Europe's Circular Economy and its Pact for Skills: working together for an inclusive and job-rich transition?

STUDY

European Economic
and Social Committee

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General information

Acronyms

Cedefop	European Centre for the Development of Vocational Training
DESI	Digital Economy and Society Index
EACEA	European Education and Culture Executive Agency
EAfA	European Alliance for Apprenticeships
EC	European Commission
ECESP	European Circular Economy Stakeholder Platform
EESC	European Economic and Social Committee
EISMEA	European Innovation Council and SMEs Executive Agency
EIT	European Institute of Technology and Innovation
EP	European Parliament
EQF	European Qualification Framework
ESCO	European Skills, Competences, Qualifications and Occupations
ESS	European Statistical System
ETF	European Training Foundation
EU	European Union
ICT	Information and Communication Technology
ILO	International Labour Organization
IS	Industrial Symbiosis
JTF	Just Transition Fund
KICs	Knowledge and Innovation Communities
LoA	Line of Action
LSP	Large-Scale Partnership
MOOC	Massive Open Online Course
NEB	New European Bauhaus
OECD	Organisation for Economic Cooperation and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
RSP	Regional Skills Partnership
STEM	Science, Technology, Engineering and Math
SWOT	Strengths, Weaknesses, Opportunities, Threats
TCLF	Textile, Clothing, Leather and Footwear
TSI	Technical Support Instrument
VET	Vocational and Educational Training
WIH-OJA	Web Intelligence Hub-Online Job Advertisement

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Abstract

The transition to circularity is changing business models and skill needs of industry in Europe. Although the capability to monitor the development of skills and occupations related to circularity is still weak, the European Commission supports industry, education institutions and public authorities in the identification of these skills and in the undertaking of skilling, upskilling and reskilling initiatives of the European workforce. The aim is not only to maintain jobs, but to equip workers with circular skills for the transition to happen. Besides the Erasmus+ programme in general and the blueprint projects in particular, the Pact for Skills, where stakeholders are supported to aggregate and create synergies, and other EU instruments are available to facilitate skills development for circularity. This study highlights some limitations of these instruments and makes suggestions for improvement. It also reviews recent analyses to understand the green or circular skills of the future which have been identified thus far in sectoral analyses and EU-wide research.

Executive Summary

New skills development is one of the conditions for moving towards the circular economy. Closing the material cycle while eliminating waste according to repair, reuse and recycle principles requires specific strategies and processes. The understanding of the skills needed to design and afterwards implement these strategies and processes is a necessary step towards the transition to circularity. A further necessary step is the development of these new skills both within the education system and the labour market.

This study includes brief introductory chapters (Chapter 1, Chapter 2 and Chapter 3), a core chapter on findings (Chapter 4) and a conclusive chapter with suggestions for the way forward (Chapter 5). A preliminary conclusion of this study is that the monitoring of the development of skills and occupations related to circularity is weak. Difficulties lay in the lack of a common and simple definition of these skills across EU countries and at the EU level. The OECD recently found a way to bypass this drawback by referring to green tasks within a job. This approach is also able to provide geo-referenced information and may thus, in the near future, facilitate monitoring at the national and regional level. In the meanwhile, our suggestion is for EU institutions to include a skill component in the monitoring framework that is currently under development for measuring a country's progress towards the circular economy. This is necessary because skills are a key driver of the transition.

The core of the study is the analysis of existing EU initiatives supporting the skilling, upskilling and reskilling of the European workforce, and the understanding of whether these initiatives suffice to make the transition to circularity fair and just. The focus is on the 21 blueprint projects funded up to the end of December 2022 under the Erasmus+ programme. These projects are aimed at creating sectoral alliances that later on are expected to support the implementation of the commitments under the Pact for Skills. The 21 alliances are broadly reviewed to understand if their skills strategies for the future refer to the greening of skills. In addition, case studies are developed for four of these alliances (i.e., automotive, tourism, construction, shipbuilding and offshore energy) in order to deepen the understanding of the relevance given to green skills or skills for circularity and to identify challenges and barriers faced in ensuring the proper skilling, upskilling and reskilling of the workforce. Across the blueprint alliances funded by Erasmus+, we find that the greening of skills is not systematically prioritised by all the segments of EU industry. In addition, across the alliances that are greening their skill needs, it is noted that the need relates mostly to the design/planning, resource management and

production stages of the value chain. Material sourcing and disposal/recycling also demand greener skills while green skills seem less important for post-purchase services.

The four case studies confirm that the blueprint projects did not give the same emphasis to the greening of skills. Evidence shows that the outputs of the blueprint projects were influenced by the demand side of the labour market, i.e., industry, represented to diverse extents in the consortia of the projects. In some cases, industry tended to address immediate needs (mainly related to the uptake of digital skills by the workforce, especially in technology-driven sectors) rather than medium-term needs such as those imposed by the compliance with (upcoming) environmental legislation. Another evidence is that for blueprint projects participated in by public authorities, the results of the alliances were more easily embedded at the territorial level. In addition, the case studies demonstrate that all the alliances contributed to support the implementation of commitments under the Pact for Skills and, most importantly, are active in seeking further funding to continue implementing the skilling, upskilling and reskilling activities shaped within the blueprint projects. Erasmus+, including its follow-up opportunity, still remains the favourite source of funding for the stakeholders who have participated in a blueprint project to continue their activities.

Besides the Pact for Skills, the blueprint alliances and the Erasmus+ programme, there is a diversified range of EU initiatives supporting the implementation of the skilling/upskilling/reskilling of the European workforce. Some of these initiatives are mature, others have an unclear or unfilled scope, and some others have a good potential for supporting the development of green skills of the European workforce. Suggestions to build further on existing initiatives are provided in Chapter 5 of the study on 'Conclusions and recommendations'. However, it is noted that, contrary to digital skills, there are no EU-wide initiatives focusing solely on the greening of skills or on skills for circularity, including for the youth. Therefore, we call on the EESC to take the opportunity of the European Year of Skills 2023 to launch a 'Youth Skills for Circularity Pledge' as a very concrete action to celebrate this year.

Finally, from the methodological point of view, this study is based on desk research, development of case studies and undertaking of interviews with key stakeholders involved in the four blueprint projects analysed in the cases. Recommendations are derived from the evidence collected throughout the study and through a SWOT analysis approach that highlights opportunities to overcome identified barriers/challenges.

1.   Introduction

The transition to circularity is expected to bring environmental, economic and social opportunities to Europe. These opportunities are importantly linked to the skilling of the current and future workforce. This study investigates existing EU initiatives which tackle the skilling, upskilling and reskilling of workers in order to understand whether these initiatives are conducive to a positive impact of the transition. In particular, it is important for the transition to have a net positive balance of job creation and/or job substitution and/or job redefinition, after the deduction of all the jobs that are/will be lost due to the changing needs of the labour market. It is also important that the changes driven by skilling, upskilling and reskilling initiatives help promote not only people's employability but also decency of work. Notably, adequate skills are both a lever and an outcome of the transition to circularity as there is no transition if the workforce is not properly skilled. Similarly, there is no positive net effect on decent job creation if the transition is not just and the need for adaptation of existing skills is not met.

2.   Objectives and scope of the study

The scope of the study is to **understand in which direction the EU is moving in terms of new skills development for circularity and, accordingly, to provide suggestions for more activities and areas of intervention**. In particular, this study provides:

- A **general overview of skills development, upskilling and reskilling to embrace circularity by EU industry**, taking into account the different professional profiles along the stages of the value chain. The question 'What skills drive circularity?' is answered through desk-research activities. Data/information gaps on the monitoring of the development of these skills are reviewed and outlined. [Objective 1]
- A description of the **state of play** of the **different EU initiatives on skilling, upskilling and reskilling that are aimed at preparing** the European workforce for the transition to a circular economy. [Objective 2]
- An analysis of the **potential impact of such EU initiatives and suggestions for improvement or adjustments.** In particular, insights from the development of four case studies contribute to understanding challenges, barriers and achievements in specific EU industries. Recommendations relate to **the way forward** with regard to opportunities for filling key data and information gaps; appropriateness of the Erasmus+ programme for reskilling and upskilling initiatives in order to embrace circularity by EU industry; circularity-related skilling programmes and long-term planning of training; ways to strengthen the activities framed by the Pact for Skills; and possible actions for future work of the EESC, including during the European Year of Skills 2023. [Objective 3]

3.   Methodology used, limitations and terminology

3.1 Overview of the methodology used and limitations

The work is organised according to three operational tasks whose methodological approach, including main sources used, is summarised in **Figure 1**. No major limitations were experienced in collecting information through desk research, but the preparation of the case studies and the organisation of the interviews were delayed by the availability of some of the blueprint projects' stakeholders.

