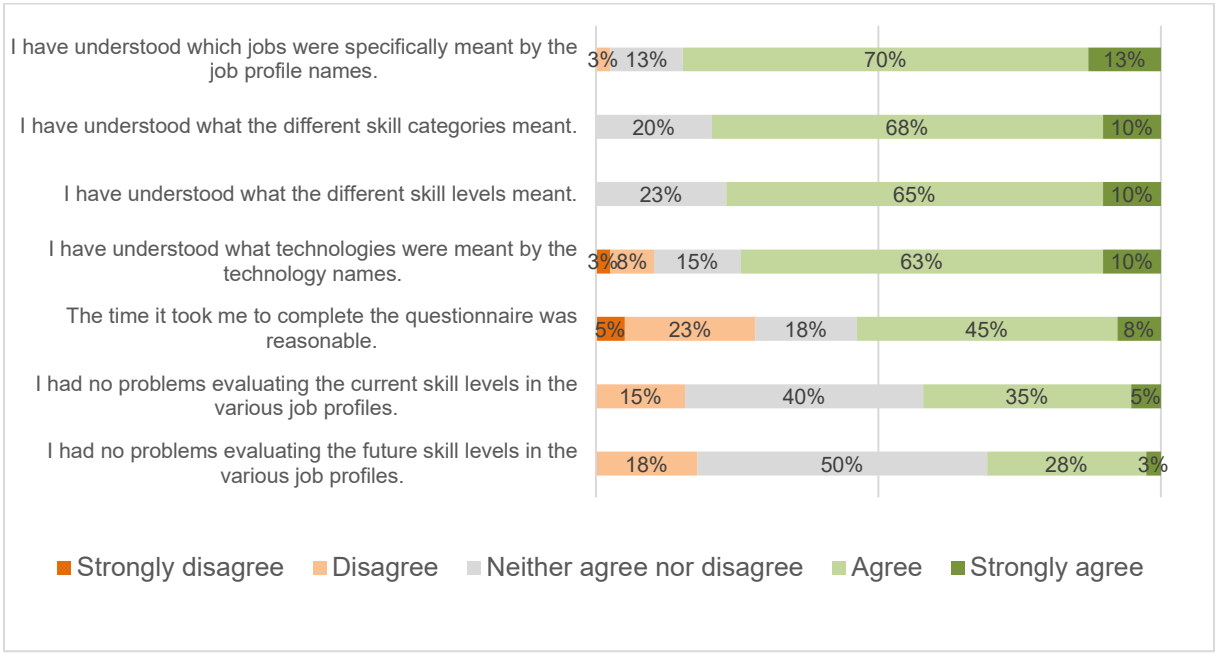


Figure 4: Evaluation items of the survey. N=40.

Despite these challenges the usefulness of the survey was confirmed. Large majorities (around 90 percent) stated that the questionnaire is at least moderately useful “to identify sector-wide trends” and “for raising awareness of needs within my company” (see Figure 5).

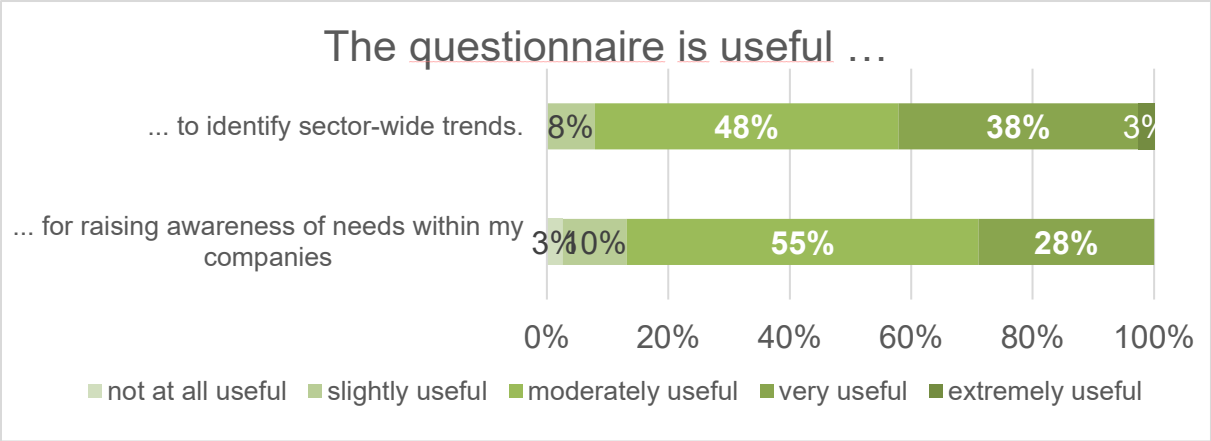


Figure 5: Usefulness of the questionnaire. N=40.

The test phase indicated to some constraints of the methodology:

- Looking at the relatively low numbers of participants, it comes apparent that as the questionnaire is dedicated to experts of the different job profiles in the companies it is not easy to reach out to these experts and motivate them to participate (even there is a translation into different languages).
- Assessing more than one job profile (and that is usually the case) increases the time for answering a lot. This resulted in relatively many participants not agreeing with the statement that the time to complete the questionnaire was reasonable.
- Also, the level of detail required sometimes seemed challenging for the participants.

Against this backdrop a simplification of the questionnaire as well as alternative ways to monitor technological development and skills needs were discussed. It will be checked, in how far this assessment could be integrated in the steelHub.

Against the backdrop of the results of both test phases, a reduced questionnaire focusing on the main variables and combined in a **Technology and Skills Foresight Index** is targeted, monitoring technological and skills development on a regular yearly basis, continuously updating and illustrating the course and trends over the years. The results of this index will be further explored by related **follow-up** workshops of selected experts from different stakeholder groups to discuss and further elaborate the statistical data in an iterative process. With this mixed methodology the restrictions of each (the quantitative and the qualitative) approach are overcome: quantitative data are setting a broader and representative ground for a qualitative in-depth and context related discussion and interpretation.

The regular standard part will be added by an important **issue of the year** (e.g. hydrogen related skills). The final results will be published, disseminated and discussed on a regular basis by:

1. **Public Report** (ESSA Fact Sheet of about 2-4 pages, translated in the main languages)
2. **ESTEP Expert Workshops** to discuss possible consequences and needed activities for skills adjustment within the broader steel industry sector.

However, it will be checked if the technological foresight questionnaire could be combined with the assessment of skills demands of the steelHub users (as an entrance for linking skills gaps with training offers). As the next European Steel Technology and Skills Foresight survey is foreseen for 2024/25 there is time to test the steelHub integration first and then decide for the best methodology to establish European Steel Technology and Skills Foresight Panel and

Index. Anyway, we have to adjust and add relevant and future technologies, job profiles, and skills classifications.

Additionally, it is considered to analyse job position postings for the forecast of skills gaps and requirements, if there is a reasonable, manageable and affordable method and solution for monitoring.

4. Online Training Ecosystem "steelHub"

The Online Training Eco-system "steelHub" sets the infrastructure for an open European exchange of training content, integrating inputs from and for steel associations and companies, VET systems, other Blueprints, European tools, and the non-formal and informal learning of individuals.

4.1 Infrastructure Development

During the implementation and test phase of the steelHub the infrastructure was further developed, more training content was integrated (including measures and guidelines for trainers), the usage was increased, and a business model was established. As a central element of the strategic Blueprint steelHub became a centralized digital platform to facilitate communication, collaboration, and coordination.

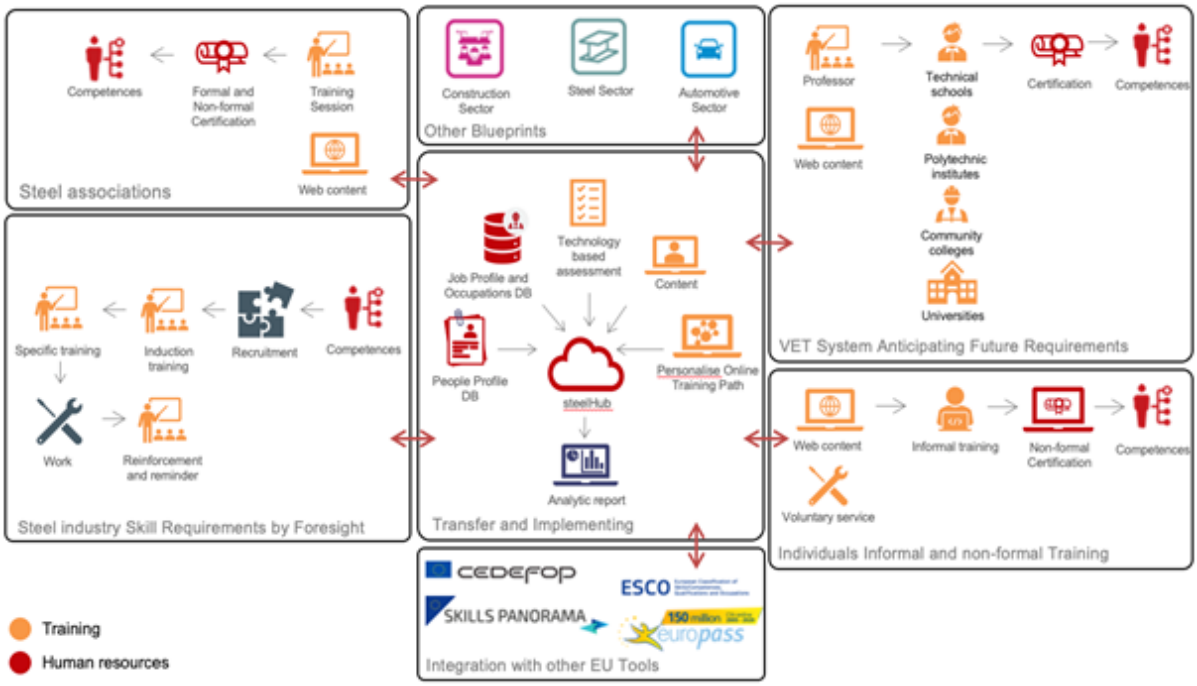


Figure 6: steelHub (European Online Training Ecosystem)

The delivery of the infrastructure of the steelHub was divided in four stages, which are highlighted in colours in the following image. Starting with a first content library (yellow) a competence model (blue), based on the ESSA job profiles, skills and tasks classification was developed. In a third stage the technological and VET system analysis was integrated (green), followed by monitoring and analysis elements (violet).

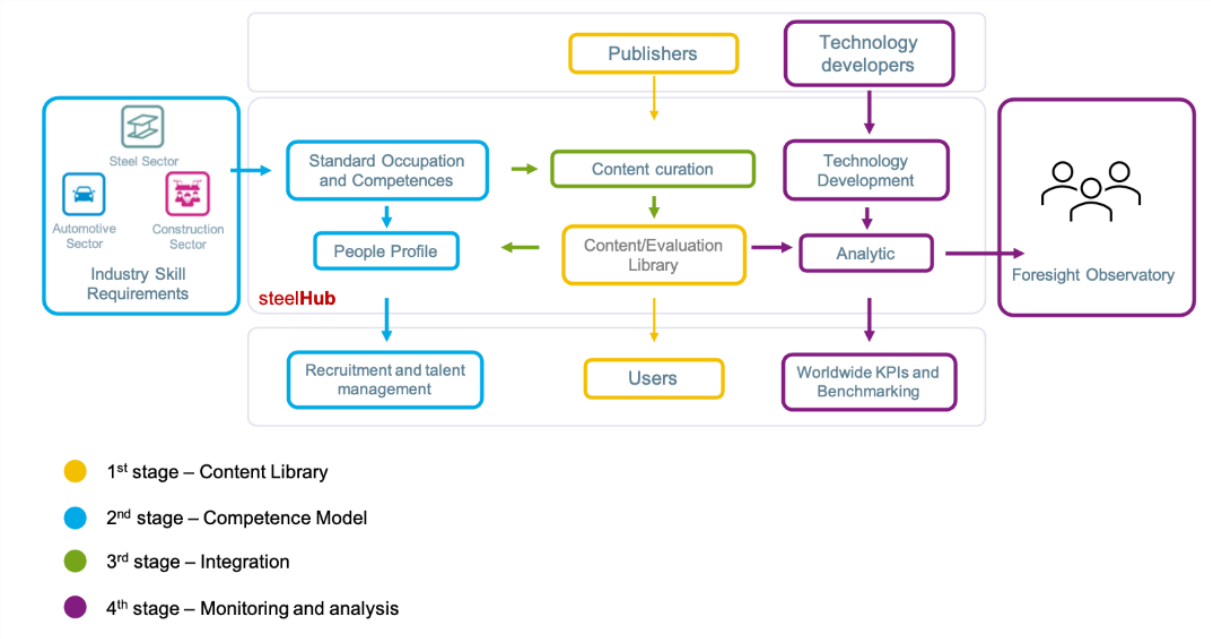


Figure 7: steelHub Infrastructure and Implementation Stages

1st Stage - Content Library

The objective of this stage is the implementation of an infrastructure that allows the connection between Publishers and Users. This first stage includes implementation of standard SCORM protocols, licenses management, publishers' access and user report. The content provided by steeluniversity and other early adopter publishers have been already distributed in companies and universities. This first stage is now on its way to integrate more trainings and tools for upskilling the European steel workforce. Therefore, it is necessary to have a formal framework to protect the IP of the publishers and accomplish the GDPR regulation. The general rules for this framework are described in the next chapter "Formalization of steelHub Implementation".

2nd Stage - Competence Model

The main goal of this stage is to have a tool to upload the Standard Occupation and Competence DB defined in WP3 and have a link to the ESCO Database. The competence model is under development and validation within WP3; however, the structure of the Database has been defined an implemented in the back-end of the steelHub as shown in the following image. Some important remarks are the multilanguage capability and links to ESCO and ISCO. During the 3rd quarter of 2021 we were working in the Front-End of this DB in order to give a visual view of the data and allow search and analyses. The first version of the module "People Profile" was developed during 3rd quarter of 2021 as well.

3rd Stage - Integration

The main goal of this stage is to connect the content and assets published in steelHub with a competence model Database thru Learning Outcomes. This integration started on 4th quarter of 2021 and was important to finish the "People Profile" module.

4th Stage - Monitoring and analysis
In this stage tools were developed to be used by the Foresight Observatory to monitor skill gaps, create reports and make changes if necessary into the Competences Database. An important module included at this stage is a survey and DB of technology developments, which is done in WP2, as a key source of information to perform a deep skills gap analysis. This stage was implemented on first quarter of 2022.

4.2 Central Elements

Finally, central elements of the steelHub are (1) a Learning Solution Directory, (2) a Skills Directory, (3) a Capability Assessor, and (4) the Integration in different learning and training paths.

steelHub sets the infrastructure for a worldwide exchange of content with a **Learning Solution Directory** for the steel sector. This directory is a collection of learning solutions delivered by Publishers into the framework of a marketplace business model. Another important component of this platform is the **Skill Directory**, which represents the current and future training needs of the steel sector, which have been developed in ESSA (see Deliverable D3.2 (Bayón et al., 2023)). This Directory is used to curate the learning solutions that have been collected and developed by WP5. Using a standard terminology and big data infrastructure, steelHub is able to identify skill gaps and the most demanded skills for the steel sector to guide the training solutions development as well as analyze trends that can support governments to define new regulation and funding tools to support the transformation of the steel sector. This information will be used for Skill Foresight Observatory to create updates in the skill directory and develop recommendations.

The integrated design of the platform offered by steelHub enable the possibility to develop new and innovative solutions into the context of **Capability Assessor** using a variety of methods to evaluate an individual's capabilities, including self-assessment, interviews, tests, and job simulations. The goal of the assessment is to determine whether an individual has the necessary skills and experience to perform effectively in each role, task or skill and design a custom development plan for each organization or individuum.

The flexible **Integration** of this platform offers organizations the ability to easily connect and integrate learning solutions with their own systems, which can improve productivity, reduce costs, and enhance overall efficiency. Besides, regional industrial and professional association are able to integrate these solutions to provide learning solutions to their members.

Figure 8: Modules of Digital Platform – steelHub

Each of these pillars involves tasks that have been developed during the piloting and implementation phase, but need to continue executing to assure good service and quality. Possible tasks for each pillar are:

1. **Learning Solution Directory,** which is a collection of learning solutions for up- and re-skilling current and future workforce.
    a. Identify and analyse learning solutions available.
    b. Develop and implement learning solutions.
    c. Identify and implement new training method using possibilities of digital learning and support (social media, virtual labs, online learning, among others).
    d. Identify and implement new training method to improve engagement of workers (e.g. workplace innovation, but also by using digital tools like tablets, augmented reality, virtual reality, among other).
    e. Innovative learning solutions for Train the trainer.
    f. New Leadership and Work 4.0.
    g. Develop and maintain Quality Assurance System to collect feedback from learners.
    h. Collect information and data for monitoring and reporting.
    i. Translation of learning solutions mainly for lower skills levels workforce.
2. **Skill Directory**, a centralize repository of skills and knowledge that represent the current and future training need of the steel sector.
    a. Develop and maintain a flexible IT infrastructure to upload, update and distribute skill Data Base.
    b. Curate Learning Solution Directory with skills and knowledge.
    c. Collect information and data for monitoring and reporting.
3. **Capability Assessor**, solutions to deliver capability assessments to organizations and individuals for Self-Directed Learning, to support individuals take primary responsibility for planning, organizing, and executing their own learning process.
    d. Develop and maintain a **Self-assessment** tool based on Skill Directory and Learning Solution Directory.
    e. Develop and implement technology-based assessment using **Evidence-Centred-Design (ECD)** methodology based on Skill and Learning Solution Directory.

    f. Collect information and data for monitoring and reporting.
4. **Integration,** steelHub is a flexible IT infrastructure that assure several integration options to meet the unique needs of organizations of different sizes and types as well as individuals. This includes the development, implementation, and maintenance of integration solutions for the following cases.
    g. Small and medium enterprises.
    h. Universities and Schools.
    i. Regional and national associations.
    j. Large organization.
    k. Individuals.
    l. EU Tools.

Besides, this pillar includes the development and maintenance of a Dashboard with the data collected from the interaction of the learners with these pillars to support the Expert Panel in the identification of emerging skills and training needs.

The steelHub platform is aligned with the European approach to micro-credentials, with qualification evidencing learning outcomes acquired through a short, transparently-assessed course. These contents may complete on-site training, online or in a blended format. The setup can be particularly useful for people who want to (a) build on their knowledge without completing a full education programme and (b) upskill or reskill to meet labour market needs or to develop professionally after starting work. The micro-credential approach will allow education institutions to offer such courses on a larger scale thru steelHub and in a comparable manner throughout Europe, ensuring agreed quality standards, and facilitating their recognition and portability across the EU.

4.3 Formalisation of steelHub Implementation (Business Model)

To assure the continuation of the steelHub a non-for-profit Business model (see the blueprint for the agreement with the publishers in the Annex) was put in place to assure a self-sufficient economical model. Subject of the agreement is that the Parties (worldsteel and publishers) agree to collaborate in sharing of learning content. worldsteel grants publishers a license to use its software. Publisher grants worldsteel a license to use its Learning Content. The license offered to each Party shall be subject to the terms of an Agreement. worldsteel provided publishers with SCORM links to allow Company to access Learning Content through its own learning management system or those of its clients. worldsteel will host the Publisher's Learning Content on its steelHub application to facilitate access by the Publisher and its clients and by worldsteel and its members and clients. Obligation of the parties (worldsteel and publishers) are regulating IPR, integration links (SCORM, Learning Management System), integration of learning content, providing technical support, monitoring content, ruling end-users modalities, dissemination, and improvements.

steelHub and the business model have been successfully integrated in 28 industries, 8 associations, 2 equipment providers, 1 Education and training provider and 10 R&D institutes and Universities. A total of 13,406 activate learners used learning solutions available in steelHub.

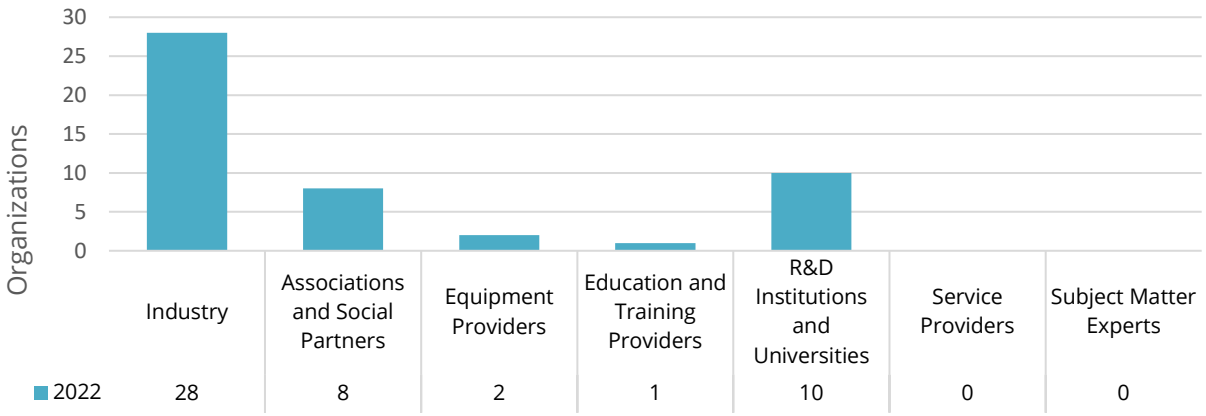
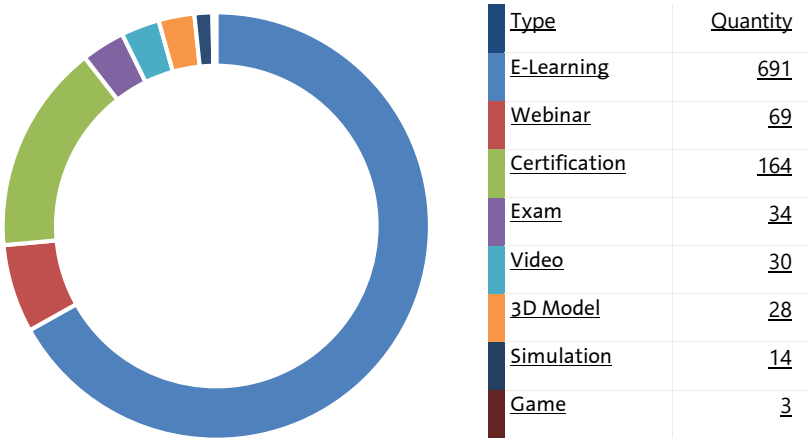


Figure 9: Organizations using steelHub

Besides, steelHub offer an additional distribution channel for stakeholders of the training ecosystem that develop and deliver learning solutions (Publishers). There are 7 Industries, 5 Associations and Social Partners, 1 Equipment Provider, 3 Education and Training Providers, 5 R&D institutions and Universities, 6 Service Providers and 4 Subject Matter Experts. These publishers contribute to a directory of 1896 solutions.

Figure 10: Publishers integrated and in progress

The community of publisher collaborate to create a Learning Solution Directory of 1,896 innovative digital learning modules in different languages. The following table represent the distribution of those learning solutions by Learning method used. An important challenge for the future development of this solution is to perform the translation of the solutions and information available to improve the dissemination at regional level, like in Poland, Italy and Rumania.



Type	Quantity
E-Learning	691
Webinar	69
Certification	164
Exam	34
Video	30
3D Model	28
Simulation	14
Game	3

The most used learning solutions correspond to the knowledge area of “Manufacturing” with 10.413 active learners and “Occupational Safety and Health”. This is because the main solutions available at this time are focus on these two main topics. There are several requirements to include solution about “Sustainability” and “Process Safety”, which is the priority of the platform for the following months.

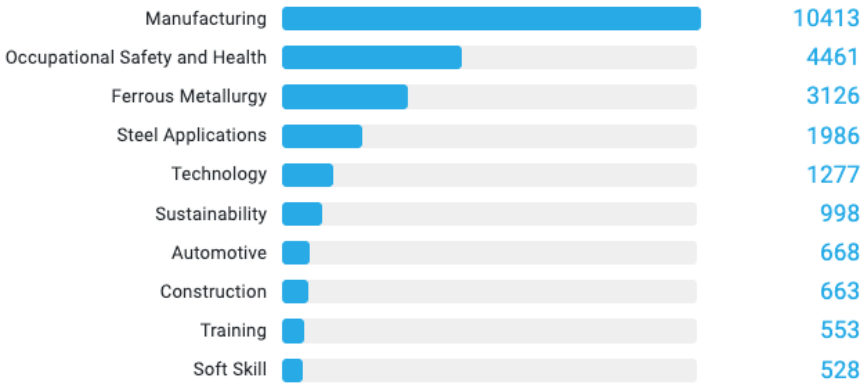


Figure 11: Active learners per knowledge area

4.4 Integration of steelHub in National-Regional Training Ecosystems

steelHub is also foreseen to be integrated in National-Regional Training Eco-Systems. It is planned as a link between the European and regional training, and between online and work-based learning.

The results of ESSA stress both virtual and on-the-job learning, in the best way combined with each other. Therefore, ESSA intends to focus on the European level by an **Online Training Ecosystem** steelHub (digital platform, online learning) and on the level of steel regions by specific **National-Regional Training Eco-Systems** (regional networking, blended and on the job learning). Both systems are complementary and could be combined by adding specific advantages to each other (such as combining digital online and regional on-site analogue training modules that could be integrated in a broader training program of the companies and VET providers):

- virtual / online: independence of time and space, integration of external modules in company and individual learning paths, coaching and monitoring

- on-site / workplace related: real working experience, interactive learning, "hands on" practical experience.

steelHub is aligned with the European approach to micro-credentials (European Commission, n. d.), with qualification evidencing learning outcomes acquired through a short, transparently-assessed course. These contents may complete on-site training, online or in a blended format. The setup can be particularly useful for people who want to (a) build on their knowledge without completing a full education programme and (b) upskill or reskill to meet labour market needs or to develop professionally after starting work.

The micro-credential approach will allow education institutions to offer such courses on a larger scale and in a comparable manner throughout Europe, ensuring agreed quality standards, and facilitating their recognition and portability across the EU. This is also a key action of the European Skills Agenda, which targets not only higher education but also vocational education and training providers, research organisations, industry, social partners, Chambers of Commerce, Industry or Crafts, and civil society organisations, which we call training providers (Shapiro Futures et al., 2020).

5. National-regional Training Eco-Systems (European Community of Practice Steel)

The multi-stakeholder and the *Eco-system* approach are the core elements of ESSA ensuring a continuous reflection of new technological and economic developments relevant for a pro-active adjustment of industry skills demands. Against this backdrop the rollout implementation and test phase started with the elaboration and formalisation of a Regional Ecosystem Concept and Framework. Based on this pilot steel countries and regions were selected, several Round Tables and Workshops were conducted, leading to the development of the European Community of Practice of National-Regional Training Ecosystems. Continuously the integration of other regions was checked.

5.1 Eco-system Approach and Framework Concept

The national-regional rollout activities, focusing on the eco-system approach and the selection of pilot steel regions, included not only activities focused on spreading the Blueprint, primary it was for starting and implementing specific national-regional *processes*: based, initiated and fostered by the ESSA Blueprint and its elements.

Due to the rapid transformation of the steel sector by digital and green technologies, ESSA is delivering a deeper collaboration among the different actors as crucial to expand existing synergies among steel regions in order to implement large-scale upskilling and reskilling strategies. In this regard, the continuous cooperation among companies, universities, public authorities and VET providers at regional level can also affect new job orientations. On the other hand, incentives can extend across the breadth and variety of training offers available to employees. Moreover, also incentives for e-learning and remote learning tools can encourage the professional upskilling in a sustainable way for companies. Furthermore, EU, national and regional efforts can pay a special attention to targeting hidden and young talents, which in the past have received less support.

A successful partnership in a region to strengthen and develop a regional ecosystem should involve partners from science and education, economy, policy, and civil society (see Figure 12):

- Education and training providers, which deliver expertise in education, help with educational programs and attract new talents to the sector.
- Regional small and large business, which are important for competitiveness and future prospects, aiming at retaining talents at regional level. In addition, collaboration between businesses can improve innovation.
- Governments and public authorities, involved in a partnership, put a strong and viable labour market and well-trained human capital on the political and economic agenda. In addition, governments can stimulate potential partners to join and can help with subsidies to enable regions to start and expand partnership and to develop activities.
- Civil society should be also integrated as much as possible, in particular at the regional level, where people live and work, in order to ensure, with the other stakeholders, a continuous social innovation process to establish and improve new social practices in skills adjustments.

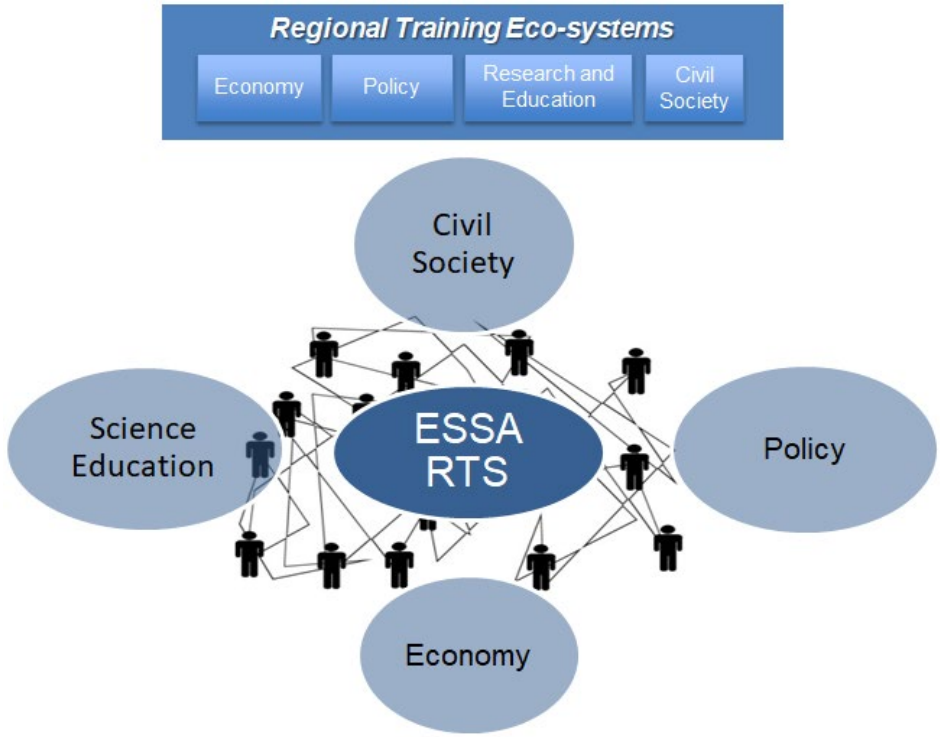


Figure 12: Regional Eco-system

In the implementation of the national and regional roll-out strategies, national associations, steel companies, unions and training providers play a key role. Through the close collaboration with national and regional VET institutions a national/regional roll-out was grounded and modified during the implementation and testing phase. On this subject, the European Steel Regions developed specific comprehensive territorial skills strategies, in line with economic, industrial, smart specialisation and innovation strategies, affecting the areas involved.

Round tables and workshops with stakeholder groups (companies, trade unions, training institutions, research institutes, policy and civil society) in the selected regions aimed at gathering information, verifying the interest and the willingness to participate. Via these

activities a *social innovation process* in the selected regions integrating all the relevant and willing stakeholders started, followed by the review of experiences, development and events. Finally, the activities developed and implemented can be transferred to and integrated in other regions, considering the results of the ESSA rollout implementation and testing phase of pilot the regions. To sum up, the following steps were undertaken (see Figure 13):

1. Selection of pilot regions (together with the National Steel Associations)
2. Regional Round Table Meetings: Information / verification of interest / willingness to participate with stakeholder groups in the dedicated region (to look at companies, trade unions, training institutions, research institutes, policy and civil society). On this subject, up to four workshops took place in each of the selected regions
3. Launch a social innovation process in the selected regions
4. Review of experiences, development and events
5. Transfer / integration of other regions, after focusing on pilot regions.

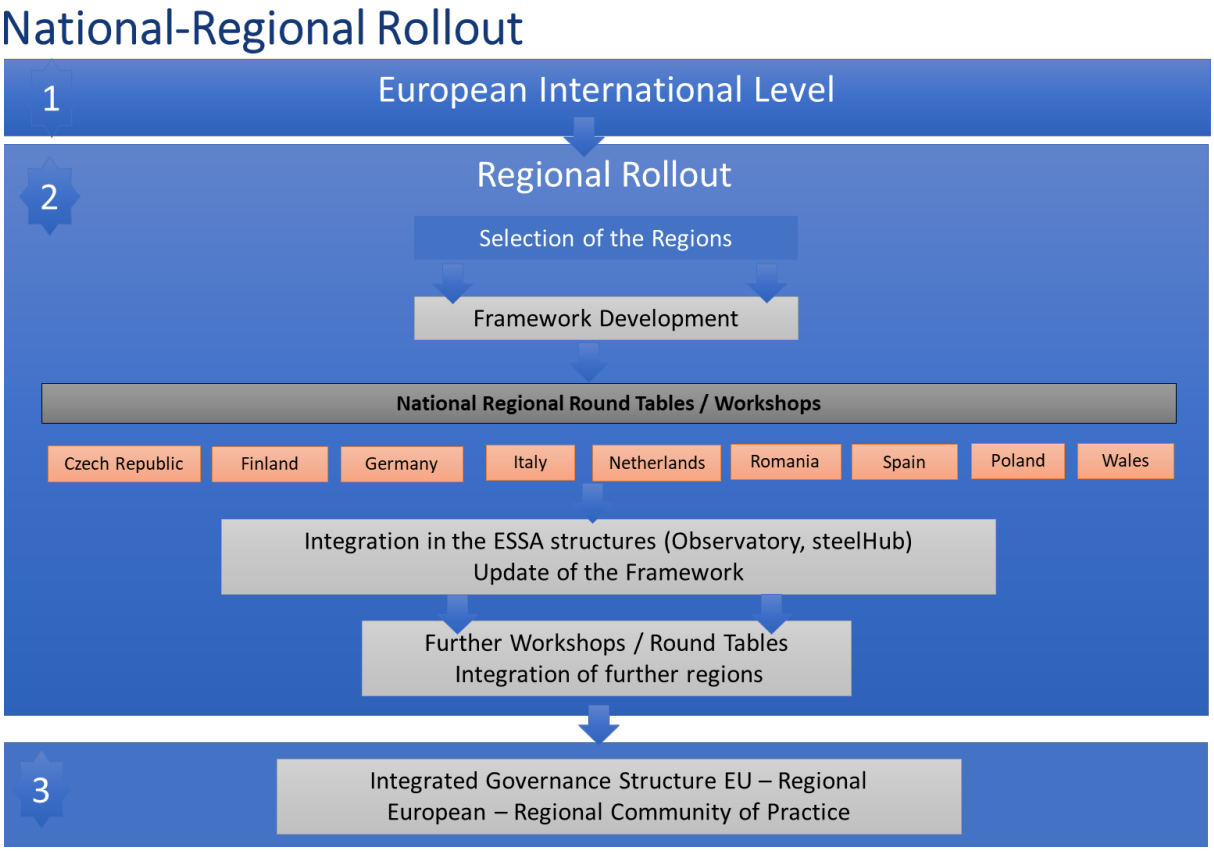


Figure 13: European - Regional Rollout

Based on the experience of Schröder (2012) implementing new regional structures for Lifelong Learning, the Regional Training Ecosystems:

- indicate new learning opportunities and support structures responding to the increasing and fast changing demands of work, education/training for companies, VET systems, and the individual learner
- integrate steel (and the wider) industry demands as a structural principal of the regional education and training system, including the improvement, reconstruction and partly new construction of traditional structures
- orientate on learning outcomes and the recognition of competences adopted on other ways than formal learning

- emphasize the growing demand and challenge for every single person to deal actively and self-confident with constant changes in the world of labour and society and - at the same time - challenge public responsibility to support individuals who are not able to maintain active learning
- improve quantitative and qualitative participation of lifelong learning of the workers and inhabitants of a region, giving access and support where people work and live.

ESSA is not serving a one-size-fits all solution but a European orientation and support framework with a set of guidelines for adapting, modifying, complementing and further developing the Blueprint on the national-regional level, step-by-step within a social innovation process. Therefore, the implementation process of Regional Training Ecosystems is characterised by

- a quick start within a “corridor of possible developments”
- new possibilities to get hold of and mobilise potential trainings
- an increased potential for education to become a “location factor” for integrated regional-local development (including the attraction of young people to the steel (and process industry) sector.

To facilitate integrational developments, the relevant stakeholders and institutions (maybe still working strictly separated) at the regional level will be connected along with their competences, responsibilities and cultures, by creating synergies in spending resources, and addressing the employees’ professional competences, creativity, and willingness to cooperate for (see Figure 14):

- pedagogic integration: new or better learning opportunities, counselling and guidance services, new learning settings, a common learning culture, etc.
- organisational integration: common administrational or directing structures, common use of resources (staff, rooms, equipment, monitoring instruments), corporate identity
- regional integration: activities and projects which reflect local demands, central or de-central organisation of learning sites, local networking, continuous communication with politics and administration, with social partners and enterprises.

This will lead to *specific and different steel regions profiles and processes* under the umbrella of the European Steel Skills Alliance, focusing on specific regional demands, necessities and possibilities.