Desk research. The focus was on the analysis of EU publications and documents (for the description of EU initiatives) and the outputs of 21 blueprint projects. In terms of statistics and information, Eurostat and OECD data were used. Other reputable documents were primarily sourced from the European Centre for the Development of Vocational Training (Cedefop) and the European Circular Economy Stakeholder Platform (ECESP).

Case studies. Four sectoral alliances funded as blueprint projects under the Erasmus+ programme were selected as case studies according to three criteria: **criterion A** = **A**dvanced level of maturity, **criterion B** = **B**igness of the employment level of the sector/industry, and **criterion C** = **C**overage of diverse economic sectors/industries. **Table 1** summarises the results of the application of the three criteria to the 21 blueprint projects which were completed or ongoing in December 2022. Criterion A led to the selection of seven alliances (first column). Criterion B identified 'automotive', 'tourism industry' and 'construction' as the three most important sectors in terms of employment level. These three industries only partially satisfied the third criterion C 'Coverage of diverse economic sectors' as the original intent

was to select industries representing the primary, secondary and tertiary sectors. Thus, the fourth selected case was the 'Maritime Alliance for fostering the European Blue Economy through a Marine Technology Skilling Strategy'. Each case was developed according to desk research and interviews. Case studies are described using a common reporting format that allows for comparison across the cases.

Figure 1. Methodological approach and main sources, by task and sub-task

	METHOD	SOURCES
T1: Provide a general overview of skills development and upskilling to embrace circularity by EU industry		
1.1: Provision of referenced terminology and definitions.	Desk research.	Cedefop works; documents accessible from the EC webpage on circular Economy; ILO glossary and documents; OECD; other global actors.
1.2: Data and information mining across statistical databases and reports on (new) skills and (new) professional profiles related to circularity.	Desk research of recent literature and data mining from existing databases. Conversations with key stakeholders.	Skills analyses developed as part of the 21 blueprint projects funded by Erasmus+; Cedefop reports and activities; Eurostat statistics; the European Circular Economy Stakeholder Platform; experts in the domain (e.g., from Cedefop).
1.3: Data and information presentation, with the outline of data gaps.	Highlighting gaps vs. the (new) skills and (new) professional profiles identified under 1.2.	Analysis of the information that is missing and that could be of use to guide evidence-based decision making by key stakeholders (i.e., policymakers, representatives of employers and representatives of workers) in order to influence skilling processes and strategies.
T2: Identification and analysis of major EU initiatives on skilling and upskilling		
2.1: Desk research of EU initiatives.	Desk research.	EU online information.
2.2: Analysis of EU initiatives' activities and state of play, and description of their expected impact.	Desk research.	EU documents, reports, assessments and online information on the identified initiatives.
2.3: Development of four case studies on sectoral alliances to understand barriers and challenges faced.	Desk research and interviews.	Project documents produced by the four selected sectorial alliances; academic literature; position papers of representative organisations (of employers, of workers); statements by industry stakeholders and trade unions; policy documents; skilling curricula; training programmes; statistics, if any; interviews with a maximum of two key stakeholders per alliance.
T3: Provide recommendations and suggest activities and areas to develop in upcoming initiatives at EU level, including possible actions for future EESC work		
3.1: Draw main findings from Tasks 1 and 2.	Synthesis of findings vs. research questions.	Validated/accompanied/complemented by position papers/opinions of relevant stakeholders/organisations/institutions.
3.2: Outline evidence-based policy recommendations which further support an inclusive and job-rich transition to circularity through the skilling of the workforce.	Analysis of opportunities to overcome identified barriers and challenges (SWOT analysis approach).	Framed, when possible, within upcoming initiatives (i.e. the European Year of Skills 2023) and linked, if relevant, to the suggestions made by the EESC in recent and relevant opinions.

Table 1. Application of criteria A, B and C to the 21 blueprint projects

Sectoral alliances ranked by level of maturity (A)	Employment level (number of people) – approximate (B)	Economic sector (C)
Automotive	14 million	Secondary sector
Maritime	120,000	Primary sector (proxy)
Space geo-information sector	25,000	Tertiary sector
Textile and clothing manufacturing	1.6 million	Secondary sector
Tourism industry	12 million	Tertiary sector
Additive manufacturing	*not available (but small)*	Secondary sector
Construction	18 million	Secondary sector

Interviews. These were carried out according to a semi-structured approach with the aim of gathering information, opinions and perceptions from a group of relevant stakeholders belonging to the four selected blueprint projects indicated above. Relevant stakeholders were selected among the blueprint projects' partners taking into account their role in the project (e.g., coordinator, work package leader) and category (e.g., businesses, education and training institutions, trade unions, business associations, public authorities). The semi-structured approach was used because it allows flexibility: topics may be deepened to varying degrees according to the role/category of the interviewed person; questions that are not relevant for the interviewee may be skipped; and arising issues, if any, may be investigated. In addition, this approach makes information collected from different blueprint projects reasonably comparable because of the existing common rationale behind each interview.

SWOT analysis. The drawing of evidence-based conclusions is organised according to the four categories of strengths, weaknesses, opportunities and threats. Recommendations are then identified building upon the opportunities. Where relevant, the drawing of conclusions is validated/accompanied/complemented by position papers/opinions of relevant stakeholders.

3.2 Terminology

There is a lack of common definitions used for green skills and green jobs as well as for skills and jobs related to the circular economy (Cedefop, 2019; OECD, 2023; EC-DG EAC *et al.*, 2023). There are also inconsistencies in the way EU countries refer to the green economy and, accordingly, in the way they select data from existing databases to quantify related jobs (Cedefop, 2019). These pitfalls challenge the common understanding of green skills and of skills for circularity as well as the definition of effective quantification initiatives and monitoring tools. This challenge is also often referred to in the skills analyses made by the blueprint alliances reviewed in Section 4.1.2.

Work on common definitions is in progress and coordinated at the EU and global level through the Inter-Agency Working Group on Work-Based Learning.[1] In a document released in late 2022 by the Group, '**skills for the green transition**' are defined as '*skills and competences but also knowledge, abilities, values and attitudes needed to live, work and act in resource-efficient and sustainable economies and societies*' (EC-ETF-CEDEFOP-OECD-ILO-UNESCO, 2022). With respect to **green jobs**, a reputable definition was introduced by the ILO in 2008, within the interinstitutional 'Green Jobs Initiative' (Stanef-Puică *et al.*, 2022). According to that definition, green jobs are '*decent jobs that contribute to preserve or restore the environment*' in traditional and emerging sectors (ILO webpage on green jobs accessed in February 2023). The definition highlights how green jobs, in addition to their environmental impact, have a positive **social impact** due to **their decency**.