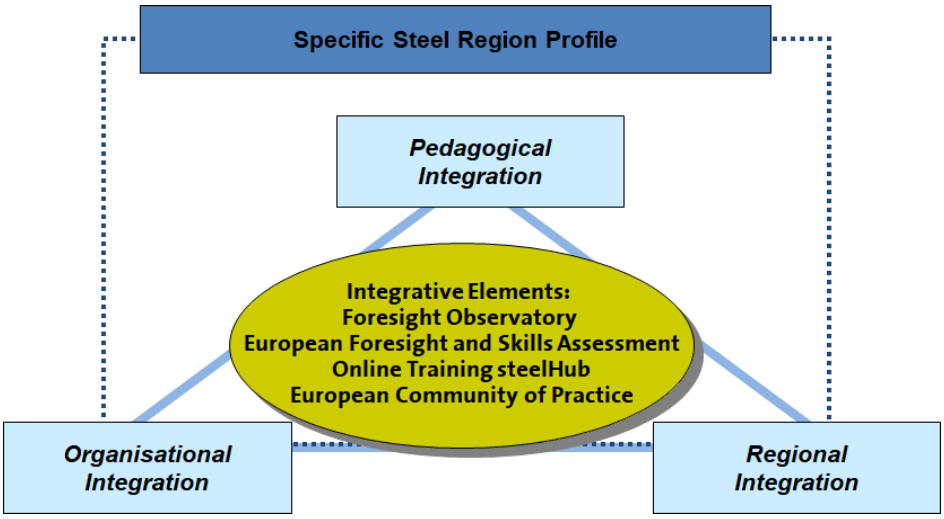


Figure 14: Pedagogical, organisational, and regional integration

By combining the regional (and national) level with the European Steel Skills Alliance and Agenda an integrative and binding cooperation going beyond pure networking is advised: extending complementary, subsidiary or supporting cooperation with setting up a new structural framework (common orientations, objectives and their practical implementation). In the sense of Social Innovation, we are aiming at developing new social practices, putting industry demands and the learner in the centre (changing from an institutional to a strict learner's and learning process perspective).

This includes different, heterogeneous innovation processes at the local level (depending on the recent demands and framework of the regions) within a common framework and overarching support structure and some common product developments. The local context for companies will also be informed by type of production and meeting the skill needs of EAF and BOF (or Hydrogen) are different (meaning different skill needs), and the plants will be at different stages of technological development and require different training provision, and VET provision has a local dimension also depending on the existing cooperation and infrastructures.

5.2 Selection of Steel Regions

5.2.1 Selection criteria

During the first step of the pilot implementation an overview of the main European steel regions has been provided, thanks to the support of EUROFER and contributions from partners and national steel associations of several European countries. To this purpose, a template for gathering information and describing the main European Steel Regions was developed (see example Germany in Figure 15). In particular the main stakeholders and players in the selected pilot regions have been identified to set up a Regional Training Eco-systems of steel companies, training providers, RTOs, and trade unions. In the example "Western Germany / Rhein-Ruhr Area" the regional situation is characterised by a broad range of companies (big companies and SMEs) still remaining after the structural change of this former extensive steel region, the strong social partnership with unions, training providers and research institutions of national and regional scope. Becoming evident that there are already existing cooperation structures, ESSA further integrated VET institutions (national such as the German Federal Institute for Vocational Education and Training BIBB and local vocational schools), as well as stakeholders from policy and civil society.

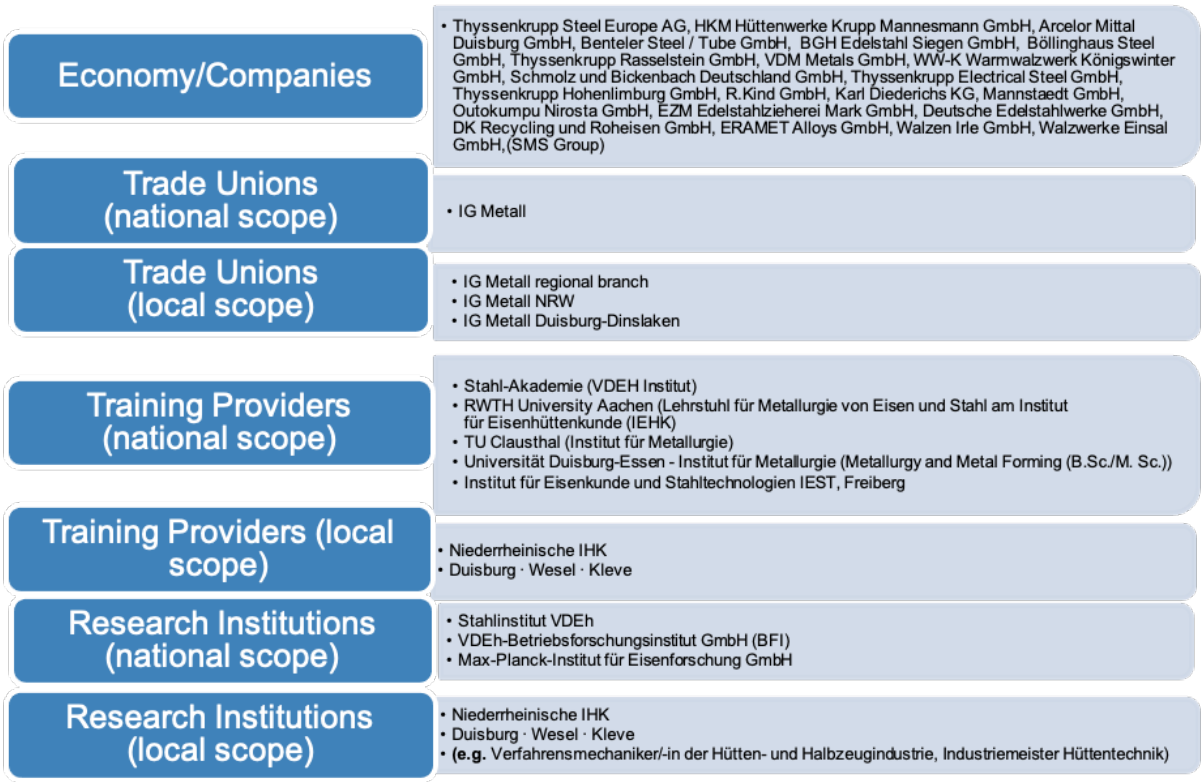


Figure 15: Steel Region Example "Region Western Germany /Rhein-Ruhr Area"

A first set of steel regions (see Figure 16has been identified in Italy, Poland, Germany, Belgium, Austria and Bulgaria, with the support of the national steel associations. The distribution of the steel companies is often not homogeneous, and there are big companies across Europe with a lot of employees relevant for the (regional) labour market to a high degree. However, beside these global players we integrated steel processing SMEs as much as possible and other regional actors.

Figure 16: Overview of mapped EU steel regions (June 2021)

Concerning the selection of pilot steel regions in the different EU Countries, the first selection of these countries has been carried out by considering the five case study countries selected

in WP4 for the VET system analysis, focused on their structures and main characteristics (Italy, regional; Spain, company oriented; Germany, dual system; Poland, centralised; UK, market oriented). Beside this, further selection criteria for pilot regions have been defined. In particular, regions have been selected by considering areas where there is a significant steel production and where there are historically productive activities for the sector. For instance, this can be well represented by Northern Italy, the German Ruhr Area, and by the Spanish regions Basque Country and Asturias. A further criterion considered is the active participation and the expression of interest in the ESSA project by many actors in the region. This provided better possibilities for cooperation inside the ESSA project with a large number of companies present in the selected region, even if they are outside the partnership of the project.

Furthermore, in the selection process of criteria for steel regions, the different routes for producing steel have been considered. Steel is currently produced in EU by two main steelmaking processes:

1. Integrated route, where steel is made from iron ore mainly via the Blast Furnace (BF). Iron, as sinter or pellets, is reduced by coke in the BF, and then converted into crude steel in a Basic Oxygen Furnace (BOF).
2. Electric route, where steel is made mainly through the recycling of scrap in an Electric Arc Furnace (EAF).

However, although in the last few decades the circularity through the EAF route and a shift to fully decarbonised electricity and the continued need for virgin steel have increased, as a third selection criteria new Carbon-lean production routes (i.e. hydrogen directed reduction and carbon capture use and/or storage (CCUS) steelmaking processes) are being considered. In this context, the transition to a climate-neutral economy can significantly affect the economic and the employment impacts on regions with important steel companies.

Since the piloting phase required a slightly more continuous exchange between the companies that should exploit the roadmap and the institutions that are developing it, the more logical way to select the pilot regions has been performed by taking also into account the main countries included in the partnership within the ESSA project and already selected in WP4 (i.e. Germany, Italy, Spain, Poland, United Kingdom). However, other countries from northern Europe are important in the steel sector, although they are less represented in the ESSA project. For this reason, also Sweden and Finland have been considered as well as Netherlands.

An additional selection consisted in including some consolidated cooperation, in particular some existing clusters to compare them with the development of new regional training eco-systems. Already identified steel collaboration clusters in this sense are: Siderex Basque Steel Cluster (Basque Country, Spain) and Steel Innovation Cluster/Polo del Acero (Aviles, Spain).

Finally, the training initiative considered by the regional rollout will cover all relevant stakeholders and workers' categories. Therefore, the expected educational level of the audience is expected to encompass both basic and advanced degrees considering linguistic issues as not all employees and regional stakeholders or actors might speak English. Therefore, in the piloting stage of the selected steel regions, ESSA partners ensured the establishment of the selected steel regions with their native language, providing on-site support. This is a further element that leads to preference, in the piloting stage, the selection of the Steel Regions among the countries that are included in the partnership of the ESSA project.

To sum up, the selection criteria can be summarised as follows:

- Relevance of the region for the steel sector;
- Willingness to participate;
- Consideration of both traditional and novel production routes, i.e. the Electric (EAF-based) steelmaking route, the integrated (BF-based) route, as well as the novel Hydrogen-based processes;
- Pilot countries of the VET system selected within the ESSA project (Germany, Italy, Spain, Poland, United Kingdom), consideration of Sweden, Finland, Austria, Belgium, the Netherlands, and Bulgaria;
- Existing consolidated cooperation clusters of the steel sector, to integrate the skills perspective;
- Possibilities of the ESSA partners to move in related steel regions in order to provide direct support and overcome language problems in the piloting stage, by facilitating the discussion with the local stakeholders in the native language.

The selection criteria have been considered in the procedure to achieve the regional pilot implementation. In particular, some pilot regions have been selected by the partners involved, with the support of the national steel association, also to the aim of identifying the most representative companies and the main stakeholders engaged, that will take part in the following steps of the implementation.

5.2.2 Scanning Possible Steel Regions

Against the selection criteria we have analysed and characterised steel countries with more detailed information about the steel regions. This detailed overview is provided to allow not only impressions of the similarities and differences of regions but it could be also used for further rollout activities and new ecosystem establishments.

Germany
Related to Germany's a federal state, consisting of sixteen partly sovereign federated states named Länder, four main steel regions can be identified, as follow:

1. “Western Germany / Rhein-Ruhr Area” (North Rhine-Westphalia);
2. “Southern Germany / Saar Area” (Saarland, Bavaria, Baden-Württemberg);
3. “Northern Germany” (Lower saxony, Bremen, Hamburg);
4. “Eastern Germany” (Thuringia, Saxony, Brandenburg).

The “Western Germany /Rhein-Ruhr Area” (North Rhine-Westphalia) (see Figure 11 above) includes many steel companies (i.e. Thyssenkrupp Steel Europe AG, HKM Hüttenwerke Krupp Mannesmann GmbH, Arcelor Mittal Duisburg GmbH, Benteler Steel / Tube GmbH, BGH Edelstahl Siegen GmbH, Böllinghaus Steel GmbH, Thyssenkrupp Rasselstein GmbH, VDM Metals GmbH, WW-K Warmwalzwerk Königswinter GmbH, Schmolz und Bickenbach Deutschland GmbH, Thyssenkrupp Electrical Steel GmbH, Thyssenkrupp, Hohenlimburg GmbH, R.Kind GmbH, Karl Diederichs KG, Mannstaedt GmbH, Outokumpu Nirosta GmbH, EZM Edelstahlzieherei Mark GmbH, Friedrich Lohmann GmbH, Deutsche, Edelstahlwerke GmbH, DK Recycling und Roheisen GmbH, ERAMET Alloys GmbH, Walzen Irle GmbH, Walzwerke Einsal GmbH,(SMS Group)). In addition, in this region the main training providers/RTO with local scope are identified, such as Niederrheinische IHK Duisburg· Wesel · Kleve (e.g. Verfahrensmechaniker/-in der Hütten-und Halbzeugindustrie, Industriemeister Hüttentechnik). On the other hand, the Trade Unions with the local scope are: IG Metall regional branch, IG Metall NRW, IG Metall Duisburg-Dinslaken.

The “Southern Germany /Saar Area” (Saarland, Bavaria, Baden-Württemberg) includes the following steel companies: AG der Dillinger Hüttenwerke, Stahlwerk Bous GmbH, Rogesa Roheisen Gesellschaft Saar mbH, Saarstahl AG, BSW Stahlwerke GmbH, Max Aicher GmbH. In this region operates IG Metall regional branch, as a Trade Union with a local scope.

The “Northern Germany” (Lower Saxony, Bremen, Hamburg) includes the following steel companies: Arcelor Mittal Bremen GmbH, Arcelor Mittal Hamburg GmbH, Salzgitter AG Stahl und Technologie, Salzgitter Flachstahl GmbH, Peiner Träger GmbH, Ilsenburger Grobblech GmbH and Georgsmarienhütte GmbH. In this region operates IG Metall regional branch, as a Trade Union with a local scope.

The “Eastern Germany” (Thuringia, Saxony, Brandenburg) includes the following steel companies: Arcelor Mittal Eisenhüttenstadt GmbH, B.E.S. Brandenburger Edelstahlwerke GmbH, BGH Freital GmbH, BGH Edelstahl Lugau GmbH, Stahlwerk Thüringen GmbH, Schmiedewerke Gröditz GmbH, H.E.S. Henningsdorfer Edelstahlwerke GmbH and ESF Elbe-Stahlwerke Feralpi GmbH. In this region operates IG Metall regional branch, as a Trade Union with a local scope.

In Germany IG Metall is the trade union with a national scope. In addition, the main training providers that operate at national level are: Stahl-Akademie (VDEH Institut), RWTH University Aachen (Lehrstuhl für Metallurgie von Eisen und Stahl am Institut für Eisenhüttenkunde (IEHK), TU Clausthal (Institut für Metallurgie), Universität Duisburg-Essen - Institut für Metallurgie (Metallurgy and Metal Forming (B.Sc./M. Sc.)) and Institut für Eisenkunde und Stahltechnologien IEST, Freiberg.

On the other hand, the main RTO with a national scope are: Stahlinstitut VDEh, VDEh-Betriebsforschungsinstitut GmbH (BFI), Max-Planck-Institut für Eisenforschung GmbH.

Italy

Concerning Italian steel regions, the situation is manifold. Although most of the steel plants (mainly based on the electric steelmaking route) are located in Northern Italy, in almost all Italian regions there are steel plants. In addition, some companies present in the Northern regions own and manage steelworks located also in central or southern Italy. Furthermore, in northern Italy there is a system including steel producers and users. For instance, the mechanical and automotive sectors in the northern regions (including, for instance, also Emilia Romagna) draw on neighbouring companies for supplies. On the other hand, although some regions do only have one steel company placed, these are big companies with a lot of employees and relevant for the (regional) labour market to a high degree.

The main steel regions in Italy are: Lombardia (38 steel companies), Friuli Venezia Giulia (4), Toscana (2), Emilia Romagna (3), Veneto (7), Umbria (1), Valle D’Aosta (1), Liguria (1), Puglia (1), Piemonte (2), Basilicata (1).

Going into detail, the main steel companies in Lombardia are: Acciaieria Arvedi, Arvedi Tubi Acciaio, Acciaierie Di Calvisano, Acciaitubi, Alfa Acciai, Borusan Mannesmann Vobarno Tubi, Caleotto (Feralpi), Tenaris-Dalmine, Duferdofin – Nucor, Feralpi Siderurgica, Ferriera Alto Milanese, Ferriera Valsabbia, Ferrosider, Fiav L. Mazzacchera, I.T.A., Ilta Inox, Industrie Riunite Odolesi I.R.O., Italfond, Itla Bonaiti, Lamina, Lima Eusider, M.A.B. Metallurgica Alta Brianza, Marcegaglia Carbon Steel, Metallurgica Marcora, O.LA.N. Officina Laminazione Nastri, O.R.I. Martin, Olifer, Redaelli Tecna, Riva Acciaio - Malegno (BS), Riva Acciaio - Cerveno (BS), Riva Acciaio - Sellero (BS), Riva Acciaio - Caronno Pertusella (VA), Rodacciai, S.N.A.R. Laminati, Salzgitter Mannesmann Stainless Tubes Italia, Tecnotubi, Travi e Profilati di Pallanzeno, Ugitech Italia. The main steel companies in Friuli Venezia Giulia are: Acciai

Speciali Zorzetto, Ferriere Nord, JINDAL SAW ITALIA, METINVEST TRAMETAL. The main steel companies present in Veneto are: Acciaierie di Verona (Pittini), Acciaierie Valbruna, Acciaierie Venete, AFV Acciaierie Beltrame, ASFO, Ferriera Valsider, NLMK Verona. In Emilia Romagna are present RUBIERA SPECIAL STEEL, S.I.P.I. and STILMA, while in Piemonte are located PROFILMEC and RIVA ACCIAIO - Lesegno (CN), and in Toscana there are JSW Steel Italy Piombino and Liberty Magona, both located on the coastal area. On the other hand, in some Italian regions, there is only one plant. In particular, in Puglia there is Acciaierie D'Italia (formerly ArcelorMittal Italia - AMI), in Umbria there is Acciai Speciali Terni (AST), while in Valle D'Aosta Cogne Acciai Speciali, in Liguria Fabbrica Italiana Lamiere and in Basilicata SIDERPOTENZA-PITTINI.

Concerning the Italian Training Providers with a local scope, in Friuli Venezia Giulia there are University of Udine and Officina Pittini as well as Danieli Academy (a private training branch of Danieli Officine Meccaniche, which offers training to internal personnel and to personnel belonging to the other private companies that are customers of or correlated to Danieli Officine Meccaniche and Danieli Automation). In Puglia there is Politecnico di Bari, Ordine Ingegneri di Taranto while in Veneto there are Ricovnersider (Federacciai) and University of Padova. In Umbria the main local Training Providers are University of Perugia, ITIS Terni, CFP Terni (Regione Umbria) and IPSIA Terni "S. Pertini". In Lombardia there are Riconversider (Federacciai) and ISFOR- Fondazione AIB, while in Ligura University of Genova, in Piemonte the Politecnico of Torino and FORAZ (Consorzio interaziendale per la formazione professionale) and in Emilia Romagna Riconversider (Federacciai).