The only definition of '**circular skills**', or skills for circularity, that we found in literature is from RREUSE, an international network of social enterprises in the circular economy. RREUSE defines a circular skill as '*any skill used to preserve the value and extend the lifespan of a product or material*' (RREUSE, 2023). With respect to jobs, Bachus (FEPS, 2022) intends with '**circular jobs**' the activities related to material loop. Circle Economy, an EU-based organisation, defines circular jobs as those occupations that support a strategy for circular economy. Circle Economy further distinguishes circular

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[1] The members of the group are the European Commission (EC), the European Centre for the Development of Vocational Training (Cedefop), the European Training Foundation (ETF), the International Labor Organisation (ILO), the Organisation for Economic Cooperation and Development (OECD) and the United Nations Educational, Scientific and Cultural Organisation (UNESCO).

jobs into core, enabling and indirect jobs. Core jobs directly derive from the definition of circular economy and include jobs related to the closure of raw material cycles, such as repairing jobs and resource management jobs. Enabling jobs are of a more horizontal nature and relate, for example, to design and digital technologies. Indirect jobs are even less specific in supporting the transition to circularity and include, for example, provision of services and logistics (Circle Economy website accessed in July 2023).[2]

At the EU level, the legal definition of circular economy is given in Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment. There, circular economy is '*an economic system whereby the value of products, materials and other resources in the economy is maintained for as long as possible, enhancing their efficient use in production and consumption, thereby reducing the environmental impact of their use, minimising waste and the release of hazardous substances at all stages of their life cycle, including through the application of the waste hierarchy*' (art.2). Alternatively, the European Parliament (EP) provides a simpler definition which is reported in **Table 2** together with the other key terms used in the study.

Table 2. Definitions of key terms used in the study

Term	Definition
Competence	'*Demonstrated ability to use knowledge, know-how, experience and – job-related, personal, social or methodological – skills, in work or learning situations and in professional and personal development*' (Cedefop Glossary online).
Circular economy	'*…a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible*' (European Parliament webpage).
Circular jobs	'*…any occupation that directly involves or indirectly supports one of the strategies of the circular economy*' (Circle Economy website).
Circular skill	'*…any skill used to preserve the value and extend the lifespan of a product or material*' (RREUSE, 2023).
Occupation	'*Set of jobs whose main tasks and duties are characterised by a high degree of similarity*' (Cedefop Glossary online). It is often inter-used with 'Profession'.
Occupational profile	The description of the occupation.
Employability	'*Combination of factors which enable an individual to progress towards or get into employment, to stay in employment and to progress during his/her career*' (Cedefop Glossary online).
Green jobs	'*…decent jobs that contribute to preserve or restore the environment*' in traditional and emerging sectors (ILO webpage on green jobs).
Green skills, or skills for the green transition	'*Skills and competences but also knowledge, abilities, values and attitudes needed to live, work and act in resource-efficient and sustainable economies and societies*' (EC-ETF-CEDEFOP-OECD-ILO-UNESCO, 2022).
Skill	'*Ability to apply knowledge and use know-how to complete tasks and solve problems*' (Cedefop Glossary online).

Note: all online sources mentioned in the table above were accessed in July 2023.

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[2] Together with the United Nations Environment Programme (UNEP), Circle Economy uses this definition to operate the Circular Jobs Monitor, a global tool to geographically locate and quantifying circular jobs.

4.   Findings of the study

4.1   Overview of skills development and upskilling to embrace circularity by EU industry

This section first reports on the latest initiatives carried out to monitor the development of skills and occupations related to circularity (Section 4.1.1). Afterwards, it provides an overview of skill needs for greener and circular economies as identified by 21 blueprint alliances (Section 4.1.2) and by wider analyses at the EU level (Section 4.1.3).

4.1.1 Monitoring the development of skills and occupations related to circularity

The monitoring of the development of skills and occupations related to circularity is constrained by the lack of their definition and by a general lack of comprehensive data that, according to the OECD, has also prevented the carry out of quantitative modelling work on skills composition and skills needs by sector (OECD, 2020). The pitfalls deriving from the lack of commonly agreed definitions on what green jobs are have several consequences, including the inability to measure the impact of green policies on job creation/loss; inability to properly inform policymaking to guide transition processes; lack of comparability among studies that estimate green jobs following different approaches; and difficulty in the selection of data from existing databases that may be used in order to quantify green jobs.

The most recent and relevant initiative to fill this information gap comes from the OECD. In March 2023, the OECD published its estimates on the share of green jobs on the basis of **the level of green tasks characterising a job** (OECD, 2023). This estimate is given at the regional level as the OECD emphasises the importance of knowing the geographical distribution of green jobs (**Figure 2**).

Figure 2. OECD mapping of green-task intensity of employment, 2021 (or latest available year)
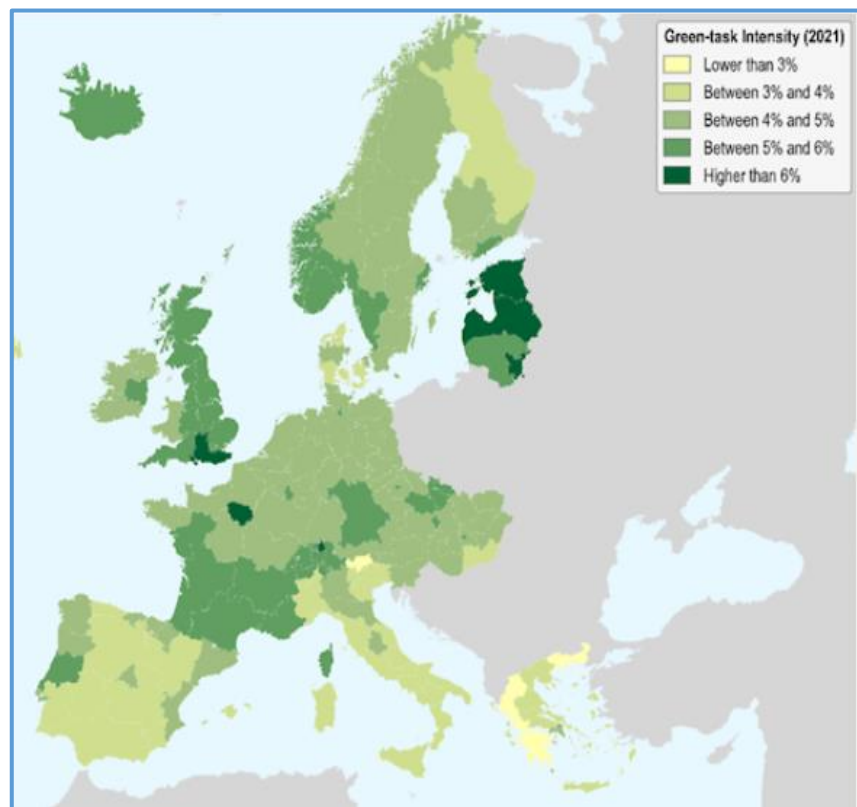
Source: OECD (2023), Figure 2.4, reproduced with OECD permission. Selected geographical area from the original image: Europe.

In fact, the green transition is expected to impact unevenly on jobs' losses and gains as well as on needs for occupations and skills change, not only across industry sectors, but also across territories.

According to this task-based approach, the OECD in its 2023 study on 'Job Creation and Local Economic Development 2023: Bridging the Great Green Divide' concludes that:

- In OECD countries, jobs with a significant share of green tasks range between 7% and 35%, depending on the region.
- Higher shares of green-task jobs are found where there are higher shares of scientific, technical and information technology activities and higher shares of people with tertiary education.
- Over a decade (2011-2021), on average, green-task jobs increased only by 2%, but in some regions the increase was as high as 10 percentage points while other regions experienced a decrease (up to seven percentage points).
- Green-task jobs are found across all regions and sectors. They are more commonly found among men (only 28% of green-task jobs are done by women) and highly-skilled workers.

Also interesting for this study is the OECD quantification of green-task and polluting jobs by industry (**Figure 3**). This quantification shows that mining and quarrying, manufacturing and agriculture/forestry/fishing are lagging behind in the greening of their jobs. Instead, the construction industry as well as the electricity and gas supply industries are ahead in greening their jobs.