Concerning Training Providers with a national scope, some universities (e.g. Scuola Superiore Sant'Anna, University of Pisa, Politecnico of Milano) or research centers (e.g. RINA-CSM, Riconversider, Associazione Italiana di Metallurgia, Consiglio Nazionale delle Ricerche), despite some of them have their headquarters in different areas of Italy (i.e. central Italy), able to provide their training offers throughout Italy.

Among other stakeholders, the main Trade Unions with a national scope are FIOM (CGIL), CGIL, FIM (CISL), CISL, UIL, UILM. However, some of them have an organizational layout not only at national level, but also at regional and provincial level. In particular, each trade union has also a delegation at Steel plant level if its representatives are elected by the employees.

Spain

While the mapping of steel regions in Spain is still in progress there is already a growing collaboration with existing steel clusters of the European Cluster Collaboration Platform: Siderex Basque Steel Cluster and Polo del Acero (Steel Innovation Cluster), presented and discussed already at the ESSA Mid-term conference session "Regional Strategies for Future Skills in the Steel Industry".

SIDEREX is a non-profit Steel Cluster Association of the Basque Country created in 1996. It assembles the key businesses of the value chain in the steel sector of carbon, stainless and alloy steel mills, steel processors to engineering and equipment manufacturers, spare parts, components, raw materials, service companies for steel plants and representatives of the Basque network in Science, Technology, and Innovation. The objective of Siderex is to improve the competitiveness in the steel industry through cooperative actions between businesses and other stakeholders as well as to protect the business interests of associated partners. In this way, it provides a complete portfolio in the areas of Internationalization, Technological Innovation, Business Innovation, Sustainability.

The ROOM4STEEL Classroom (SIDEREX) aims at facing one of the main problems for the sector, such as the lack of specialization of society (students) around the steel industry. On this subject, the driving-force companies in the region, committed to society and with the collaboration with the Basque Country University (Faculty of Engineering of Bilbao), have created in the 2020/21 academic year the ROOM4STEEL Classroom (under the sponsorship of SIDEREX). This classroom is focused on training of students to incorporate them into the job market of companies in the steel sector, by retaining young talents and enhancing and increasing their capabilities, as well as by improving the image of the steel sector among new students.

First discussion with SIDEREX showed a high interest for the complementary ESSA perspective of blue-collar workers, because up to now from a skills perspective it is only focusing on the academic and higher education side. Vice versa, SIDEREX is important for the ESSA rollout in its region, by transferring and disseminating the results of the ESSA project to a large number of industries using multiples information channels, such as Side News, Steel Observatory, scientific journals, social media, website, press releases.

Asturias region has a powerful role in steel-related developments in Spain as well. In Asturias there are several value chains with steel products. The related collaboration cluster **Polo del Acero (Steel Innovation Cluster)** aims at improving competitiveness by facing current challenges, such as twin transition and promoting the skills for the future. This Steel Innovation Cluster includes 19 partners with a turnover close to 5.000 M€ (80% partners cover 80% of the sector) and almost 10,000 direct employment (49% of the sector). Its mission includes: boosting leadership of Steel Innovation Cluster through the technological differentiation of its products and processes; promoting technological collaboration that allows assuming projects with large scope, attracting talent and new companies; promoting innovation and technology development among the cluster members. In addition, the objectives of this cluster include the promotion of training and qualification in all matters related to R&D&I within the Steel Value Chain. For instance, the cluster project CALDIA is a training initiative performed 3 times since 2017 and it involved more than 150 participants from industry. It is open to partners all along the steel value chain, including tailored modules for the promotion of Digital Competences and on solving particular challenges under collaborative schemes. IDONIAL (Asturias Region) is the first Spanish Authorised Training Body. Profiles (i.e. Operator, Designer, Inspector and Supervisor) were created for METAL AM processes in industry and training courses in place. On this subject, STEEL SQUARE is a strategic asset, originated from the strategic partnership between ArcelorMittal and IDONIAL. Steel Square is a unique facility that provides solutions in and for steel.

The ESSA partner ArcelorMittal Spain Holding and ArcelorMittal Poland have regional campuses of ArcelorMittal University in both countries and both campuses are keen to become a key factor in the test and roll out of ESSA project tools.

Poland

Steel industry in Poland is concentrating in the south-eastern area, where most of the steel companies and their training providers are placed. Therefore, ESSA will be integrated in these already existing cooperation structures to stress the skills adjustment proactively and systematically connect the region with the European Steel Skills Alliance and Strategy.

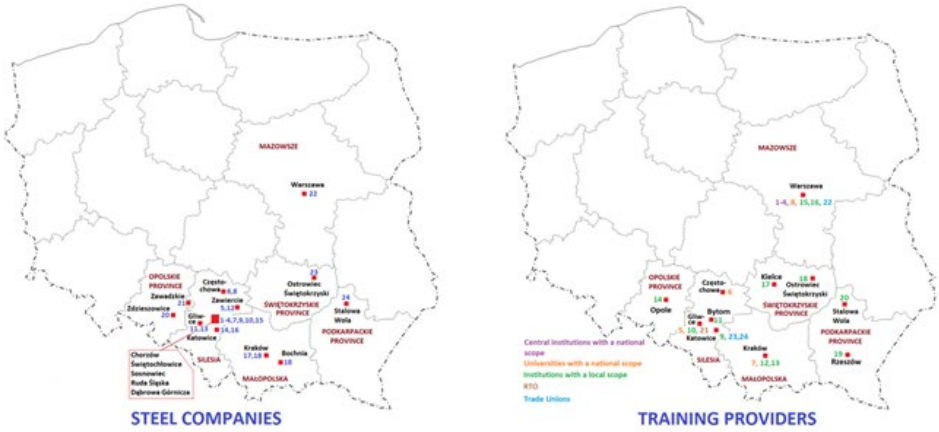


Figure 17:Polish steel companies and training providers

ESSA will concentrate on the Silesia region (Śląskie Province / Voivodeship): The capital city - Katowice, area - 12,333 km^2, population - 4.5 million. The Śląskie Voivodeship is the most industrialized region in Poland and one of the most industrialized areas in Europe. Traditionally, it is a place of hard coal mining and steel mills were built near the coal mines. Silesia is characterized by the largest employment in the country (11.9% of national employment in the national economy), and in terms of the total value of industrial production sold (17.9%), the region ranks second in the country. The economy of the voivodeship is dominated by the following industries: coal (in Silesian mines producing 90% of the sold production of hard coal mining in Poland) and metallurgy, as well as the electromechanical, metal, chemical and food industries. The voivodeship has the largest share in the production of passenger cars and crude steel. There are 16 steel plants in the voivodeship. Total crude steel production capacity in terms of Maximum Possible Production (MPP) in this region is around 8 million tonnes per year, which is near 70% of domestic production capacity.

Companies present in the Silesia region include:

- One steel plant based on BF + BOF route of steel production: ArcelorMittal Poland Oddział w Dąbrowie Górniczej */ ArcelorMittal Poland's Unit in Dąbrowa Górnicza* – Headquarter of ArcelorMittal Poland (AMP), former Huta Katowice.
- 4 steel plants based on EAF route of steel production: CMC Poland; Huta Częstochowa; Walcownia Rur Batory (Alchemia Group); Cognor Oddział Ferrostal Łabędy w Gliwicach */ Cognor Branch Ferrostal Łabędy in Gliwice*
- 11 re-rollers steel plants (including 3 AMP production sites): ArcelorMittal Poland Oddział w Sosnowcu */ ArcelorMittal Poland's Unit in Sosnowiec* – former Huta Cedler; ArcelorMittal Poland Oddział w Świętochłowicach */ ArcelorMittal Poland Świętochłowice Unit* – former Huta Florian; ArcelorMittal Poland Oddział Huta Królewska */ ArcelorMittal Poland's Huta Królewska in Chorzow*; Rurexpol (Alchemia Group); Huta Bankowa (Alchemia Group); Kuźnia Batory (Alchemia Group); Cognor Oddział Ferrostal Łabędy w Zawierciu */ Cognor Branch Ferrostal Łabędy in Zawiercie*; Huta Łabędy; BGH Polska (BGH Group); Huta Pokój (Węglokoks Group); Ferrum.

Quite significant number of stakeholders is engaged in this region in context of VET for steel sector: central institutions (Ministerstwo Edukacji Narodowej (MEN); Departament Strategii, Kwalifikacji I Kształcenia Zawodowego (DSKKZ) / *Ministry of Education and Science; Department of Strategy, Qualifications and Vocational Training (DSKKZ)*, Ośrodek Rozwoju Edukacji (ORE) */ Educational Development Centre (ORE)*, Instytut Badań

Edukacyjnych (IBE) / *Educational Research Institute (IBE)*, Związek Zakładów Doskonalenia Zawodowego (ZZDZ) w Warszawie / *The Union of Vocational Education Centres (ZZDZ) in Warsaw*); Universities with a national scope (Politechnika Śląska w Gliwicach m(PSl) / *The Silesian University of Technology, Gliwice (PSl),* Politechnika Częstochowska w Częstochowie (PCz) / *The Czestochowa University of Technology, Czestochowa (PCz),* Akademia Górniczo-Hutnicza w Krakowie (AGH) / *AGH University of Science and Technology, Krakow (AGH),* Politechnika Warszawska, Warszawa (PW) / *The Warsaw University of Science and Technology, Warsaw (PW)*), RTO with national scope (IMZ), Training providers with a local scope (Zakład Doskonalenia Zawodowego (ZDZ) w Katowicach */ Vocational Education Centre (ZDZ) in Katowice,* Górnośląskie Centrum Edukacyjne (GCE) im. Marii Skłodowskiej - Curie w Gliwicach / *Maria Skłodowska-Curie Upper Silesian Educational Centre (GCE) in Gliwice,* Centrum Kształcenia Ustawicznego (CKU) w Bytomiu */ Continuing Education Center (CKU) in Bytom*), Trade Unions with a national scope (Federacja Związków Zawodowych Metalowców i Hutników w Polsce (FZZMiH), Warszawa / *Federation of Trade Unions of Metalworkers and Metallurgists in Poland (FZZMiH), Warsaw,* Krajowa Sekcja Hutnictwa NSZZ "Solidarność" Katowice / *National Metallurgy Section of NSZZ "Solidarność" Katowice*) and Trade Unions with a local scope (Zarząd Regionu Śląsko-Dąbrowskiego NSZZ Solidarność Katowice Regionalna Sekcja Hutnictwa NSZZ Solidarność / *The Board of the Śląsko-Dąbrowski Region of NSZZ Solidarność Katowice Regional Steel Section of NSZZ Solidarność*).

Belgium

Belgium is a federal State divided in 3 regions: Flanders, Wallonia and Brussels. There is also a division based on the languages. They are referred to as “communities”. However, this word is not adapted to its constitutional signification: Flemish Community, “French” (meaning French speaking) Community and the German-speaking Community. Brussels is a particular situation, being the capital of the country as well as the fundamental administrative centre for the European Union.

Regions have mostly economical competences but communities have the competence of scholar education (primary, secondary and high schools).

Concerning companies, the division of companies between regions is not relevant unless about energy prices. It can be rather spoken in terms of Groups:

- Arcelor Mittal: Gent + Liège & Industeel (AMDS branch)
- APERAM Genk + Châtelet
- NLMK La Louvière + Clabecq
- Liberty Steel (LLD)
- RIVA - Thy-Marcinelle
- TATA Steel – Segal

In addition, there are 2 Research Centers: OnderzoeksCentrum voor de Aanwending van Staal (OCAS) and Centre de Recherches Métallurgiques (CRM)

Training Providers with a national/regional scope are not present in Belgium, as the sector did not set up ‘steel academy’ of specific steel training institutes. However, there is a promoting association on steel called INFOSTEEL, which focuses on the use of steel in the construction in Belgium and Luxemburg. Therefore, INFOSTEEL organises classes and a training set, but its goal is to promote steel among all players (engineering bureaus, architects, etc.) involved in construction.

Concerning Trade Unions with a national scope, they can be divided in 3 families, divided themselves into Flemish and French-speaking branches and blue/white collars:

- Christian: ACV/CSC METEA (blue collar) + LBC/CNE (white collars):
- Socialist: ABVV METAAL + MWB (blue collar) + SETCa/BBTK (white collars)
- Liberal (CGSLB)

In addition, leading personnel have their own trade union: CNC/NCK. It is important to remind that Trade Unions do not have juridical personality in Belgium. Concerning Trade Unions with a local scope, in Belgium all Trade-Unions have a hierarchical structure including regional or local branches, but they do not have 'own' existence, not differentiated from their 'national' structure.

Bulgaria

In Bulgaria the main Steel Regions are Pernik, Burgas, Ruse, Montana. They include the main companies, such as Stomana Industry SA (Pernik), Promet Steel JSC (Burgas), EMC Distribution Ltd (Ruse), Berg Montana Fittings EAD (Montana). In the listed regions are present Training Providers with a local scope. In particular: Technology Vocational High School "Marie Curie", in Pernik; Technology Vocational High School "N.Vaptsarov", in Radomir; Vocational High School, in Burgas; Vocational High School on Mechanical Engineering, in Ruse. In addition, in Bulgaria as Training Providers with a national scope there are: University of Chemical Technology and Metallurgy, Technical University – Sofia, and the "Angel Kanchev" University of Ruse.

The main Trade Unions with a national scope in Bulgaria are the Trade Union Metalicy and the National Federation Metallurgy. On the other hand, concerning the Trade Unions with a local scope, in Pernik there are Trade Union Metalicy, National Federation Metallurgy, National Trade Union Zashtita, while in Burgas there are Trade Union Metalicy and National Federation Metallurgy.

Austria

In Austria, there are three main steel regions, such as:

1. Linz: this is the city, where Voestalpine group is headquartered, and also where its main division (Steel Division) is located.
2. Mur Mürz Area (within federal state of Styria): this is the area, where historically the iron and steel industry developed.
3. Graz: this is not the main steel area, but the city where Stahl- und Walzwerk Marienhütte Gesellschaft m.b.H is located.

Concerning companies, in Linz voestalpine AG (holding company) and voestalpine Stahl GmbH (as well as other companies of the voestalpine steel devision) are present. On the other hand, in the Mur Mürz Area there are the following companies: voestalpine BÖHLER Edelstahl GmbH & Co KG, and other companies of the voestalpine High Performance Metals Division; voestalpine Metal Engineering GmbH and other companies of the voestalpine High Performance Division; Stahl Judenburg GmbH; Breitenfeld Edelstahl AG. Finally, Graz includes Stahl- und Walzwerk Marienhütte Gesellschaft m.b.H.

In Austria, Training Providers with a national scope include Universities mainly focused on technology (i.e. Montanuniversität Leoben, FH Joanneum Kapfenberg, Johannes Keppler Universität Linz, K1 MET – Metallurgical Competence Centre in Linz (reseach centre), FH Oberösterreich – University of Applied Sciences Upper Austria, with technology focus in Wels, Technische Universität Vienna, Technische Universität Graz, FH Technikum Vienna). In

addition, there are some public schools like: high technical schools, of which some have a special focus on steel/metals (like the one in Leoben); vocational schools, if a relevant technical apprenticeship is chosen.

Concerning the Training Providers with a local scope, in Linz there is Voestalpine Ausbildungszentrum Linz, Duale Akademie – a special training with different training priorities, including one in metal technology, offered by Economic Chamber in Upper Austria. On the other hand, in Mur-Mürz-Area there is voestalpine Ausbildungszentrum Kapfenberg.

Concerning Trade Unions, the main Trade Unions with a national scope are: Pro-GE and gpa-djp.

5.3 National-regional Rollout

However, the described preliminary selection had to be modified during the implementation phase because of practical reasons. European – national/regional connection nodes had to be found in order to sustainably stimulate and coordinate the national-regional rollout activities. As no Bulgarian and Austrian organisations are part of our consortium we decided to look for other willing ESSA partners to start and coordinate the establishment of national-regional training ecosystems. Finally, against the background of the rollout concept, the steel regions analysis and the defined selection criteria, nine representative steel regions were selected for a first rollout to the member states and steel regions (see also Figure 13). The planned focus on the solely regional perspective was replaced by a combined national-regional approach, due to the recommendation of the national stakeholders to start in some countries with an integration of the main national stakeholders (from educational authorities, employment and economic agencies, unions). As listed below (see also Figure 18) we started with rollout processes on the

- national level in Finland (because there is no specific conglomerated steel region)
- national-regional level in Czech Republic, Germany and Spain (combining national and regional perspectives)
- regional level in UK (Wales), Italy, Poland, Romania, and the Netherlands (concentrated steel regions).

With national-regional workshops and round tables we rolled out the European results, tools and measures of ESSA within the following steps:

1. Developing a common Framework for the National-Regional Workshops
2. Conducting a first round of workshop in the pilot regions (autumn 2021): Information, verification of interest, willingness to participate of stakeholder groups in the dedicated region (companies, trade unions, training institutions, research institutes, public employment and education institutions, and civil society)
3. Review of experiences, development and events and integration in the ESSA structures, tools and measures (beginning of 2022)
4. Conduction of further in-depth workshops with specific topics that were raised in the pilots (round 2 and 3), supporting the further activities within a social innovation process (spring - summer 2022)
5. After focusing on the eight pilot regions an integration of other regions is foreseen (spring 2022), conducting first workshops in the new regions (summer 2022)

6. Setting up of a European-national-regional European Community of Practice for supporting National-Regional Training Ecosystems, exchanging good practice and mutually learning from each other (from 2022 on).

Finally, we set up skills and training related ecosystems in nine countries or regions. In the end all the ecosystem developments were different depending on the composition of the actors, the defined priorities and processes, and the specific regional demands. All in all, with these rollout activities we integrated more than 100 additional stakeholders in our Skills Alliance: companies, public authorities, associations, unions, research institutions, universities, vocational schools, training providers and others.