Figure 3. OECD quantification of green-task and polluting jobs, percentage of all jobs, by industry, 2021 (or latest available year)
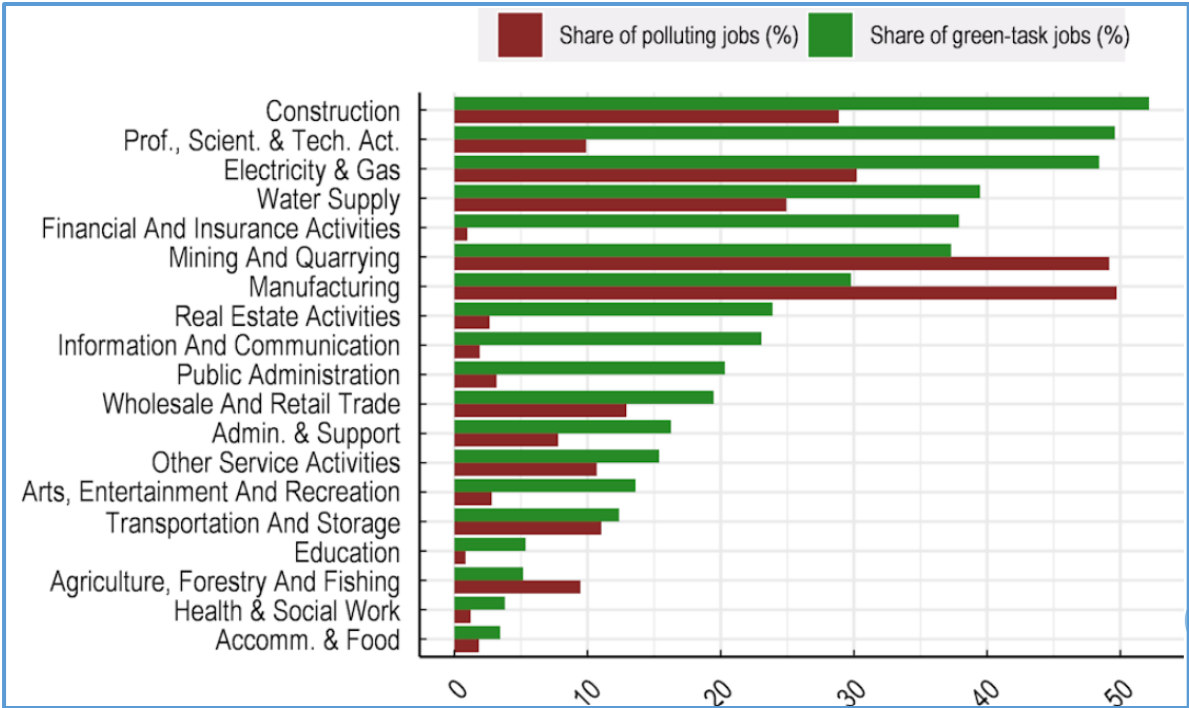
Source: OECD (2023), Figure 2.10, reproduced with OECD permission.

Notwithstanding the data shortcoming, Eurostat is working on the development of a monitoring framework to measure a country's progress towards the circular economy. The EU definition of circular economy provided in Regulation (EU) 2020/852 is at the basis of this development work. The Eurostat framework includes a set of indicators around the five areas of 'Production and consumption' (nine indicators), 'Waste management' (five indicators), 'Secondary raw materials' (five indicators),

'Competitiveness and innovation' (four indicators), and 'Global sustainability and resilience' (four indicators).[3] Among the four indicators of the 'Competitiveness and innovation' area, the number of persons employed in the recycling, repair and reuse sectors and rental and leasing sector is included. This last indicator is the one used by the EC in its communication on 'A new Circular Economy Action Plan' where it is stated that '*Between 2012 and 2018 the number of jobs linked to the circular economy in the EU grew by 5% to reach around 4 million*' (EC, 2020).

Eurostat monitoring framework continues to be updated (a revised version of the framework was released in mid-May 2023), but from our viewpoint **the framework is still lacking one or more indicators on skills for circularity**. This may be a consequence of the fact that these skills have not yet been defined, and/or that existing data flows do not suffice to generate these indicators. Nevertheless, the rationale on which the framework is built should reflect the role of skills as a driver of the transition to circularity. The comparison with the digital transition comes naturally. Digital transition is monitored in each Member State through the DESI index which has a 'human capital' component related to skills. In DESI 2022, for example, this human capital component includes six indicators: at least basic digital skills (% individuals); above basic digital skills (% individuals); at least basic digital content creation skills (% individuals); ICT specialists (% individuals in employment aged 15-74); female ICT specialists (% ICT specialists); enterprises providing ICT training (% enterprises); and ICT graduates (% graduates) (EC, 2022).

4.1.2   Green skills for the future as identified by the 21 sectoral alliances under Erasmus+

The sectoral skills analyses carried out as part of the blueprint alliances funded by Erasmus+ are briefly reviewed in this section in order to gain a broad understanding, by industry, of the skills of the future. **The 21 blueprint projects that were completed or ongoing in December 2022 are considered**. The review shows that green skills are not prioritised by all the alliances.

Six of the 21 blueprint alliances (28%) clearly refer to green skills in their skills needs analysis implemented under the Erasmus+ projects.

- o In the **construction industry**, circular economy is considered important in reducing the material/resources used and the waste generated. Traditional occupations (i.e., craft workers, technicians, workers in general, professionals, architects and planners, craft and related trade workers for dismantling and construction managers) will need upskilling across the areas of safe work with chemicals; waste and recycling (e.g., managing construction waste in a closed cycle, using waste-free and low-waste technologies); use of raw materials; sustainable planning and organisation (e.g., energy-saving architectural design, high comfort and functional buildings); green public procurement; knowledge of regulations; knowledge of dismantling procedures; new procedures of deconstruction; and wood construction (Construction Blueprint, 2022). More on this blueprint alliance is provided in case study #4.
- o The **tourism industry** envisages the need of green skills in the areas of environmental management at destination, planning for sustainable tourism, resource management (water, energy, emissions, waste), awareness on and conservation of nature and culture, green certifications/awards/eco-labels for the industry stakeholders (e.g., tour operators, accommodation providers, restaurants),

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[3] More information is available [here](#).

education and awareness of hosts/guests, knowledge of climate change, renewable energy systems, sustainable materials and impact assessment (NTG, 2019). More on this blueprint alliance is provided in case study #3.

o The alliance for **maritime transport industry** refers to a 'green shipping' area for future skills development. These skills are expected to improve the sustainability of the industry and relate to the understanding of the risk factors involved by alternative fuels and energy sources; operation of complex hybrid, low- and zero-emission machineries; accountability for emissions according to legal requirements; environmental economics; performance management systems; logistics and optimisation methods; and advanced routing (SkillSea, 2022). The alliance developed two [green skill courses](#) covering, among other domains, alternative fuels, green legislation in an operational context, determination of the environmental impact, climate change and the adaptation of transport infrastructure, energy-efficient operation (power production/power consumption/energy efficiency awareness), management of operation in a green context, improvement of green performance in an operational context, calculation and documentation of emissions.

o The **shipbuilding and offshore energy industry** specifies that one of the industry's main drivers in shipbuilding is the 'greening' of operations in order to reduce vessels' air, noise and water emissions and enhance energy efficiency. New skill needs relate to the development of innovative concepts in ship design and the introduction of new technological solutions such as dual-fuel or alternative fuel engines, open- or close-loop scrubber systems and antifouling paints. Concerned occupations are those of naval architects and marine engineers. In the offshore renewable energy sector, new skills will be required in materials engineering as new materials for the development of offshore infrastructure will be introduced, also with a view to extending their life cycle or period of operation (MATES, 2020a; MATES, 2020b). More on this blueprint alliance is provided in case study #2.

o Green skills are required in the **digitalisation of energy industr**y. The alliance reports that these skills are considered necessary and are increasingly 'trending' in the industry. Also referred to as 'skills for sustainability', these skills are expected to be needed to comply with environmental legislation, to reduce energy losses, and to manage large scale Distributed Generation (aimed at generating energy nearby the place where it is used) as well as carbon emissions tracking and reporting. Green skills include '*ethical behaviour, with particular emphasis on preserving the natural environment, ecology (code of ethics); economical use of entrusted resources; waste segregation; energy-efficient drivers; ecological integrity; and ecological sustainability*' (EDDIE, 2022).

o The alliance for **industrial symbiosis** considers green skills as essential for maintaining the competitiveness of the industry as a whole. **This alliance reflects circularity** as 'industrial symbiosis' (IS) is '*the use by one company or sector of underutilised resources broadly defined (including waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials) from another, with the result of keeping resources in productive use for longer*' (SPIRE-SAIS, 2021). Among the green skills characterising an 'IS facilitator' are eco-design, lifecycle thinking, knowledge in waste management, waste prevention, reuse and recycling and knowledge of the corresponding legislation in these areas (SPIRE-SAIS, 2021). The alliance also focuses on the skills necessary to pursue energy efficiency.

Five alliances (24%) marginally refer to green skills in their skills analyses, without elaborating too much on the type of new or emerging skills and/ occupational profiles.

o The **battery industry**, in its intermediate deliverable on the analysis of future skills, does not refer to green jobs, however, the industry, among other profiles, envisages the need for competences related to the modelling and simulation of carbon emissions, responsible sourcing of raw materials, reuse and, most importantly, recycling of batteries. On this last aspect '*Knowledge of the physical/chemical recycling processes is needed and should be supported with environmental skills/knowledge, circular economy, and design of batteries and components*' (ALBATTS, 2022). Recycling will involve both blue- and white-collar workers. In the latest release of the analysis (release 3), the need for skills on impact/lifecycles/circularity assessments was specifically mentioned with respect to the electrification of inland waterways (ALBATTS, 2023).

o The alliance for **Textile, Clothing, Leather and Footwear** (TCLF) industry explicitly recognises the importance of green skills, but, in the short term, priority is given to digital skills as well as to process and production skills, i.e., conventional skills. 40% of the alliance's companies have a green skills gap and green skills are in particular foreseen in the 2030 scenario to be shaped by consumers' sustainable and conscious behaviour. The most relevant occupations related to the green transition are expected to be that of laboratory technician (dealing, for example, with research on new materials and textiles), leather technologist (i.e., a specialist in leather properties), textile finishing technician (dealing with chemical and mechanical processes), supply chain (data) manager, product (lifecycle) manager and sustainability expert (TCLF, 2022).

o In the **primary sector**, the alliance distinguishes skill needs for sustainability, digitalization and the bio-economy in agriculture. The latter is the most relevant in terms of specification of skills and knowledge that are evidently linked to greening or circularity. Skills refer to the efficient use of resources and logistics; the production, management of renewable energy and its use; the by-products and co-products valorisation; and the application of circular economy and recycling practices. Essential knowledge relates to bio-economy and circular economy principles, food waste reduction, energy efficient production methods, biobased products and ecosystem services, reuse, recycling and nutrients circulation vs. nutrients removal (FIELDS, 2021).

o In the **steel industry**, sustainability is an important driver that also affects the skill domain. Green skills are not as essential as specialised technical skills and advanced technological skills, but their importance is growing. This is linked to the need to maintain the competitiveness of the industry in the future and to meet EU environmental targets by 2050. Considered green skills refer to energy efficiency, environmental awareness (i.e., the capacity to include environmental concerns while taking decisions as well as in processes and technologies), waste reduction and management, resource reuse and recycling, and water conservation. These skills have a subordinated-to-moderate role in job profiles, but are of particular importance for some specific jobs such as the 'process engineering supervisor' profile (ESSA, 2022).

o The **microelectronics industry** marginally refers to green skills and even to skills for circularity under a broad 'environmental awareness' knowledge. This knowledge is especially required for process and material engineers in order to green production, but several occupational profiles are concerned. In particular, skills relate to the design stage (to improve the product's environmental performance), the processing of raw materials, the disposal of industrial waste and the energy efficiency of manufacturing. However, environmental awareness ranks 11th out of 12 main technical skills required by the industry, with priority being currently given to skills related to the digital domain (METIS, 2021).

Four other alliances (19%) refer primarily to a broader concept of skills for sustainability.

- The **automotive industry** does not refer to green skills. However, environmental challenges and climate goals are identified as drivers of change and among the future foreseen job roles is a 'sustainability manager'. This manager is expected to develop and implement a sustainability strategy within the company that, among other tasks, looks at waste treatment and disposal as well as recycling of the different materials (textile, electronics, paper, plastic, etc.) (DRIVES, 2020). More on this blueprint alliance is provided in case study #1.
- Similarly, the **blockchain industry** refers to environmental competence as a transversal future requirement for blockchain managers and, to a lesser extent, for blockchain developers and blockchain architects (CHAISE, 2021).
- In the **software industry**, there is no reference to green skills, but the aspects of sustainability management and 'sustainable software' development are mentioned with respect to profession-related skills (where 'sustainable software' implies the presence of 'smart' coding aimed at reducing the use of energy). Even if these two aspects are expected to gain importance in the future, sustainability management is the least needed skill in a set of fourteen professional skills (European Software Skills Alliance, 2021).
- The **defence industry** does not refer to green skills, but under its 'transversal skills' for the C4ISTAR (Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance) domain acknowledges that, in the long term, the aviation industry '*will look for workers with green skills, related to the use of renewable energies and materials for defence equipment, the design and the production of engines with less CO2 emissions*' with the aim of reducing its environmental footprint (ASSETs+, 2021).

Finally, a number of alliances (29%) do not refer to the greening of skills. These alliances include **additive manufacturing**; **space geo-information** (where skills needed in the future are technological and not related to a green or circular thinking); **cultural heritage** (where very broad function areas are identified to determine the industry's competences and occupational profiles); **cybersecurity**; the **rail system;** and the **Work Integration Social Enterprises** (notwithstanding the fact that many activities carried out by social enterprises relate to reuse, recycling and waste management).

The above review shows that the greening of skills is – so far – not an essential aspect for many of the 21 alliances, and even when it is considered an option because of, for example, upcoming greening legislation, it is not prioritised in the short term. Within the alliances, priority is largely given to the development of digital skills [4]. In addition, when categorising the (new) green skills and/or occupational profiles identified in the skills analyses of the 21 sectoral alliances funded by Erasmus+ versus the stages of a theoretical value chain (**Figure 4**), it is noted that some stages demand more green skills than others. In particular:

- The new profiles identified in the skill analyses of the blueprint projects **primarily relate to the design/planning, resource management and production** stages of the value chain.
- New green skills and/or occupations are also demanded for material sourcing and disposal/recycling in a reasonable number of industries.

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[4] The fact that these alliances were implemented during the COVID-19 pandemic may have raised the demand for digital skills by the industry component of the projects and slightly changed the skilling, upskilling and reskilling priorities. This aspect was raised during the interviews with the tourism blueprint project.

    o   Green skills for the three stages of sales/operation, outbound logistic and post-purchase service are required in very few industries.

The above findings may point to the need to include the perspective of the end-users in the blueprint alliances. Including this perspective would give adequate emphasis to the identification of new green skills in the industry in order to follow up on those stages of the value chain that are of direct importance to consumers (i.e., operation, sales and post-purchase).