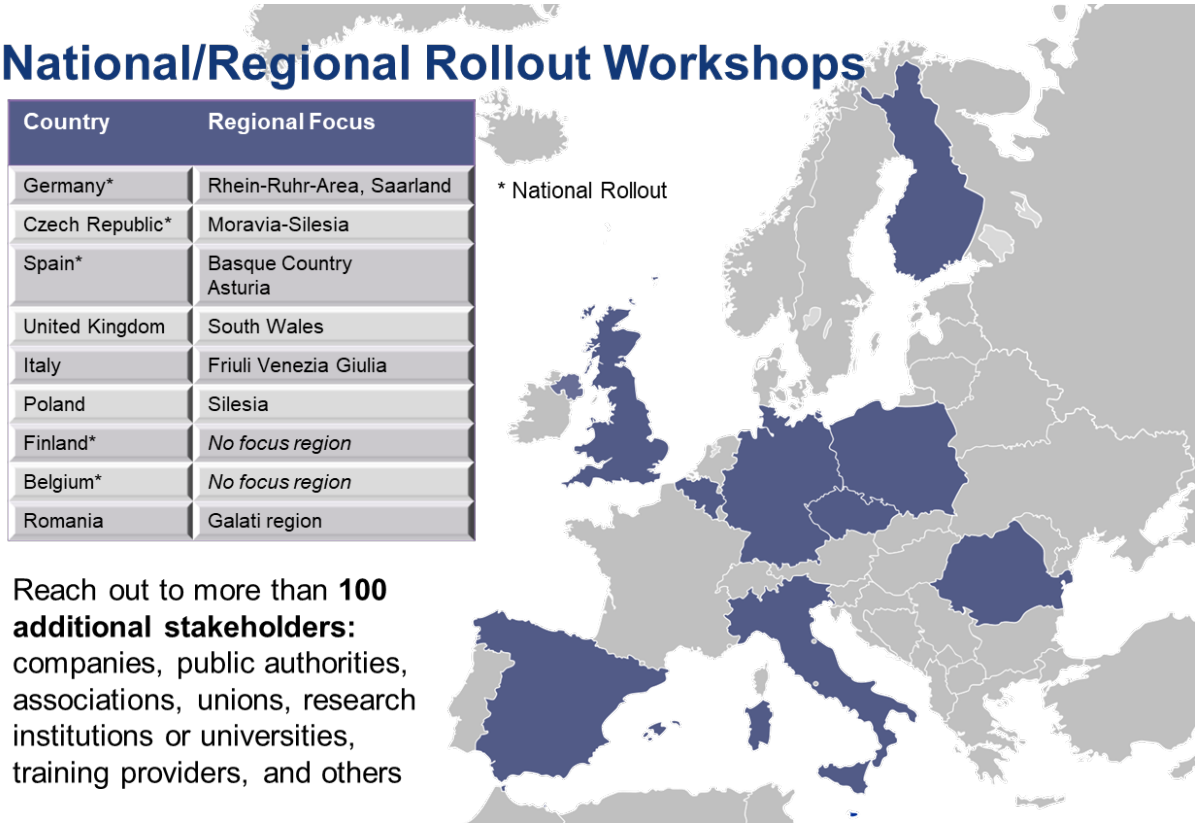


Figure 18: Pilot Rollout Countries and Regions

5.3.1 Common results of the National/Regional Rollout Workshops

The rollout workshops within ESSA's National-Regional Training Eco-System (ESSA RTS) took place in eight countries: Germany (national rollout with focus on Rhein-Ruhr-Area as well as a rollout workshop in the Saarland region), Czech Republic (national rollout with focus on Moravia-Silesia), Spain (national rollout with focus on Siderex (Basque Country) and Polo del Acero (Asturia)), United Kingdom (South Wales region), Italy (Friuli Venezia Giulia region), Poland (Silesia region, but also on the national basis), Belgium (National rollout) and Romania (with a focus on the Galati region). In the following, the most important common topics that were discussed in all rollout workshops and are considered as huge challenges for the European steel industry as a whole will be presented:

The **poor image of the steel industry** as a declining industry, polluting the environment and offering arduous manual labour causes low participation of young people in technical schools and is seen as one of the causes for recruitment problems. One suggested solution approach in this regard is to rebuild the positive image of the steel industry in the minds of the public and

decision-makers, which is progressing, but very slowly. There is the need for coordinated ‘campaigns’ to change the image and develop and disseminate a new narrative, highlighting the steel industry's sustainability and transformation efforts while looking at the steel industry as a solution for climate change, attracting and asking (young) talents to take part in the transformation. Creating new channels of access to this sector (e.g. through greater use of social media) and showing more presence in schools and universities is also a needed measure in order to show the "new steel industry 4.0" changing the view of the general society (e.g. stable employment, good labour conditions, etc.).

As the steel sector is a male-dominated industry, initiatives for more **involvement of women** are already carried on (such as the ‘WomenOfSteel’ podcast to attract female engineers, see Figure 19). Attracting female talent can be done by developing a communication strategy to involve current women to encourage other woman to work on steel, by more incentive for their involvement, by valorising the female perspective, and by promoting the application of Industry 4.0 technologies that can help in gender equality.

Figure 19: Women of Steel Campaign
https://www.youtube.com/watch?v=OlyC6IKWTRQ

A still outdated corporate culture of the steel companies with partly outdated hierarchical structures and **unattractive job profiles for young people** was also highlighted. The proposed solutions stressed more efforts to attract young applicants related to their demands for work (low hierarchies, new leadership, work-life balance, etc.) and the adaptation of job profiles against the background of the digital and green transformation (industrial symbiosis, decarbonisation, circular economy).

To overcome the **shortage of skilled students** due to the low interest of young people in the steel industry and in Vocational Education and Training in general (academisation) as well as to the lack of proper career guidance, the following measures were outlined in the rollout workshops: On the one hand, promoting the attractiveness of working in the steel industry and career opportunities plays a major role. Regular cooperation between companies, training administration and vocational training system was also highlighted by the workshop participants. At the same time, new job profiles related to green and digital technologies need

to be developed, while old job profiles need to be modernised against the background of transformations. Promoting STEM-related courses of study, increasing the number of targeted internships in companies and hours dedicated to alternating school and work were also mentioned as important measures. Another goal is to improve the knowledge of parents and families about the attractiveness of the steel sector as an interesting and future-oriented workplace. The integration of underrepresented and disadvantaged target groups (women, refugees, migrants and others) can also be an effective way for the steel sector to get new applicants.

The **disconnection between formal training and companies' requirements** was underlined by the lack of communication between steel companies and vocational education and the lack of vocational teachers. In particular, it is important not looking at a change of the VET system, rather than improving it by networking among training institutions and academies of companies (e.g. in Italy) and thereby creating closer interactions between companies and VET schools. However, companies might need to retrain apprentices onsite after college training, especially for manual and practical skills. Consulting could also be part of the solution by asking workers about their needs and concerns. Nevertheless, workers participation in lifelong learning in companies have to be stimulated in general - not only by and in the companies but with the support of social partners and policy.

In almost all countries, the **poor relationship among companies, universities and public administration** and the need for public support was underlined and. For instance, there is a lack of cooperation between the steel industry and the education authorities with regard to updating curricula (in centralised VET system), while in decentralised VET systems there is a lack in general catalogues concerning technical skills useful for the steel industry. Some common suggested solutions are:

- Fighting the stereotype that vocational schools are attended by weaker students
- A more flexible training system, including programs, initiative, public funding according to company's needs, without enormous bureaucratic barriers
- More interaction with policymakers
- Revision of the standard professional profiles at the regional level (e.g. in Italy)
- Putting new contents into existing profiles by policymakers
- Having the support from Educational Public Administration (VET/Higher Education) and to carry it out on the national rollout (e.g. Spain).
- Stronger government support to vocational training activities, technological education (e.g. in Czech Republic).

In addition to many commonalities, the rollout workshops also highlight major differences - not only between different states, but also within states, between individual regions as well as between individual companies. For example, emigration is seen as a major challenge in some countries, while other countries benefit from immigration and thus gain new potential workers. At the same time, there are major differences within countries with regard to the challenges in rural regions compared to metropolitan regions. Labour shortages are particularly pronounced in rural regions, also because potential applicants and workers often emigrate to metropolitan regions. It is also evident that the challenges of small and medium-sized enterprises are very different from those of large corporations. Therefore, targeted measures for SMEs are also necessary.

Against the backdrop of these challenges, support and **help of ESSA and the usage of its steelHub** was highly appreciated. It was underlined that ESSA is a very good initiative to

engage all the relevant stakeholders and to offer a platform to rethink the way education and training are intertwined with current economic and technological developments. Connecting ESSA with regular national-regional workshops or meetings to exchange the necessities of training and to forward a competitive training to steel industry is needed. Within ESSA, the Online Training Ecosystem steelHub tool is an important part of the learning process in educating professionals for the steel sector. Further information about opportunities to use steelHub online training services is needed, and how to involve the national-regional steel industry and VET actors and existing (e.g. in Spain) and forthcoming regional steel training ecosystems.

5.3.2 Results of National/Regional Rollout Workshops for each country

In this chapter, the central results of the rollout workshops in the respective countries are presented. The focus is on the general description of issues in the countries, the question of which stakeholder groups contributed and which challenges and approaches to solutions were discussed in the course of the workshops. After the general topics were presented in chapter before, the individual national and regional contexts will be presented below. Even though there are many overlaps with regard to the prioritised challenges in the individual countries and regions, the topics are differently handled, showing different priorities and approaches for solutions. Starting with the Tata Steel Ijmuiden in the Netherlands as a kind of reference model for an already successful regional Ecosystem, the results of the workshops in Germany, Czech Republic, Spain, Wales, Italy, Poland, Finland, Belgium, and Romania will be summarised.

Most of the big steel companies do have strong relationships with the regions they are placed in. Corporate Social Responsibility activities (a) show the responsible corporate conduct towards environment, employees and other stakeholders going beyond legal requirements; (b) lead to new business strategies, cross-sector cooperation, stakeholder integration and interaction; and (c) are the starting point for new problem solutions and approaches - within the company and in the local, regional environment. Against this backdrop the regional cooperation within a Regional Training Eco-System of all the willing stakeholders from different sectors (industry, policy, education and research, and civil society) will raise a win-win-situation improving regional development. To illustrate how this networking could look like from the industry perspective, the Tata Steel Eco-system experience is described in the following as a kind of a reference model.

The Netherlands (Regional Training Ecosystem Tata Steel Ijmuiden as reference model)
Dutch national, regional and local policies have been stimulating the enhancement of strong regional ecosystems. In particular, national policies subsidized the creation of regional public private partnership in Centers of Expertise (with Universities of applied science) and Centers of Innovative Craftsmanship (with VET providers) to create together with companies and knowledge institutes strong centers for education and innovation around a certain sector in the region[5]. In addition, the Dutch national government developed more “focused based” economic policy. Specific sectors were selected based on being the most innovative for the country but also the most competitive on the world market. Nine “Top sectors” were defined and, as these sectors are mostly regionally based, national policy focused on the enhancement R&D and innovation, with also a special emphasis on the role of the regional ecosystem and focused on more partnerships between education, businesses, knowledge institutions and local and regional governments. Concerning the steel sector in the Netherlands, in the region of Tata

[5] Source: https://wea-rekatapult.eu/

Steel **IJmuiden** a strong regional ecosystem has been developed. In particular, Techport is a regional public-private partnership, a regional network with more than 60 schools, companies and governments. It includes also Tata Steel Academy, which aims at achieving international competitiveness of the regional manufacturing and maintenance industry, well-trained technical staff and a culture of open innovation. The case study at Tata Steel shows that it is crucial having new talents available on the regional labour market, due to the aging and mobility of workforce. In addition, it is fundamental that the current and new workforce are capable of delivering the transitions that the steel sector is facing, for instance the developments in Smart Maintenance and the Energy Transition. In this process, Tata Steel needs to be supported by regional schools, other regional companies and regional and local government. And the partnership mainly focuses on four action lines, such as technology promotion (especially among young people), attractive technology education, attractive jobs in technology and innovation.

TATA Steel Academy is comprising its own company school, a training centre, a material handling centre and an Advanced Analytics Academy. Every year around 170 apprentices enrol in a vocational training programme leading to a formal certificate (EQF level 3 or 4) recognized by the Dutch government. Furthermore, also employees enrol – while already working for the company – in vocational programmes at EQF level 4 and 6 (and in the near future also 5). The vocational programmes are offered in a close partnership with a VET provider (Nova College) and several universities of applied science in the region. Training is now also provided in cooperation with the same VET provider in the region, Nova College. This is in line with the overall model in The Netherlands, which foresees a close collaboration between VET providers and businesses. At Tata Steel, students spend 80% of their time in the company and one day a week learning at Nova College and obtain a certificate which is recognised by the government. In the training centre and at the material handling centre, 6,000-7,000 training courses (e.g. safety training, technical training, operational excellence, material handling) are provided every year to Tata Steel's employees, but also to businesses from the region. Additionally, Tata Steel focuses on enhancing interest in technical disciplines, especially for girls and young women. For instance, this is done during the Girls' Days, on which girls get to discover careers in technical industries and meet role models that prove they can have interesting careers in these industries.

Additionally, Tata Steel Academy partakes in Techport, a regional public-private partnership, the goal of which is to achieve future international competitiveness of the regional manufacturing and maintenance industry, well-trained technical staff and a culture of open innovation. The partnership focuses on four action lines, namely: technology promotion (especially among young people), attractive technology education, attractive jobs in technology (that is, how to recruit and retain new talents) and innovation. Examples of actions undertaken by Tata Steel Academy as part of the partnership are usage of 3D printers, advanced analytics, virtual reality, classes in science and technology for pupils from primary schools. Two projects that deserve particular attention are the Fieldlab Smart Maintenance and the Hyperloop. The former was started together with various partners from the industry, but also education providers (both VET providers and universities) to enhance the curriculum in Smart Maintenance offered by Tata Steel Academy and to train employees from all companies through a test setup of a water pump installation. Tests are based on real-life situations fed back by steel plants. The Hyperloop is a project meant to create a clean alternative for short haul flights, in which smart autonomous vehicles move through a network of safe tubes made out of steel. Tata Steel Academy uses this project to combine R&D with education. Students

from the Academy and from universities and researchers work together to design, produce and test prototypes of the tubes.

Field Lab Smart Maintenance is an example of a project with different partners: *Tata Steel, ROC Nova College, Vrije Universiteit Amsterdam, Amsterdam Center of Data Analytics, SKF, Bosma & Bronkhorst, Semiotic Labs, IJssel Technologie, SKF Group, Inertia, Facta.* The Field lab comprising a part of the curriculum for the VET school, short workshops/trainings for employees from all the partners, and it is part of the development for an Associate Degree (level 5 EQF) Smart Maintenance. The Field Lab is a test setup of a waterpump installation, where students and employees can test and practice how to innovate our maintenance strategies by using sensors and algorithms. Tata Steel factories deliver the input for real situation cases and issues to be tested and experienced in this fieldlab.

Why working together in a regional ecosystem?
For Tata Steel it is very important to have an adequate amount of new talents available on the regional labour market to work at the company due to the aging and mobility of the workforce. However, besides quantity, it is also very important that the current and new workforce are capable of delivering the transitions that our company and the steel sector in general is facing, for instance the developments in Smart Maintenance and the Energy Transition. To stay competitive shortages, well-educated human capital has to be provided and the skills of the workforce have to be improved to keep innovating. Therefore, Tata Steel invests in current and future human capital; in skills, in ability to adapt to new ways of working and to deliver improvements and innovations by the workforce, working together with others. This is something Tata Steel cannot do alone and they need the region: schools, other regional companies and support of (regional and local) government. Successful partnership in the region was created to strengthen and develop a regional ecosystem:

- Educational providers: They deliver expertise in education and help with educational programs of good quality and – where needed – also formalization (recognition by government and on labour market). Secondly, they are important for attracting new talent to the sector and interest them in technology. Schools are a very good place to reach new potential and interest them. Also, educational providers can help businesses with translating innovation and new technologies into what an employee or student needs to know or do differently and help prepare them for the future.
- Businesses, small and large, in the region are part of the production and supply chain. First of all, also the business (and their employees) in the region need to be able to adapt fast to new innovations and not follow behind, as they are also part of the value chain and therefore important for competitiveness and future prospects. Furthermore, labour markets in the Dutch country are mainly regional. Therefore, it is necessary to attract and retain talents in the region together. Thirdly, in collaboration between companies innovation and mutual learning can flourish. And lastly, a large company as Tata Steel has the scale to really test prototypes and new innovative ideas. One of the challenges start-ups face is to be able to scale up their idea. In the partnership of Techport Tata Steel is able to bring fully test prototypes of small businesses in the region on a larger scale.
- Governments are also fully involved in the regional partnership as they are important for agenda setting, putting a strong and viable labour market and well-trained human capital on the political and economic agenda. Secondly, governments can give a boost to the scope and size of the network and can stimulate potential partners to join. And lastly, governments can help with “injection” subsidies to enable regions to start a

partnership and to develop activities, after development being carried on by the partners themselves.

The partnership focuses mainly on four action lines (**promote, learn, work, innovate**) namely:

1. Technology promotion (especially among young people): many children loose interest in technology after a certain age. In different events and activities (challenges, career events, assignments) business show how careers in technology look like and let them experience it as well. An important specific target group are girls as they are under-represented in technological education programs and careers. There are special events and programs to also reach this big potential group.
2. Attractive technology education: make sure that with by working together closely as education providers and business, curricula stay up to date and entail enriched context of technology and innovation.
3. Attractive jobs in technology is about recruitment (traineeships for instance) and how we are able to retain talents in our region by lifelong learning and development programs and possibilities for mobility between companies in the region and keep upskilling our workforce in the region.
4. Innovation: TATA Steel works together in Techport with different partners on different activities. For starters they bring in use cases from the companies involved around smart maintenance. Then prototypes are tested and business cases for it them are elaborated. Furthermore, they test new technologies in field-labs, not only for learning more about the technology itself but also to get more insight in the skills gaps of employees or students have concerning this new technology.

A couple of **lessons learned** about working together closely are:

- A clear agenda helps: it gives all partners a clear idea and scope of the partnership.
- Bring in content: a partnership/working together is not a goal but a means to a goal.
- Government support can boost and strengthen partnerships and collaboration in the region.
- Try to build a structural network, with explicit commitment (for instance in kind contributions of companies)
- To get companies to join and/or to really get involved in projects; build a business case. If you can show what a business will miss out on or what it can deliver in money and time, businesses are willing to invest.
- Do not over-ask smaller businesses: They are important for your region (human capital, innovation etc) but do not always have the time (or money) to be a big contributor. Nevertheless, it is very important that they stay connected and can join trainings and activities.

Germany

A total of **three workshops** were held in Germany. In the individual workshops, different stakeholder groups were integrated – steel companies and steel processing SMEs, public authorities, research organisations, associations and unions, as well as training providers and VET schools. With the integration of these different stakeholders, a first important objective of the rollout was achieved, as the workshops served as a platform for exchange of actors at both national and regional level, while networks were created and strengthened.