Figure 4. Authors' categorisation of the (new) green skills/occupational profiles identified by the 21 blueprint alliances, by industry and by value chain's stage
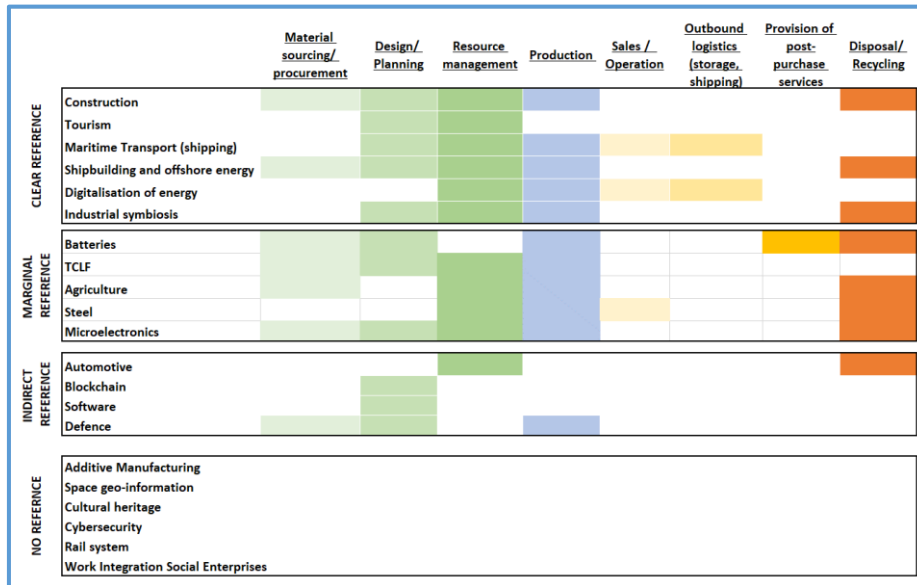
Notes: 1) Attributions are made by the authors on the basis of the desk review of selected deliverables of the blueprint alliances – see list of references. 2) The value chain is defined as a concept describing the stages needed to add value to a product or service. These stages are: material sourcing/procurement, design/planning, resource management, production, sales/operations, outbound logistics (storage, shipping), provision of post-purchase services, disposal/recycling. The concept is kept broad in order to accommodate the skills identified within a wide range of EU industries.

4.1.3   Green or circular skills for the future as identified in EU-wide studies

In 2019, the OECD conducted a review of studies analysing the impact of circular economy on employment. This state-of-the-art exercise principally looked at the quantitative aspect, but also made considerations on the changing requirements in terms of skills. From the quantitative point of view, the review of 47 scenarios from 15 modelling studies concluded that the implementation of resource efficient and circular economy policies may result in a net jobs gain ranging from 0% to 2% (OECD, 2020). The OECD also noted that '*An analysis of global sectoral economic data in 2011 reveals that just four material-intensive sectors (i.e. construction, food products, primary metals and non-metallic minerals and power generation and distribution) account for almost 90% of global material use, while relying on only 15% of the workforce. This suggests that overall job losses resulting from policies that tackle materials consumption might be modest. This loss could potentially be more than compensated by job creations in more labour intensive sectors, most notably services*' (OECD, 2020). The growth of employment is also confirmed by Cedefop. Cedefop has undertaken studies on the green economy

and/or green skills since 2008. In 2021, it forecasted that the adoption of the European Green Deal would result in employment growth (+1.2%) and 2.5 million new jobs. This growth will affect sectors differently, with some sectors such as mining and quarrying experiencing a decline in their employment levels (Cedefop, 2021). The transition to circularity is expected to have a net positive effect on employment and require the upskilling of workers also according to Bachus, author of the chapter on 'The job impact of the circular economy: an outline' in 'The Circular Economy and Green Jobs in the EU and Beyond' (FEPS, 2022). The author refers to the findings of a Flemish study to show that in some EU countries the growth of circular jobs is significant. In particular, in Flanders, 'circular jobs' increased by 16.4% over the period 2008-2020. These jobs mainly concerned men and blue-collar work and showed no significant differences from the regional average in terms of age and wage.

From the point of view of types of jobs that will be affected, an OECD working paper (OECD, 2020) underlines the scarcity of information, in literature, on the future skills that will be needed to support the circular economy transition. However, it also points to some specific findings that are partially confirmed by our review of skills needs of the blueprint alliances. First, **skills needs for circularity are concurrent to needs determined by other drivers of change, digitalisation currently being the most important of these drivers**. In practice, these two sets of skills are often mutually required, as indicated by some of the skills analyses made by the blueprint alliances. This interdependency is also well reflected by the 'twin transition' concept where the green and digital transitions interact and reinforce each other to deliver against EU policy targets. The interaction between the two transitions generates the demand for cross-cutting skills such as those related to STEM and communication (EC, 2018). Second, the OECD reports that Chateau, Bibas and Lanzi (2018) noted **a wider variation in occupations than in skills when it comes to the green transition**, and concludes (by referring to a 2010 Cedefop report) that '*In general the evidence suggests that most green jobs only require a 'topping up' of existing skill sets rather than the development of completely new skill sets'* (OECD, 2020). This may be intended as the need for upskilling rather than reskilling.

A recent study by RREUSE (2023), that refers to circular skills and is thus a step forward with respect to only 'greening' activities, envisages an increase of manual skills needs in activities related to repair, reuse and preparation for reuse. Research on manual skills carried out by McKinsey & Company results in different findings (**Box 1**). Notwithstanding these contradictions that may simply depend on sector-specific needs, it is interesting to note that RREUSE (2023) also indicates that skills for the circular economy need to be complemented with other skills such as digital and cognitive skills.

> **Box 1. The importance of skills related to social and emotional aspects may increase**
> According to McKinsey & Company, the importance of manual and physical skills will decrease while the need for new skills related, for example, to social and emotional aspects will increase. The research distinguishes four categories of skills that will be demanded of future workers: cognitive, inter-personal, self-leadership and digital. Among the findings of this research is that proficiency in these skills does not necessarily require formal educational attainments.
> Source: McKinsey & Company article accessed online in March 2023.

Bachus (FEPS, 2022) reports that, in general, circular jobs are considered more labour intensive than the average. This is particularly true for reuse, rental and leasing as well as repair occupations. In

addition, jobs in the circular economy require practical experience and more on-the-job training, are diversified and primarily based on technical skills. However, only a small proportion of these skills are directly linked to circularity. In addition, technical/specialist and STEM skills will need to be combined with horizontal skills such as soft, communication, social and digital skills. Also, the ability to understand integration along the value chain will be important. This understanding requires the presence of transversal skills. Finally, the author believes that the changes driven by circularity highlight the importance of vocational and educational training (VET) and of lifelong learning for workers to keep pace with ongoing transformations; of skills forecasts in the medium and long term, rather than in the short term; and of large-scale reskilling/upskilling interventions.

A study by Ethica (2021) investigates if and in which terms STEM skills will be changing in the transition to a circular economy. The study focuses on the Nordic region (Denmark, Finland, Iceland, Norway and Sweden) and states that STEM professions are key to the transition to circularity because they deal with design and technology development. Still, a change in the way analysis and problem solving are carried out is necessary. For this reason, the study develops a circular economy competence framework to establish how circular economy principles should guide STEM professionals and engineers. In practice, besides their specialisation in a single discipline/sector, STEM professionals and engineers are required to widen their horizontal knowledge with sustainable and circular economy competences. At the design stage, lifecycle thinking, knowledge of circular materials and impact of products and services over their lifecycle are required. A second competence relates to the knowledge of circular business models. A third competence relates to the management of system/interconnections and to digitalisation. Finally, the competence framework also includes interdisciplinary skills such as communication and collaboration.

By focusing on the youth, a recent work carried out within the framework of the project 'Circular Economy- Sustainable Competences for Youth' (CESCY), implemented over the period 2019-2022 and co-funded by Erasmus+ Strategic Partnership, provides insights on the attitudes, skills and knowledge considered necessary for young people to participate in the transition to circularity (CESCY Project, 2022). According to the consultation of 50 companies from five EU countries, necessary attitudes include adaptation and flexibility, creativity, motivation and mindset, ethics and vision. Some of these attitudes reflect the need to think outside of the box. For example, creativity is needed to transform products into services or to think of new products based on waste streams. Among the necessary skills are leadership and teamwork, collaboration, communication and critical thinking, design thinking and systems thinking. For example, the latter is key to understanding impact areas and dependencies. Finally, the desired knowledge includes the understanding of what circular economy and circular business are. According to these findings, CESCY developed a 'Circular Economy Competence Framework for Young People' that also includes a self-assessment tool. The CESCY project had no evident follow-up after its completion.

Cedefop most recent and relevant initiative (**Box 2**) is a 'Sectoral skills foresight' project (2021-ongoing) that in May 2023 produced a policy brief titled 'From linear thinking to green growth mindsets'. The foresight work, which is based on the consultation of experts, does not identify specific new occupations, but considers the following as essential for the transition to circularity: circular product design skills; systems thinking; technical skills for circular approaches; product and process design skills; skills enabling working in a multidisciplinary team; and data analysis skills (Cedefop, 2023).

> **Box 2. Limited focus on green skills of past Cedefop sectoral analyses of skills development**
>
> Cedefop carried out broad sectoral analyses of skills development for the tourism sector (2020), the automotive industry (2021) and the construction sector (2023). Green skills are only briefly mentioned in both the tourism and automotive industries analyses. Instead, the reference to green skills is more relevant in the analysis of the construction sector (April 2023) that is importantly based on the deliverables produced by the blueprint alliance for the construction industry.

In summary, the above review shows that **green skills cannot be disentangled from digital skills**; that **existing technical skills will need to be framed differently** in order to achieve a systems thinking approach from the design to the disposal stages; and that **a range of 'horizontal' skills** related to, for example, social, cognitive, communication and flexibility aspects, and not necessarily attained through formal education, **will be increasingly required of workers**. Furthermore, it is expected that **new circular economy competence frameworks will need to be developed** for categories of workers (e.g., young people) or categories of skills (e.g., STEM).

4.2 EU skilling initiatives: state of play and their expected impact

4.2.1 The Pact for Skills

The European Skills Agenda 2020[5] launched the Pact for Skills. The Pact for Skills is a flagship initiative promoted by the European Commission (EC) which aims at facilitating joint efforts for the reskilling and upskilling of European workers. By means of **large-scale multi-stakeholder partnerships**, it encourages joint work and pooling of resources in order to have a greater impact. Common stakeholders involved in these partnerships are social partners, businesses, education and training providers, associations, sectoral organisations, chambers of commerce, public authorities at all levels (national, regional and local) and employment services. Some of the ecosystems supported by the Pact for Skills have made skilling commitments; others have potential commitments in the pipeline. The way blueprint alliances link to the Pact for skills is explained in **Box 3**.

> **Box 3. Blueprint alliances and the Pact for Skills**
>
> In late November 2022, the European Education and Culture Executive Agency (EACEA) launched within the Erasmus+ programme a call for Alliances for Sectoral Cooperation on Skills implementing the 'Blueprint'. The call specifies that '*The large-scale partnerships under the Pact for Skills will build on the Blueprint for sectoral cooperation on skills. Therefore, Alliances under this funding call will support the implementation of the commitments under the Pact by developing sectoral skills strategies. These strategies have to lead to systemic and structural impact on reducing skills shortages, gaps and mismatches, as well as ensuring appropriate quality and levels of skills*' (DG EMPL website accessed in March 2023).

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[5] COM(2020)274 final.

The role of the EC under the Pact for Skills is to provide a range of support services organised under four main areas (SPIRE-SAIS Mid-Term Conference [presentation](#) dated 3-4 March 2022):

- Knowledge Hub: information on EU funding opportunities, tools, best practices and instruments for upskilling and reskilling; access to skills intelligence sources such as Cedefop and the blueprint alliances; knowledge-sharing and peer learning among members of the Pact, including through the organisation of webinars.
- Networking Hub: partnering and networking initiatives among the members of the Pact and also with other potential members; mapping of relevant initiatives at national, regional and local level; linking of partnerships with relevant national initiatives and strategies; and building synergies with existing EU initiatives such as Europass and Cedefop skills intelligence.
- Communication Hub: organising high-level skills fora, ensuring presence in social media and on the web, publishing quarterly newsletters, engaging according to a communication strategy, maintaining progress of commitments made.
- Support for Partnerships: providing technical assistance tailored to the needs of each partnership (following an agreed roadmap). Support is provided with respect to governance, funding, upscaling commitments, monitoring progress, anticipating skills needs and quality of re/upskilling offer.

There are two types of partnerships for skills: Large-Scale Partnerships (LSPs) and Regional Skills Partnerships (RSPs). At the EU level, LSPs define an engagement model for stakeholders from the 14 industrial ecosystems, and value/supply chains, of the renewed EU Industrial Strategy. Regional Skills Partnerships are multi-stakeholder partnerships implementing the Pact for Skills' objectives at a regional level (one or more regions can be within one EU Member State or across different EU Member States) without necessarily focusing on a single industrial ecosystem. **Box 4** reports on the first Regional Skills Partnership launched in late 2022 under the Pact for Skills. That is an example of RSP defined by a territorial scope. A second Regional Skills Partnership was launched in February 2023 (EC [news article](#) dated 02/02/23). It focuses on the skills needed for the green and digital transition of the chemical industry across European regions and is an example of RSP defined by the type of industry.

Box 4. Regional Skills Partnership for the Regione Lombardia (Italy)

The Regione Lombardia partnership addresses industry-related challenges by means of skilling initiatives systematically supported by cooperation among a broad range of stakeholders, from public entities to businesses, trade unions and associations. The three commitments made by the partnership relate to (i) the promotion of skills and professions for a sustainable production system which implies the setup of a regional observatory focused on Sustainable Business Taxonomy and new skills; (ii) the identification of local needs in terms of skills and alignment of needs with training paths for young people; and (iii) the facilitation of investments in digital skills. Point (ii) will allow the identification of necessary upskilling and reskilling initiatives within the local economy.

Sources: Regione Lombardia Regional Skills Partnership [Agreement](#); EC [news article](#) dated 16/12/22.

In terms of impact, in May 2023, the EC indicated the involvement in the Pact for Skills of **1,500 stakeholders and the existence of 18 large-scale partnerships. Overall, these partnerships '*have***

committed to offer upskilling and reskilling opportunities for at least 10 million people of working age across the EU in the coming years' (EC news dated 5/06/23). At the end of 2022, the impact on the ground of the Pact for Skills was estimated by the EC to be: '*1,999,277 individuals reached by upskilling and/or reskilling activities; 15,525 training programmes updated or developed, and, €159,955,721 invested into upskilling and reskilling*' (EC, 2023a).

Not all industries with a Pact for Skills have made skilling 'commitments' (as called by the EC) or 'ambitions' (as called by the partnerships). **Table 3** provides the details of some of the commitments quantifiable in terms of skilled, upskilled and/or reskilled workers. **Box 5** provides an example of a partnership that has no commitments specified in terms of number of workers to be upskilled and/or reskilled, but has made potential commitments in terms of training offer.

Table 3. Skilling commitments, or ambitions, under the Pact for Skills

Shipbuilding and Maritime Technology	**Offshore renewable energy**
• Upskilling and reskilling 7% of the workforce over 5 years, equal to 201,600 people. • Attracting 234,000 new talents by 2030.	• Skilling 20,000 - 54,000 new workers over five years (2021-2026). • Upskilling and reskilling for 250,000 people by 2025.
Construction • Upskilling or reskilling at least 25% of the workforce in the next 5 years, with a target of 3 million workers.	**Aerospace and Defence**: • Upskilling 6% of the workforce per year, reaching at least 200,000 workers. • Reskilling 300,000 new talents.
Tourism • Upskilling or reskilling of 10% of the workforce each year, from 2022 to 2030 (1.3 million workers). • Increase participation in upskilling and reskilling by 40% of the workforce and by 80% of the unemployed until 2025.	**Microelectronics**: • Upskilling/reskilling 250,000 workers by 2025.
	Automotive • Upskilling/reskilling of 5% of the workforce per year (expected skilling of 700,000 workers).

Sources: partnership agreements under the Pact, downloadable from DG EMPL webpage on the Pact for Skills; EC Pact for Skills presentation dated 6 April 2021; SPIRE-SAIS Mid-Term Conference presentation dated 3-4 March 2022.