The **first workshop had a national scope** and focused on the topic of image and talent attraction, which is of high significance for the entire German steel sector. Different national

stakeholders were invited to the workshop, where general challenges were discussed and, in the next step, possible solution approaches were explored in order to deal with image problems and the attraction of skilled workers. In the **second and third workshop**, two regions including their specific challenges were examined in more detail: While the second workshop focused on steel in the **Rhine/Ruhr region** in North Rhine-Westphalia, the third workshop dealt with the **Saarland region** and its steel ecosystem. In the workshops, and especially in the third workshop, not only changes in large steel groups were considered, but also the situation in other parts of the value chain, for example in steel processors and automotive industry suppliers. However, references to national challenges and approaches were also made in both workshops, as well as connections to other regions, especially with regard to similarities and differences between the two regions Rhine/Ruhr and Saarland themselves. All three workshops took place online, also due to easier possibilities in involving stakeholders from different regions of the country. In terms of content, the evaluation of the results of all three workshops revealed the following focal points, challenges, needs and solution approaches:

For the German steel industry as a whole, the green and digital transformation offer great opportunities to **change the image of the steel sector and develop a new narrative**. Digitalisation and decarbonisation also go hand in hand with new and modernised job profiles. Fittingly, younger applicants in particular have high expectations on sustainability and work-life balance, while financial aspects no longer seem to be as prominent as they used to be. Especially in academic occupation fields, bottlenecks and difficulties in recruitment are expected. The demand for skilled workers is thereby particularly high in the IT sector. Accordingly, the steel sector in Germany and Europe must work to better meet the needs of young skilled applicants.

From a technological point of view, the path seems to be clearly marked out, with the replacement of coal through **hydrogen** being of central importance in the German steel sector. With regard to education and training, however, the transformation towards hydrogen is not yet clearly mapped in Germany. In this context, it is evident that nationwide training framework programmes do not yet take hydrogen technology into account and the topic is not yet systematically addressed at national level. Accordingly, there is an urgency to adapt training frameworks, to include hydrogen in curricula and update education literature. Nevertheless, companies, chambers, employment agencies, business development agencies and vocational schools are already following qualification approaches to prepare employees for the hydrogen transformation. A lot of these approaches are developed in a bottom-up approach, where further training is mainly driven by the needs of companies. Thereby, the topic of hydrogen is considered in internal company training measures (e.g. thyssenkrupp Europe Steel; Dillinger) and at vocational schools and chambers, mostly at regional level. Regional approaches by companies, chambers and vocational schools that have already been successfully implemented (e.g. by tkse; IHK Nord Westfalen; Westfälische Hochschule & h2netzwerk; and others) were presented during the workshops. Again, the presented approaches show the importance of cooperation between different stakeholders and in order to provide qualification at all skill and qualification levels and to promote lifelong learning. In this context, the workshops show that the steel sector is working very actively with its cooperation partners to increase the acceptance of transformation topics and further education. In terms of the green and digital transformation in general, workshop participants also highlight that exchange and cooperation between different sectors is also useful; for example, experiences from the chemical sector and the refinery sector (and vice versa) should also be shared.

The importance of transversal skills for employees in the course of the green and digital transformation was particularly emphasised, especially in the third workshop of the rollout. For

example, personal skills are required from employees, such as: Openness, willingness to change, motivation - and thus being basic prerequisites for the readiness for lifelong learning. Social skills are also becoming more important in the course of the digital and green transformation, e.g. in the form of communication and teamwork skills. At the same time, digital skills are now required at all jobs and qualification levels. Likewise, basic methodological skills are important: In this context, the workshop participants report that, especially among young applicants, deficits in numeracy and literacy are increasingly perceived as a hurdle to the acquisition of other (e.g. digital) skills.

Czech Republic

The rollout in the Czech Republic was coordinated by OS Kovo. In total, **two online workshops were held** where different stakeholder groups were represented and engaged in discussions and agreements, including different steel companies, training institutes, associations and trade unions as well as labour market actors.

The **first workshop** was mainly used to present the ESSA project and to have broad discussions on the situation regarding skills, image and talent attraction in the Czech Republic. Thereby, the following main challenges were identified: In order to be able to attract skilled applicants to the industry, the steel sector has to be made more attractive for young people – especially against the background of an aging workforce. Above that, more involvement of the national and regional government is needed with regard to the implementation of new technologies in steel industry, but also in terms of training and retraining of workers. One of the main issues for the steel sector in the Czech Republic is a lack of support of the government with regard to VET activities and technological education, which has been going on for decades. This in turn also results in limited personal resources.

The **second workshop** focused on skills and jobs in the steel industry of the future. In this workshop, besides the progress of the ESSA project, the steelHub as the ESSA Online Training Eco-System was presented.

Central discussion results were the following: There is a long-term problem in the Czech steel industry with competitiveness against third country producers, high energy costs and compliance with European regulations. At the same time, the Czech Republic has a very low unemployment rate and a high turnover of employees in companies. Aside from that and as in other European countries, there is a lack of interest among pupils in craft professions, which in turn are needed in the steel industry. Despite numerous recruitment events, according to the impression of the workshop participants, many parents do not recommend employment in the crafts to their children.

In general, the participants of the workshops reported a great pressure that comes along with the transformations of the steel industry; whereby one of the main challenges is to master the green transformation and still remain competitive. According to the stakeholders, this also has a negative impact on the interest of students in an education in the steel sector. From a technological point of view, decarbonisation through the switch to hybrid furnaces and the use of electric arc furnaces (EAF) were the main topics discussed. Especially in the context of EAF, the main challenges to be addressed are energy load and a lack of quality scrap. Digitalisation on the other hand is seen as necessary and helpful for reasons of cost reduction and to compensate for the lack of skilled labour, but it also goes hand in hand with new demands on the employees.

Participants of ESSA workshops in the Czech Republic expressed the will to cooperate in the future based on the results of the ESSA project, depending on the national circumstances.

ESSA's results and the approach of the project could be an inspiration for the implementation of TRAUTOM Project (which was discussed in-depth during the two workshops) and for any future projects regarding the skill perspective implemented in different sectors (not only steel).

Spain

A total of **three workshops** were held in Spain to explore the current situation in the Spanish steel sector, including challenges and best practice examples with regard to the skills perspective. In the Spanish workshops all important stakeholder groups were involved: companies, associations and trade unions, training providers and training institutes, public authorities as well as universities and research institutions. The main outcomes of the workshops can be summarised as follows:

The negative **image of the industry** and related challenges are an important issue in the Spanish steel sector. Against this background, the development of a new narrative highlighting the steel industry's efforts towards sustainability and change is of key importance, also in terms of talent attraction. To this end, different approaches to presenting the "new steel industry 4.0" were discussed and presented in the workshops. The regular and continuous cooperation between companies, public administration and providers through workshops and meetings is particularly important. The development of a communication strategy involving working women in the steel sector is also key, e.g. in the form of promoting initiatives such as **#MujeresDeAcero (#Women of Steel)**, a classic initiative in the steel industry in Spain since 2015. Attracting young people from vocational training and universities through plant visits in steel companies is one of the approaches, as is the promotion of lectures and conferences about steel companies in universities and vocational school education centres. ESSA is perceived as a very good initiative to involve all stakeholders in this context. Especially the steelHub was of great interest to the participants, especially in its function of communication platform to involve all ecosystems.

The **third workshop** was mainly dedicated to companies. It focused on the ESSA categorisation of competences, competence assessment and the steelHub. Thus, the focus was mainly on the concrete applicability of the ESSA tools, also against the background of the image of the sector and the attractiveness for young talents. All in all, the rollout in Spain was very successful - so that even beyond the project duration, there is a demand among the stakeholders to continue the rollout with regard to the skills perspective and to further exploit the ESSA tools.

United Kingdom (Wales)

In the United Kingdom, **three workshops have taken place so far**, while a fourth workshop is already in planning. Not only stakeholders from companies, associations and trade unions, research organisations, training providers and universities, but also representatives of civil society were involved. The focus was on the **steel region of South Wales** - whereby Cardiff University worked closely with the South Wales Industrial Cluster in conducting the workshops.

As an outcome, the **workshops resulted in clear recommendations**: For industry in the South Wales region, it is thereby recommended that an independent audit is conducted on skills needs to meet decarbonisation goals. To be able to meet the ever-changing skills landscape a continuation of the skills needs assessments between now and 2050 is recommend, with a dedicated role developed within government to facilitate delivery of the skills needs. Above that, long term funding and sharing of knowledge and resources are needed: There must be a long-term investment plan involving the central UK Government and the Welsh Government to tackle skills and training needs. The skills landscape for industry also needs mapping further, to fully understand the current system and how it addresses the

needs of industry more generally, and the ‘green skill’ and decarbonisation challenges specifically.

Another concrete recommendation revolves around the formation of a skills hub, or hubs, to focus on the provisioning of these skills as a one-stop-shop for providing, and signposting to, courses and providers that can deliver skills quickly. In order to build collaboration between stakeholders to address the decarbonisation skills challenge, it is recommended that a framework for collaboration is developed involving representatives of all key stakeholders. The workshops also showed that there is a need for greater policy coordination, particularly between different government departments (Education and Skills, Economy, Climate Change).

Italy

In Italy**, three rollout workshops were organised**. The focus was on the Friuli Venezia Giulia region. All the important stakeholder groups were integrated, including companies, training providers, associations, research institutions and public authorities. Thereby, the following results were obtained in the workshops:

In Italy, the topics of image and recruitment, staff demand and supply, and vocational training were discussed and ranked as the most important regional needs and challenges. The discussion here shows that technological specialisation schools (ITS = Istituto Tecnico Superiore) have greater flexibility in creating curricula. The focus is on trying to stick to national job profiles and updating profiles every year according to new technologies. However, there are also difficulties within the regional qualification systems to follow the technological development and the qualification needs of companies. This requires a stronger commitment from policy makers to support this process. According to the workshop participants, Italian regions thereby do not have the same autonomy compared to Northern European regions. The discussion also shows that companies (not large multinationals) in the Friuli Venezia Giulia region have close relations with other regions. This constitutes a rich network that can be used by other (also foreign) companies with the same characteristics.

The workshops also identified challenges and skills requirements related to digitalisation, decarbonisation and the shift to "green steel": It became clear that there is a lack of interest among young students in the steel sector and in training in the steel industry in Italy. Students, on the other hand, are less interested in the production aspects of the steel sector, but more interested in digital technologies. Accordingly, training activities should be more focused on these aspects/topics. Sustainability topics should also be emphasised more: e.g. through training on topics aimed at reducing emissions or improving energy efficiency and linked to digital technologies.

The use and **added value of the steelHub** as a vocational training tool for the steel sector was also discussed: The workshop participants gave constructive feedback on the Online Training Eco-System platform steelHub. Finally, due to the interest of the participants, the third workshop focused mainly on steelHub as a tool for vocational training in the steel sector. Overall, the workshop participants agreed that the steelHub is an important tool from which stakeholders in the steel sector can benefit greatly.

Poland

A total of **four workshops** took place in Poland. Representatives from companies, public authorities, research institutions, universities, training providers as well as associations and trade unions participated. The following topics were discussed and results achieved:

One of the main points of discussion in the **first workshop** was the lack of candidates both for vocational schools in the specialities required by steel companies as well as for workers directly

employed in the companies. Individual steel mills undertake various local initiatives to promote work in these mills, work with vocational schools to attract candidates but the results are far from sufficient. Therefore, during the **2nd rollout workshop**, there was a proposal to try to coordinate these activities within the framework of ecosystem activities, to develop common tools, to take advantage of best practices in the region, in order to increase the effectiveness of these promotional activities and to showcase the steel sector as an excellent and attractive place for a lifelong career.

Against this background, the idea has emerged to help refugees from Ukraine to enable their children to be educated in vocational schools at all levels of education (especially in professions in demand in steel mills), and to enable their parents to work directly in steel mills. It is estimated that there are currently up to 2 million refugees in Poland, some of whom come from steel regions in Ukraine. Therefore, this part of the refugees would be easier to assimilate into the Polish steel regions. Both issues were considered to be developmental and it was decided to take further action within the established ecosystem to achieve a win-win situation for all parties (refugees, VET schools and steel mills).

The **3rd Workshop** in Poland was mainly focused on coordinating the promotion of the sector to the public to encourage people to take up jobs in the sector and to go to school for vocations in demand in the steel industry. Aside from that, the integration of refugees from Ukraine both into the vocational training system for the steel sector and directly as employees in the sector was discussed. All participants at the meeting thereby confirmed the desirability of undertaking promotional activities for employment in metallurgy as part of a sector-wide action. It seems necessary to improve the image and break false stereotypes about working in this industrial sector. The steel sector is a modern industry employing workers with a wide range of occupations and levels of education, including a growing proportion of IT specialists and participating in the Industrial Revolution 4.0. In this context, an inventory of the promotional materials used in the steel mills should be carried out and a sector-wide campaign strategy developed. A further **4th workshop** in early 2023, with a wider range of stakeholders, was dedicated to this topic, too.

So far, there are no refugees from Ukraine working at the steelworks. The steel mills offer them jobs and would be happy to employ them, but there is a lack of applicants. This is probably due to the limited number of men, as they are not allowed to emigrate due to military service obligations. Possible specialists require Polish certification of professional qualifications and Polish language training. Most women are employed in services, with the provision of care for minor children being a problem. The workforce is characterised by high turnover, with some returning to the country and a significant proportion going further west. Representatives of the Polish steel mills confirmed the above views. They did not note the employment of refugees or their willingness to apply for jobs in the steel mills. This also applied to ArceloMittal Poland AMP, which helped in transporting several hundred Ukrainians to Poland from Krzywy Róg, where ArcelorMittal has its smelter.

Finland

The ESSA project and its tools have been presented at various national meetings of the Finnish steel industry. For example, ESSA has been promoted at the regular meetings of the Finnish Technology Industry Association and project progress and results have been reported. Although there is great interest in the ESSA offers and tools, other topics are prioritised due to the current economic situation (Covid19/Ukraine war). In an annual meeting of vocational school teachers and professors of the Federation of Finnish Technology Industries (June 2021), cooperation with ESSA was also agreed upon. Concrete steps were postponed as this

first requires obtaining approval for Finnish rollout activities and discussing possible connection points.

In terms of content, the focus in Finland will not only be on upskilling, but also on retraining unemployed people and integrating them into the labour market. The demand from metal companies for new and qualified workers with vocational training or a university degree is increasing, while the boundaries between the two levels are becoming more and more blurred. Education in Finland has a broader spectrum due to the small population and creates the conditions for an easier change of occupations. Tools from ESSA could also be applied on the basis of intensive cooperation between industry and the education sector, for example in relation to already existing and successfully functioning ecosystems.

Furthermore, a broad approach including other metals (such as nickel, cobalt, copper) besides steel is envisaged in Finland. In the long term, the integration of ESSA into the annual meetings of the Association of Finnish Technology Industries, with a special focus on teachers and industry professionals, is foreseen. Based on the national and regional coordination of activities that has already taken place, possibilities are currently being planned for a rollout workshop based on the ESSA results, which will take place after the project period.

Belgium

In Belgium, **one workshop was held** in a small round of stakeholders, with steel company representatives and associations present. The main challenges in Belgium are also in recruitment and training: First, the search for the right candidates was discussed, with participants stressing that there are not enough candidates on the labour market for the industrial sector. At the same time, the demands in steel professions are increasing, in the form of rising qualification requirements, especially against the background of digital and green developments. Upskilling is accordingly an important issue in the steel industry; however, not every worker can be upskilled.

Steel is considered an old economy in Belgium (as it is in other European member states), therefore a new way of training/thinking, new mindset is needed or in other words, an improvement of the attractiveness and image of the steel industry. Highlighting the importance of steel can be helpful in this: The image people have of the steel industry needs to change. According to the participants, more efforts need to be made to attract younger people to STEM subjects (and the industry) at an early age (students, etc.). However, the steel sector also competes with other industries; e.g. the geographical (rural) location of steel plants is often a problem when it comes to attracting applicants.

The workshop also discussed sector-specific challenges in Belgium. According to this, the Belgian steel sector has not developed a common path in several respects:

- Financing opportunities are scarce in the Belgian steel sector
- Reflection on the needs of companies at sectoral level is needed
- Current situation: 6 different international company groups representing about 10 steel producing companies.

The workshop also showed that there is a great openness of companies to the skills perspective, especially in terms of upskilling and retraining of workers. The following approaches were discussed in this context: First, participants agreed that joint efforts are needed among Belgian steel companies; for example, by sharing on best practices to improve the attractiveness of the sector, also to create a common vision. Joint efforts on training are also needed: more broad training can be used to train workers (e.g. for digitalisation). At the same time, more cooperation with universities, vocational training institutions and schools is

needed. Higher turnover than in the past creates a greater need for new employees. This makes efforts by companies to be attractive to applicants all the more important; for example, through increased visibility in social networks. Steel companies also try to promote a green and modern image and to attract younger people to STEM subjects (and industry) at an early age (students, etc.).

The possible **role of ESSA in Belgium** was also discussed: for example, ESSA could promote direct communication between companies and regional stakeholders and at the same time be helpful to build a Belgian identity for steel.

Romania

A **hybrid workshop** was held in Romania, organised by Danubius University and LIBERTY Steel Galati. Among the participants were representatives from steel companies, universities, public authorities and technological high schools.

The content included detailed, useful introductions from each person present, a presentation on the ESSA project and Steel University initiatives. A dynamic conversation started about the regional and local challenges facing the industry and the community in terms of attracting, training and retaining workers. The group of participants were enthusiastic about working together to identify challenges and opportunities. It was agreed to proceed with Romania's participation in the ESSA project. The next steps are to extend the invitation to more stakeholders: Training providers/vocational schools; associations and trade unions; public authorities; research institutions; civil society organisations; ministries of education and industry. Accordingly, the rollout in Romania will also continue in the future.

5.4 European Community of Practice for National-Regional Skills and Training Ecosystems (ECoP Steel)

ESSA results and the Blueprint Prototype were the background to develop an iterative, cyclical update route for the national-regional implementation concept and strategy (rollout). Against this backdrop and in line with the European Open Coordination method, the ESSA Blueprint offered a general cross-European orientation and framework to support specific national and regional skills adjustments in the steel companies onsite and regions. This included policy and (funding) recommendations and pathways (e.g. via co-financing of ESF/EFRE and national/regional funds). In line with the Steel Sector Careers project’s suggestion for combined school and industry led initiatives, ESSA rollout activities and implementation focused on the regional level where people live, work and learn with active involvement of companies and VET schools ensuring the "dual approach" by combining practical on the job or workplace-based learning with formal VET and online inputs. However, the results of the first workshops lead to **combined national-regional** activities, integrating national responsibilities, and possibilities of esp. national public authorities and national associations.

The Blueprint execution led to an interrelated and connected European-national-regional implementation and rollout structure. Because of the differences in VET systems and skills needs in the European countries and regions, ESSA served not a one size fits all solution but an **orientation framework** to be adjusted, linked and modified to the steel regions' specific demands and environment. However, by integrating the national level (because the public responsibility for VET is often placed at the national government level) ESSA focusses on the regional level because of its utmost relevance from a practical implementation perspective. A common strategy for continuous improvement and adjustment of skills, competences, and occupations institutionalised in Regional Training Eco-Systems is needed where people live,

work and learn. Additionally, SMEs and steel *processing* companies are more often restricted to a region than big global steel companies, and this is a good way to address them as well. Same applies for the *integration of (national) unions*: They are more active at the company and regional level (and not so interested in "abstract" European solutions, as often being handicapped by language barriers).

Against the rollout experience, connecting the National-Regional Training Ecosystems (ESSA RTS) with the ESSA Foresight Observatory will be done by establishing a **European Community of Practice (ECoP Steel)**. Within this EU-wide network, national-regional ecosystems will share knowledge, tools, strategies and good practice, learn from each other, support each other, and conduct common research and development to improve the steel regions. In order to avoid fragmentation and to reinvent the wheel several times new, the ESSA ECoP Steel will catalyse regional collaboration on the European level (within the Foresight Observatory) to develop the training solutions within the local context by connecting the steel regions and its regional stakeholders, using synergies to accelerate the progress.

The rollout will be coordinated, supported and implemented by the ESSA Foresight Observatory in collaboration with the European steel associations and platforms as described above. Especially the national steel associations and unions will be involved in the rollout activities. Again, within the member states there will be a focus on steel regions (steel industry clusters). These clusters will setup different specific (depending on the main regional employment, education and training, and social demands) Regional Skills Eco-systems connected with the steelHub (Online Training Eco-system). With the main steel regions in Europe the ESSA Blueprint will support and be combined with national/regional skills approaches. A key element is the integration of companies, VET institutions, science, policy, social partners (esp. unions), and civil society activities at the regional level within the eco-system structure and governance. **Regional Dialogues** have to be done to set up or integrate the Regional Training Eco-systems in already existing regional structures (for innovation and education and training), checking what kind of support is needed from the national level (steel associations, training providers, VET institutions, policy, funding) and the EU level. Systematic mutual exchange between the Foresight Observatory and the Steel Regional Training Ecosystems will be bundled in the **Community of Practice (ESSA CoP)** within the Foresight Observatory ensuring mutual synergies, support, exchange and learning. This ECoP will inform the work of the European Foresight Observatory as a junction for improving skills adjustments proactively together, learning from each other, and pushing both technological innovation and qualification of the workforce forward in a common manner, to the benefit of each other.

The main objective of the ECoP is to set up a **platform** for sharing best practice as well as common goals and information and for connecting and coordinating the national-regional rollout in order to aligning and sharing their experience. The platform content will include **strategies for skills development** and **strategies for networking**, with clear objectives, agreeing on goals and purpose and explaining the added value. In addition, it is crucial to define the end-users of the contents clearly and be in continuous communication with them. In particular, it will include (as stated by the partners in the ESSA Final Conference):

- A web platform (e.g. to share best practices and content, such as recent projects, etc.);
- Information exchange: collect information from different countries to be aligned and share the experience;
- Connect and coordinate the rollout of regions and nations → moderating processes;
- Content related strategies for skills development and for networking;

- Keep permanent contact to all stakeholders: generate networking to share common problems and solutions;
- Keeping updated about project results as well as related projects:
  - Catalogue practices → Library
  - Present expert content
  - Help each other – answer questions
  - Collaborate on common and emerging themes.

The **ECoP Structure** will include different topics based on good practices exchange, presenting the following characteristics:

- Structured as an online platform: steelHub as platform to stay in contact.
- Hybrid fashion: Online platform alongside regular annual meetings
- Open forum
- Organise regional stakeholder meetings and stakeholder sub-groups → meetings face to face
- Create an award program every year to share best practice and award them;
- Create KPI for talent development for monitoring the processes, benchmarking and align objectives of the eco-system.
- Topics to be included: good practices exchange, hot topics,
- for specific interest groups - sub-themes and issues → each of the interest groups should have an owner or community manager
- Create awareness and visibility.

The combination of the Regional and National level with the European Steel Skills Alliance and Strategy will lead to plan a cooperation within the ECoP of Steel Regions, by extending complementary, subsidiary or supporting cooperation with setting up a new structural framework for the practical implementation. In this regard, during the **ESSA** project, it has been discussed **how to connect the ECoP with the rollout regions**. Concerning the ECoP approach, one important point are the connection nodes, in particular, to connect the national-regional developments with the European ones. First decisions have to be made before developing these things further. In particular, it is crucial to discuss the acceptance to move on after the project time, who runs the online platform and at which conditions and who will coordinate the ECoP on behalf of the ESTEP FG People. To sum up:

- Establishing reliable connection nodes (e.g. through influential institutions)
- Find a central co-ordinator with resources (particularly time) and influence within the sector
- Identifying representatives (e.g. for each country) as connectors
- Set-up an online platform or integration in steelHub
- Creating region-based groups (for even more intense regional cooperation)
- Creating a clear message on benefits as well as on tangible outcomes of value to industry, across National Associations and steel companies in each region.

Finally, in order to manage the ECoP in a sustainable way, suggestions of the ESSA partners to answer **how should the ECoP be run sustainably** are:

- Integration in ESSA Governance and existing institutions → FG People; also e.g. steelHub (integration of ESSA governance into FG people);

- Looking for funding to set up the online platform and specific themes (e.g. through membership fee) → ensure economical sustainability;
- Identifying key stakeholders to co-ordinate at ECOP and Regions level → ECoP should run by the same persons that run the Regional Rollout;
- Creating regular tasks/communication to maintain activity and interest;
- Organising common events (language might be a problem);
- Sustainability by EU funded projects / dedicated EU funding;
- Set a clear strategy (who is responsible for what in the level of management);
- Organising online workshops;
- Regular webinars about content of interest for all communities;
- Hybrid meetings to enable labour conciliation of family and working life;
- Periodic meetings to share the results.

6. VET System Alignment

The analysis of the VET systems of Germany, Italy, Poland, Spain and UK, representing different forms of organising VET (central, decentral, dual, etc.) (see Deliverables D4.1 (Antonazzo, Weinel, Stroud, et al., 2022) and D4.2 (Antonazzo, Weinel, & Stroud, 2022))) was the background for a further elaboration of the VET system support, the VET system matrix and several recommendations to navigate the national VET systems, tackle emerging skills gaps and leverage the opportunities offered by the EU frameworks and tools.

The main *recommendations to the steel industry* (see executive summary of Deliverable D4.5 (Antonazzo et al., 2023)) comprise:

- Lobby at the regional level and focus on a sectoral specialisation through CVET
- Engage with schools to promote dual training and placements
- Engage with worker/labour mobility[6]
- Make use of EQAVET framework for monitoring quality of provision
- Consider the opportunities and limits of modular provision
- Encourage workers to make use of national schemes for validation of prior learning
- Align internal provision with national/international frameworks/benchmarks
- Nourish an innovation culture at all levels
- Integrate with online training platforms (e.g., ESSA steelHub)
- Aim to engage with and adopt whatever cross-sectoral initiatives and tools becomes available to compare sector-relevant qualifications.

Recommendations from the VET system analysis which the Blueprint took up or will take up:

- Acknowledge and address country differences
- Address identified skills needs
- Academic drift to be reflected in the strategy
- Engagement of all social partners
- Contribute to national reviews of vocational qualifications
- Support train the trainers
- Integrate EQAVET principles in the steelHub

[6] This was formerly to be through ECVET, but since its discontinuation we align ourselves with the principles rather than the programme.

- Promote a better understanding of the opportunities and limits of modularisation
- Synergise with ESCO.

To provide industry stakeholders with comparable information about steel-relevant IVET qualification programmes a Sector Skills Matrix (see Figure 20, and in detail Deliverable D4.3 (Antonazzo et al., 2021) and D4.4 (ESSA, 2021)) was elaborated including the five European pilot countries of ESSA: Germany, Italy, Poland, Spain and UK. The main focus of the Matrix is on the depth and breadth of transversal skills provision at the level of learning outcomes offered formally through the VET qualification programmes.

In particular, the matrix is designed to capture the following information:

1. the most relevant steel-production IVET and CVET programmes related to Maintenance, Melt Shop, Rolling Mills, Logistics and Quality Control in each of the five case study countries
2. Learning Outcomes concerning transversal skills
3. Information related to national VET systems: national labels, classification numbers, links to curricula and regulations (if available).
4. Assessment/Evaluation in each of the five case study countries in the form of a *RAG (red – amber - green) grading* of:
   - current transversal skills provisions compared to *current need* of the steel industry to establish *current* transversal skills gap
   - current transversal skills provision compared to *expected future (2030)* need of the steel industry to establish *future* transversal skills gap

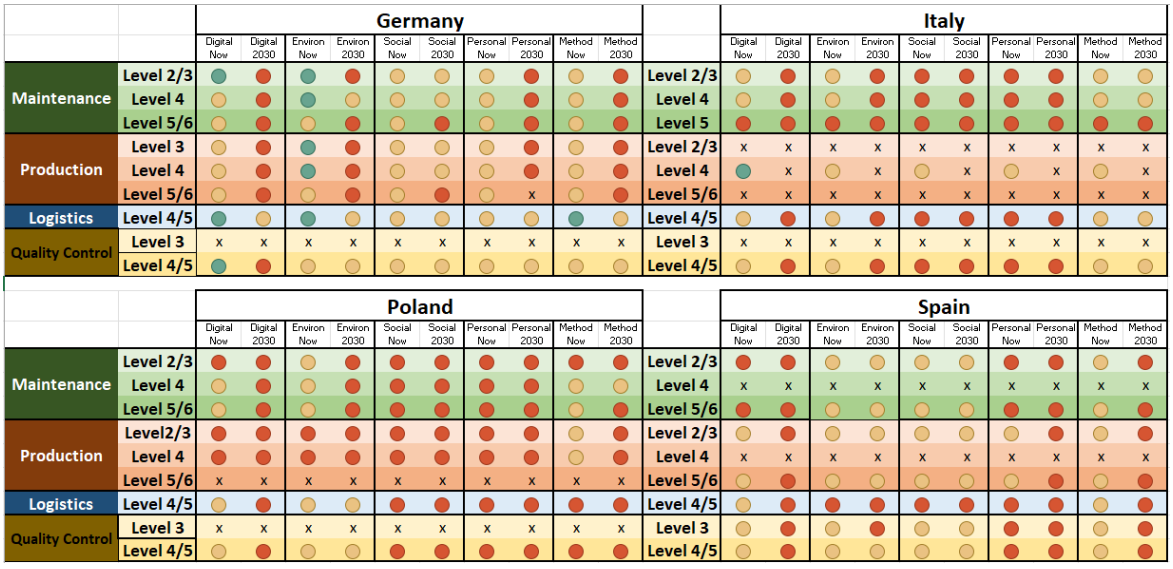


Figure 20: Global layer of VET System Matrix
RAG (red – amber- green) - grading of match between transversal skills provisions of (occupational) qualification programmes and current and future steel industry requirements in four case study countries

The Matrix opens up a range of angles for comparing national vocational programmes and VET provisions with the industry requirements. Beyond the confines of the ESSA project, there is potential usefulness of the sector skills matrix for a range of actors operating at three different levels.

At the European level, the Matrix might prove useful to EU institutions such as the Commission but also EU-funded research projects as well as European-level institutions representing social partners. The matrix can inform EU-level steel-sector focused strategic decision-making

related to policies, research programmes and development and/or adjustment of European VET tools. EU-level industry bodies and trade unions can use the information provided by the Matrix in similar ways or to use it to inform campaigning or lobbying efforts.

Industry bodies and trade unions operating at the national level could use the Matrix to try and influence the direction of national VET systems or to develop additional training programmes in response to identified skills gaps. The Matrix can also serve as useful feedback mechanisms to national VET institutions, which in turn might adjust decisions and activities to close identified skills gaps. The Matrix might also prove to be of value to a range of training providers as identified skills gaps offer opportunities to those with the capacity of closing them through the development of training offers.

Finally, at a regional level, the Matrix might prove useful to regional economic development initiatives such as the South Wales Industrial Cluster (SWIC) in the UK or the *Initiative Ruhrkreis* in the West of Germany. Given the industry- and sector-transcending nature of transversal skills, the matrix might inform broader regional and local initiatives for cross-sectoral transversal skills development. Given also the fact that steel companies are often concentrated within particular regions and localities, VET institutions operating at this level might also find the Matrix useful to inform their approaches to training provisions or to underpin wider skills development campaigns.

Regarding the relationship to other ESSA outputs, the VET system analysis in general and the Matrix in particular focus on steel-industry relevant aspects of national VET systems. The main analytic unit of the Matrix is '(occupational) qualification' and the aim is to come to an assessment whether available initial or continuous VET qualifications provide workers with the currently required capacity to perform particular steel jobs including working with new technologies. The Matrix database and the methodology that informs it are available in D4.3, D4.4 and in the online platform repository *steelHub*, operated by worldsteel's, steel university.

Furthermore, with the ESSA framework concept **VET system integration** is complementarily conducted by the European steelHub and the national-regional ecosystems is as follows:

1. Regional/national ecosystem:
    - address recommendations to the states/regions where gaps emerge (e.g. on the basis of ETP panel results, and the WP4 Skills Matrix)
    - provide relevant and up-to-date information on sectoral trends and skills gaps
    - as a basis of which the key actors can act to change the system from within (e.g. improve curricula, considering different learning arrangements);
    - providing policy-makers with abstract models and examples of effective regional VET-business configurations (e.g. see the one described below for Tata Steel).
2. Online ecosystem:
    - provide guidance on how to better navigate and make use of national VET (especially CVET and recognition of non-formal and informal learning procedures) and EU frameworks
    - build micro-credentials on top of VET systems to fill gaps and complement them with more customised training.

7. ESSA Alignment with European Alliances

Alignment with and integration in European Alliances is the backbone of the ESSA strategy and was further elaborated during the whole project duration. During the implementation and

test phase this was increasing and improving a reliable ground for a steel sector cooperation by involving companies, training and VET providers, science, policy, social partners. During the implementation phase the ESSA partnership was further extended by the national-regional rollout and sustainable aligned with the main existing European steel sector alliances ESTEP, EUROFER, industriALL, and the Sectoral Social Dialogue Committee on Steel (SSDCS).

ESSA is a **project of the Steel Industry for the Steel Industry**. Therefore, straight from the beginning and during the implementation phase the European Steel Skills Alliance was based on a steel sector partnership comprising about 40 partners. The project consortium consists of 24 partners:

- **Steel companies:**
  thyssenkrupp Steel Europe, ArcelorMittal Poland, ArcelorMittal Spain, Salzgitter AG, Sidenor, Celsa Group/Barna Steel, Tata Steel
- **Education and training providers:**
  Steel Institute VDEh, IMZ, Scuola Superiore Sant'Anna, Worldsteel / Steel University, DEUSTO, Cardiff University (also research institution), ThyssenKruppSteel Europe Training Centre (part of the steel company), ArcelorMittal Spain Training Centre
- **Steel associations and social partners:**
  EUROFER umbrella organization of the steel industry employers, World Steel Association, UNESID Spanish Steel Association, Belgium Steel Platform, Wirtschaftsvereinigung Stahl (German Steel Federation), Federacciai (Italian Steel Federation), European Cold Rolled Steel Association CIELFFA, Association of Finish Steel and Metal Producers, OS KOVO (trade union)
- **Research institutions:**
  TU Dortmund University, Cardiff University, RINA/CSM, Visionary Analytics VA

completed by 20 **associated partners**:

- ESTEP European Steel Technology Platform, industriALL (European Industry Union), EIT RawMaterials, Industriarbetsgivarna (Swedish Industry Federation), Polish Steel Technology Platform, Enrico Gibellieri (European Steel expert), Unite and Community (UK unions), CEPIS Council of European Professional Informatics Society, University of the Basque Country, Warwick University, ArcelorMittal Italy, Fédération Métallurgie CFE-CGC, Metalowców NSZZ „Solidarność”, UK Steel, SAAT Consulting, Swansea University, ArcelorMittal Germany, Commercial Metals Company (CMC), Liberty Steel/ GFG Alliance.

Affiliated organisations to the above are also included and provided access to their respective members. The partnership is directly involving **13 EU countries**: Belgium, Czech Republic, Finland, Germany, Italy, Lithuania, Netherlands, Poland, Romania, Spain and UK, completed by France and Sweden (associated partners). Nevertheless, via EUROFER, industriALL, CIELFFA, and steel company subsidiaries in other countries ESSA is **covering the whole steel industry member states** in Europe, including the steel processing and SME perspective.

This alliance will underline the ESSA activities after the project duration within the new governance structure, coordinated via the Foresight Observatory and supported by the Large-Scale Partnership Energy Intensive Industries under the Pact for Skills.

To ensure the integration of different perspectives the ESSA Foresight Observatory is guaranteeing the integration of stakeholder representatives of all steel relevant areas, ensuring

a quadruple helix perspective (industry, policy, education and science, and as much as possible civil society (mainly at the steel regions level, where people live and work)).

The transfer of the results into practice includes a new coordination and **distribution of responsibilities**. Responsibilities but also duties and interaction for continuous learning have to be *newly balanced and interrelated in the ESSA governance structure* between industry, VET systems, and the individual learner, supported by new policy frameworks, for instance:

- Steel industry focusing on company specific short-termed adjustments of skills needs (within a middle and long-term foresight strategy)
- VET systems engaging with general and transversal competences and skills relevant across sectors
- Individuals by improvement of self-learning capabilities and a lifelong learning attitude, empowering individual lifelong learning capabilities
- Policy by developing new innovative frameworks supporting lifelong learning (e.g. through individual learning accounts, integration of online learning arrangements, new possibilities and more leeway of VET systems to integrate company education and training demands.).

Future development of education and training programs might focus also on different responsibilities, tasks and procedures of the workforce and the executives within the company (based on the results of the ESSA company workshops):

- **Workforce:** Work independently in complex topics with digital media, identifying and articulating skills challenges proactively, personal responsibility for learning, sharpen the individual responsibility of the employees as regards to training, closing skills and knowledge gaps independently by oneself, "find one´s feet“ quickly, even under tendencies of rationalization and shorter cycles of innovations - that means: learning on your own, open feedback culture, culture of lifelong learning, training as a benefit to employability.
  However, self-responsibility requires guidance: It is theoretically possible for individual workers to take over responsibility for closing the open skill gaps, however on the practical side, it is quite difficult. Pull factors (schemes for career progression) and push factors (fundamental training) are needed. Otherwise, one gets lost in the system. The capacity of people to select learning targets autonomously is limited and difficult without guidance. Empowering courses at the beginning are important to provide people the basic cognitive tools to identify their learning targets. This includes also a new responsibility and role for the executives (mainly related to the workforce appeal described above).
- **Executives:** New leadership from instructing to coaching, mentoring, supporting; conditions for self-learning require active role of executives (impart confidence and implement self-learning), need of cultural change, executives should become mentors, ambassadors, stay role model – identify and break new grounds, provide orientation how to achieve sustainable success.

Integration in EU programmes and actions and the European process industry community

ESSA is and will be further linked with the European Commission current and planned actions and frameworks: Digital Education Action Plan**,** Cedefop’s work on skills, the sector-based Pact for Skills, the Blueprint for Sectoral Cooperation (focusing on the sectors put forth by the new EU industrial strategy) and the New Skills Agenda 2020 published by the Commission

and its planned European Education Area Communication. All these initiatives of the Commission are connected with the full toolbox of the EU, including the EU semester (with country-specific recommendations to facilitate skills uptake), European funds (European Social Fund, European Regional Development Fund, Erasmus+, InvestEU Just Transition Fund, etc.) and the European Social Dialogue.

A strong focus of ESSA will be on the cooperation and exchange with other sectoral industry related Blueprints, especially concerning a combined rollout strategy to the Member States and steel regions. Additionally, concerning green skills there will be a close cooperation and exchange with the SPIRE-SAIS Blueprint "Skills Alliance for Industrial Symbiosis - Cross-sectoral Blueprint for a Sustainable Process Industry"[7]. As the Steel Industry is representing one of the ten energy intensive industry sectors in A.SPIRE this cross-sectoral Blueprint produces tangible results also for the steel industry which are expected to be integrated in further activities. Additionally, the Clean Steel Partnership under Horizon Europe and results of the Green Steel project will inform the ESSA Blueprint within the next improvement phase. Important Projects of Common European Interest (IPCEI) of the steel industry will be monitored and listed in a related ESSA repository, checking possible skills alignments.

To broaden the perspective beyond the Steel Industry ESSA integrated institutions in the partnership not focusing (only) on the steel sector, e.g. EIT RawMaterials and the Council of European Professional Informatics Society (CEPIS) completed by several European platforms, networks and projects:

- European platforms and networks: Skills Panorama, Pact for Skills, Smart Specialisation Platform, European Cluster Collaboration Platform, European Apprentices Network, European Platform for Digital Skills and Jobs, Centres of Vocational Excellence, eTwinning, European Network for the Transfer and Exploitation of EU Project Results (see Table 1 below).
- Steel Sector related projects: esp. SUSTAIN, Steel Sector related Important Projects of Common European Interest (IPCEI)
- Steel related Sectoral Blueprints: SPIRE-SAIS, Skillman, SAM, DRIVES, Construction, and others.
- European tools: ESCO, Europass, EQAVET, etc.

The integration of ESSA in the **Pact for Skills** and its Large Scale Partnership Energy Intensive Industries is of especially high relevance to ensure the sustainability of ESSA with a cross-sectoral industry skills perspective. In the same line the cooperation with other sectoral process industry Blueprints has already started: esp. with SPIRE-SAIS where steel is one of ten relevant sectors focusing on industrial symbiosis and energy efficiency and other Blueprints of the steel value chain: automotive, construction, additive manufacturing.

Platform	**Relevance**
Skills Intelligence https://www.cedefop.europa.eu/en/tools/skills-intelligence	Integrates in one single portal data and information on skills needs and mismatches

[7] https://www.spire2050.eu/sais

Platform	Relevance
European Platform for Digital Skills and Jobs https://ec.europa.eu/inea/en/connecting-europe-facility/cef-telecom/apply-funding/2019-digital-skills-jobs	Boosting digital skills in Europe, offer information, resources, overview of training and funding opportunities and a community space for networking and collaboration both on European and national level
Pact for Skills https://pact-for-skills.ec.europa.eu/index_en	Overarching initiative within the New Skills Agenda, shared engagement model for skills development in Europe ESSA is part of the Large Scale Partnership Energy Intensive Industries (LSP EII)
Smart Specialisation Platform https://s3platform.jrc.ec.europa.eu	Options to identify those regions and regional clusters that are focusing on the same sectors as ESSA Useful for regional roll-out of project results.
European Cluster Collaboration Platform www.clustercollaboration.eu	Options to identify those regions and regional clusters that are focusing on the same sectors as ESSA Useful for the plan for regional roll-out of project results.
European Network for the Transfer and Exploitation of EU Project Results www.enter-network.eu	Amplify dissemination work The European Network for the Transfer and Exploitation of EU Project Results Since 2005, E.N.T.E.R. has brought together organisations from across Europe in successful EU project work. Join our network by registering your organisation and your projects.
European Apprentices Network https://apprenticesnetwork.eu/	Recruitment of talents and young people
eTwinning https://www.etwinning.net/en/pub/index.htm	Community for schools in Europe and offering a platform for staff (teachers, head teachers, librarians, etc.), working in a school to communicate, collaborate, develop projects, share and being part of a learning community in Europe
Centres of Vocational Excellence https://eacea.ec.europa.eu/erasmus-plus/actions/centres-of-vocational-excellence_en	Bringing together a wide range of local partners, to develop "skills ecosystems" that contribute to regional, economic and social development, innovation, and smart specialisation strategies

Table 1: Overview of relevant EU collaboration Platforms

8. From a Project to a Sustainable Alliance and Governance

The transitions from a funded project to a sustainable alliance and governance is smooth. All the relevant elements are already developed and implemented during the Blueprint development, implementing and testing phase:

- The further **ESSA governance** is taken over by the **Foresight Observatory** integrated in the ESTEP Focus Group People and supported by ESTEP, EUROFER and industriALL Europe.
- The online training platform **steelHub** is consolidated and improving and extending continuously is guaranteed by a business model (increasing the number of providers and users).
- The **European Community of Practice of Steel Regions (ECoP Steel**) is ensuring the exchange and support of existing and further National-Regional Training Ecosystems

However, beside already applied leadership the ongoing activities of ESSA relate on the ongoing integration of the different stakeholders and their intrinsic motivation. Establishing interrelated Alliances and Leadership on the European, national and regional level, fostering joint Blueprint activities and setting the ground for a national/regional rollout will stay alive. Responsibilities for the different representatives (i.e. associations, companies, VET providers and systems, individual learner) are or will be allocated. The participating organisations, or stakeholders, have been selected because each of them is – in different ways – strategically committed to the European steel industry. Key stakeholders, including those directly involved in ESSA and those to which the project relates, have been identified and will be drawn upon for the identification and analysis of the intelligence related to the execution of the Blueprint and for the design and development of the network beyond the finite funding period.

The already huge ESSA partnership is engaged in supporting measures for the transfer, implementation, monitoring, cooperation and dissemination (EU and Member State Level) as well as for national roll-out activities:

- Steel companies and social partners (associations and unions) are central and are engaged with ESSA 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 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 institutes provide the social and technical basis of the skill needs analysis and contribute to skill requirements and foresight in respect of Work 4.0, as well as contributions to the 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 (such as ESCO, EQF, etc.). A contribution to policy recommendations (including collaboration with EU and Member State Stakeholders, national funding institutions) will also be coordinated 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 contribution to policy recommendations and transfer, implementation and monitoring processes.
- The **Task Force Small and Medium Sized Enterprises** (SME) will take care of integrating SME topics and measures

Process- and result-oriented Key Performance Indicators (KPIs) will monitoring the outputs and outcomes, advancement and success rate of ESSA for both during the project and after its completion are in focus.

Ensuring the multi-stakeholder approach, **next steps for 2023/24** will further develop the central elements of ESSA:

Foresight Observatory:

- Establishing a yearly regular technology and skills foresight survey leading to a Steel Skill Index
- Yearly validation by an expert workshop
- Identification of new job profiles
- Integration of skills for industrial symbiosis and energy efficiency
- Project repository: integration of the existing database in the ESSA homepage, steelHub
- Image and recruitment repository: events, materials etc.

The Observatory will start its further implementation and regular activities after the project duration from July 2023 on.

steelHub:

- New content, publishers, users
- Translation of training modules
- Integration of further ESSA tools: self-assessment, national-regional platforms
- Further job profiles, occupations selection and integration
- Train the trainer, teacher measures

ECoP Steel:

- Yearly Roadmap
- National-regional platforms integrated in the steelHub
- Integration of further regions, member states
- Yearly workshops (in the regional ecosystems, European exchange)

A crucial aspect will be the nomination of an ECoP leader and the responsible person for each National-Regional Training Eco-systems (ESSA RTS). Additionally, the integration of the online training platform steelHub into onsite training environments at steel regions level as well as the development of complementary National-Regional Training Eco-systems (ESSA RTS) will be on the agenda.

The regional framework development will include also the exploration of esp. European funding schemes of the European Commission relevant for the regions (European Social Fund, European Regional Development Fund, Erasmus+, InvestEU Just Transition Fund, etc.).

Pact for Skills: Large Scale Partnership Energy Intensive Industries (LSP EII)
Concerning the Large Scale Partnership Energy Intensive Industries under the Pact for Skills the European Steel Skills Alliance and Agenda ESSA and the Skills Alliance for Industrial Symbiosis SPIRE-SAIS are integrated. Based on a Memorandum of Understanding the two Blueprints will merge under a common umbrella with two specific foci:

- SAIS = cross-sectoral and **industrial symbiosis skills** specific blueprint
- ESSA = example of a **specific sector (steel)** related blueprint including an incremental upskilling of representative job profiles (t-shaped skills: technical and transversal skills (green, digital, social, individual, and methodological)).

Main activities planned:

- Roadmap development
- Integration, merging topics/challenges to be solved
- Integration of further partners
- Support for ESSA/SPIRE-SAIS Workshops
- New proposal for the call spring 2024

Annex

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Figures

Tables

Abbreviations

Abbreviation	Meaning
AM	Additive Manufacturing
AMDS	ArcelorMittal Downstream Solutions
AMP	ArcelorMittal Poland
BF	Blast furnace
BIBB	Federal Institute for Vocational Education and Training
BOF	Basic oxygen furnace
CCUS	carbon capture and utilisation and/or storage
CEPIS	Council of European Professional Informatics Societies
CGSLB	General Confederation of Liberal Trade Unions of Belgium
CIELFFA	European federation of the national associations of cold rolled narrow steel strip producers and companies
CNC/NCK	National Confederation of Managerial Staff
COSME	Competitiveness of Enterprises and SMEs
CRM	Centre de Recherches Métallurgiques
CSP	Clean Steel Partnership
CVET	Continuing vocational education and training
DB	Database
E.N.T.E.R.	European Network for the Transfer and Exploitation of EU Project Results
EAF	Electric Arc Furnace
EASME	Executive Agency for Small and Medium-sized Enterprises
ECoP Steel	European Community of Practice Steel
EFRE	European Regional Development Fund
EQAVET	European quality assurance in vocational education and training
EQF	European qualifications framework
ESCO	European skills, competences, qualifications and occupations
ESF	European Social Fund
ESSA	European Steel Skills Agenda
ESTEP	European Steel Technology Platform
ETP	European Steel Technology and Skills Foresight Panel
FG People	Focus Group People
GDPR	General Data Protection Regulation
ISCO	International Standard Classification of Occupations
IPCEI	Important Projects of Common European Interest
ITS	Istituto Tecnico Superiore
KPIs	Key performance indicators
LLD	Liberty Steel
LSP EII	Large Scale Partnership Energy Intensive Industries
MPP	Maximum Possible Production
MWB	Metal workers Wallonia-Brussels
OCAS	OnderzoeksCentrum voor de Aanwending van Staal
R&D	Research & Development
R&D&I	Research & Development & Innovation

RAG	Red – amber - green
RFCS	Research Fund for Coal and Steel
RTOs	Real-Time Operating System
RTS	Research and Technology Organisations
SAC	Social Affairs Committee
SAIS	Skills Alliance for Industrial Symbiosis
SCORM	Sharable Content Object Reference Model
SETCa / BBTK	Association of Employees, Technicians and Managers
SMEs	Small and medium-sized enterprises
SSDCS	Sectoral Social Dialogue Committee on Steel
VET	Vocational education and training
WP	Work package

steelHub Business Model (Blueprint)

As worldsteel is a Not-For-Profit organization, the revenue model reflects the organization's effort to fulfil the task of maintaining the infrastructure and service available through steelHub and continue delivering training content to the Eco-System. Neither worldsteel nor the Publisher shall charge the other party fees related to the provision of learning content. As an open system on the one hand worldsteel sells Publisher Training Content licensed from Publisher, worldsteel shall retain a part of AA% of the realised revenue and Publisher shall receive BB% of the realised revenue. On the other hand, Publisher sells worldsteel Training Content: In the case Publisher sells learning content licenses from worldsteel, Publisher shall retain CC% of the realised revenue and worldsteel shall receive DD% of the realised revenue.

All rights, title and interest (including but not limited to all copyright, trademark and other intellectual property rights) belonging to the Publisher (including but not limited to learning content) licensed hereunder shall remain exclusively with the Publisher, its affiliates or its licensors. worldsteel, as a licensor of intellectual property of the other Publisher, will cooperate in all reasonable ways to protect the licensed intellectual property. worldsteel's data hosting servers are located in the European Union and the United States of America, and worldsteel's delivery of the software may include worldsteel's collection, maintenance, processing and storage of personal data in Belgium and potential transfers to other countries. Publishers observe and comply with all applicable data protection and privacy laws, legislation or regulations of any country with respect to personal data of Software users.

As a first business model the following section describes the formal relationship between the publisher, who is the owner of the learning content; and worldsteel, who manage the steelHub infrastructure.

The foreseen Business Model is based on:

1. worldsteel, through steeluniversity, it's education and training programme, has developed expertise and assets in delivering steel industry training;
2. Publisher has developed expertise and assets in delivering training, particularly classroom and online courses;
3. Parties have a shared interest to collaborate in offering the training of the other Party through steelHub distribution channels; and
4. Parties will agree to confirm their mutual rights and obligations in writing in an Agreement.

Subject of the agreement
The Parties agree to collaborate in sharing of learning content. worldsteel grants Publisher a license to use its Software. Publisher grants worldsteel a license to use its Learning Content. The license offered to each Party shall be subject to the terms of the Agreement. worldsteel will provide Publisher with SCORM links to allow Company to access steeluniversity Learning Content through its own learning management system or those of its clients. worldsteel will host the Publisher's Learning Content on its steelHub application to facilitate access by the Publisher and its clients and by worldsteel and its members and clients.

Obligation of the parties
worldsteel shall:

- Host steeluniversity learning content and Company learning content in its steelHub application and website steeluniversity.org;
- Provide company with SCORM files to allow Company's clients to access the steeluniversity and Company training through their client's Learning Management System;
- Take reasonable efforts to market, distribute, support and license the Publisher learning content; and
- Provide company access to steelHub to monitor use of Publisher learning content as well as steeluniversity learning content licensed by Company to its clients.
- Provide technical information and support for its learning content, which includes:
    - Technical support for responding to inquiries and questions of end-users, and
    - Implementation of updates and correction of errors.

Publisher shall:

- Provide steeluniversity with Company learning content files for the purpose of hosting on steeluniversity's steelHub application and website steeluniversity.org;
- Take reasonable efforts to market, distribute, support and license the Company learning content and steeluniversity learning content hosted on steelHub;
- Provide metadata for the learning content, such as images, descriptions, and key words to use for marketing purposes; and
- Provide technical information and support for its learning content, which includes:
    - Technical support for responding to inquiries and questions of end-users, and
    - Implementation of updates and correction of errors.

Revenue model
worldsteel is a Not-For-Profit organization and the description of revenue model of this section reflects the organization's effort to fulfil the task of maintaining the infrastructure and service available through steelHub and continue delivering training content to the Eco-System.

Fees for Service: Neither worldsteel nor the Publisher shall charge the other party fees related to the provision of learning content.

worldsteel Sells Publisher Training Content: In the case worldsteel sells learning content licensed from Publisher, worldsteel shall retain AA% of the realised revenue and Publisher shall receive BB% of the realised revenue.

Publisher Sells worldsteel Training Content: In the case Publisher sells learning content licenses from worldsteel, Publisher shall retain CC% of the realised revenue and worldsteel shall receive DD% of the realised revenue.

Payment terms
Payments will be made quarterly. Each Party shall provide the other Party with an invoice itemising the fees due with reference to this Agreement. Invoices shall be submitted at least thirty (30) days prior to the payment date.

worldsteel will provide Company with a quarterly report summarising usage of learning content licensed under the Agreement between parties. The report will identify the name of the learning content licensed and the total number of users for each item of learning content. The data will be used to calculate license fees due under the Agreement.

Intellectual Property
All rights, title and interest (including but not limited to all copyright, trademark and other intellectual property rights) belonging to the Publisher (including but not limited to learning content) licensed hereunder shall remain exclusively with the Publisher, its affiliates or its licensors. worldsteel, as a licensor of intellectual property of the other Publisher, will cooperate in all reasonable ways to protect the licensed intellectual property.

Except as expressly permitted herein, worldsteel shall not:

1. Copy, modify, adapt, translate, decompile, disassemble or reverse engineer the learning content or any Software provided by the publisher or otherwise attempt to discover the source code;
2. Rent, lease, or assign the Software to any third party; or
3. Permit any learning content, including text, images, video, graphics, data and software provided in connection to this Agreement to be used other than in conjunction with the training of authorised users.

Delivery of learning
worldsteel will host its learning content and that of the Publisher on the steeluniversity cloud-based infrastructure as licensed from Amazon Web Services. Two delivery solutions are employed; steelHub for clients using their own learning management system and steelLMS for clients wanting to use steeluniversity's learning management system.

steelHub is a solution whereby worldsteel provides Customer with a proxy file for each element of learning content, such as a course, simulator or 3D model. The proxy files are compliant with SCORM 2004 4th edition. The proxy files are provided to clients for implementation in their LMS. Customer learners launch the content from within the company LMS and information of the learner's performance, like time, score, and status, is recorded in the customer LMS.

steelLMS is a LMS solution created by steeluniversity for those clients who do not have their own LMS. Learning content licensed will be accessible through steelLMS.

Territory
The geographic territory will be defined between parties.

The Parties agree to undertake best efforts to not contact the same potential clients, but in any event, the minimum sales price shall apply. This effort to focus marketing is non-exclusive and each Party shall retain the right to sell licenses to any client.

Data Handling
Publisher acknowledges that worldsteel's data hosting servers are located in the European Union and the United States of America, and worldsteel's delivery of the Software may include worldsteel's collection, maintenance, processing and storage of personal data in Belgium and potential transfers to other countries.

Publisher represents and warrants that:

1. It shall observe and comply with all applicable data protection and privacy laws, legislation or regulations of any country with respect to personal data of Software users;
2. It has obtained all necessary consents to enable the lawful transfer of user's personal data made by Publisher to worldsteel and any sub-processors, to enable the processing of user's personal data for the purposes set out in this Agreement; and
3. It shall obtain all necessary consents for transfer of user's personal data outside the European Economic Area.