Box 5. The potential commitments of the alliance of the textile, clothing, leather and footwear (TCLF) industry

118 organisations from the TCLF industry signed a pact on 16 December 2021 (Euratex webpage accessed in March 2023). The first objective of the Pact aims at 'Promoting a culture of lifelong learning for all'. Upskilling and reskilling outcomes are foreseen under this objective and do not solely target the industries' employees but also the youth, the unemployed and workers from other industries that may wish to change their career. Among the foreseen activities under this objective are the design and roll out of courses on green skills (promoting durability, repair and waste management activities) and circular design skills. The Pact does not include any concrete commitment, but 'potential commitments' are indicated, among which are a 20% increase of the offer of apprenticeships in the industry, the design of 20 new tools and processes related to digital and green skills, and a 10% increase, EU-wide, of the training of trainers offer (Pact for Skills for

the EU TCLF industries, 2021). The TCLF's skills strategy specifies that those entities participating in the pact receive financial, administrative and networking support from the EC to implement collaboration initiatives and projects (TCLF, 2022). It also underlines that '*From the perspective of the Sectoral Skills Strategy, the development of regional /national TCLF Pact for Skills, inspired by the EU Pact for Skills actions and activities, will be crucial for the successful implementation of the recommendations*' (TCLF, 2022).

4.2.2 The European Commission 100 intelligent cities challenge

The challenge supported 136 cities over the period 2020-2022 in achieving their digital and green transition. A new group of cities will be supported in the second edition of the challenge that was launched in December 2022 and is implemented through Local Green Deals. One of the themes covered by the challenge is the upskilling and reskilling of cities' workforces (ICC webpage on upskilling and reskilling accessed in March 2023). In 2023, the European Innovation Council and SMEs Executive Agency (EISMEA) and DG GROW prepared under the challenge a 'Cities Guide to Reskilling the Local Workforce – Introduction to launching a Local or Regional Skills Partnership'. For this initiative, no evidence was found on its impact.

4.2.3   The European Alliance for Apprenticeship (EAfA)

The European Alliance for Apprenticeships (EAfA) is a skilling initiative of the European Commission which focuses on quality and effective apprenticeships. From the policy point of view, its scope is shaped by the Youth Employment Support package launched in July 2020. The Alliance supports the implementation of the Youth Guarantee and aims at reducing the skills supply and demand mismatch on the labour market. In February 2023, EU funding to EAfA was renewed. The Alliance's members are supported in delivering apprenticeships through networking, knowledge-sharing and bench-learning activities. In addition, under the Alliance, pledges are made by different stakeholders according to various objectives among which is to increase the supply of apprenticeships. Since 2013, the Alliance reports the facilitation of 382 pledges, corresponding to the creation of 1,072,362 apprenticeships places, the majority of which were created in recent years (735,355 between 2019 and 2020) (EAfA news dated 5/08/21). In 2021, when the pledges were surveyed among the alliance's members, EAfA's added value was also surveyed. EAfA as a multi-stakeholder platform was in general considered valuable or very valuable by 89% of the respondents; the most appreciated support was knowledge-sharing and exchange of best-practices (82% of the respondents), followed by networking and opportunities for cooperation (54%) (EC-DG EMPL, 2021). Also, EAfA reports that members appreciated the '*sense of belonging to a community of like-minded people with shared goals and objectives*' (EAfA news dated 5/08/21).

4.2.4   The Just Transition Fund

The Just Transition Fund (JTF) is a new financial instrument under the cohesion policy. Established by Regulation (EU) 2021/1056, its scope is to provide support in addressing the socio-economic challenges deriving from the climate transition. Among the activities eligible for funding is the **upskilling and reskilling of workers and jobseekers** (Art.8). In particular, support is foreseen to enable these persons to '*adapt to new employment opportunities*'. The fund has an envelope of more than €25 billion over the period 2021-2027. At the country level, its resources are allocated by means

of JTF operational programmes. **Box 6** reports on an example of its use from Ireland. More examples of using the JTF for the skilling of workers in transition situations may be sourced through the IndustriAll European Trade Union's Just Transition website.

**Box 6. Greening workers' skills with the JTF: an example from Ireland**

€590,000 from the JTF are used to support the skilling and upskilling of all the employees of an Irish semi-state company, Bord na Móna, impacted by the decarbonisation process. The company produced peat-made briquettes which were used as fuel. With the end of peat-harvesting, driven by the transition away from fossil fuels, the company has a 'brown to green' strategy in place with the aim of remaining a major employer in the Midland region. The JTF is used to facilitate the re-engagement in low-carbon employment or in alternative employment of all its employees (approximately 1,500, according to Bord na Móna website). Apparently, several employees have asked for third level or specialist industry qualifications. The training will take place over the period 2021-2024.

Sources: EU cohesion data online; Ireland's JTF; Bord na Móna website accessed in March 2023.

4.2.5   The Technical Support Instrument

The Technical Support Instrument (TSI) is an initiative of the EC to support EU countries in the implementation of structural reforms, including in the policy area of skills, education and training. TSI is the successor of the Structural Reform Support Programme (2017-2020). It is managed by DG REFORM and has allocated €864 million over the programming period 2021-2027. It supports any stage

Figure 5. TSI projects in the policy area of skills, education and training
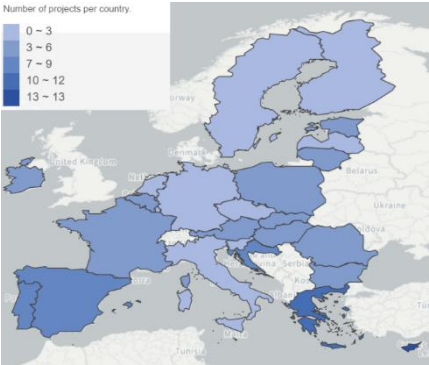
of the envisaged reforms. It does not require co-financing and is activated following a request from an EU Member State. Since 2015, 115 projects have been implemented on skills, education and training. The map in **Figure 5**, created and extracted from the TSI's projects webpage, shows the distribution of these projects across EU countries. Some examples of recent projects funded under the TSI are 'Technical assistance for the elaboration of a National Skills Strategy of the Republic of Bulgaria' (Bulgaria, 2022), 'Support on the implementation of a national skills framework for learning pathways' (Greece, 2022) and 'Digital skills to increase quality and resilience of the health system in Italy' (Italy, 2022).

4.2.6   The New European Bauhaus Academy

The New European Bauhaus (NEB) initiative is meant to support the implementation of the Green Deal by accelerating the green transformation according to the core values of sustainability, aesthetics and inclusiveness. The initiative, launched in 2021, puts emphasis on creativity and on the contribution of the whole society to the exploration and design processes in order to tackle environmental (sustainability) and societal (accessibility and affordability) needs. The NEB relies on skills and knowledge as enablers of change and has direct links to circularity in the construction industry. This evidence led to the establishment of the NEB Academy. In the context of the 2023 European Year of

Skills, the NEB Academy aims to foster green and digital skills in the construction sector. More in general, **funded with a grant of €1 million** from the Circular Biobased Europe Joint Undertaking, **the NEB Academy** is expected to **provide training and knowledge-sharing opportunities related to sustainable construction**, biobased materials and circularity (EC, 2023b). However, this and other initiatives such as the community-led NEB Lab 'NEB goes South' project seem to be more related to education than to the skilling of the workforce.

4.2.7   The European Circular Economy Stakeholder Platform (ECESP)

The European Circular Economy Stakeholder Platform is a joint initiative by the EC and the EESC. The platform has a dissemination and interaction scope aimed at accelerating the transition to circularity. Started in 2017, nowadays it is a **mature virtual space**. In May 2023, it included more than 760 good practices. The 'education and training' toolbox lists relevant skilling projects. Other sections provide examples of strategies/commitments/pledges as well as access to relevant studies/documents/reports. The platform is a **key source for identifying initiatives** in skilling, upskilling and reskilling towards circularity. It is meant to be of use to the whole society, including businesses, trade unions, consumers and public authorities at all administrative levels. From the governance point of view, there is a Coordination Group comprising 24 members whose mandate has recently been renewed up to 2025. Members are pan-European entities/organisations from the civil society, the private, academic/research and public sectors. In its work plan for 2023, the Coordination Group decided to focus on a limited number of topics (bioeconomy, built environment, textile, citizen engagement and circular behaviour, and critical raw materials) and on some horizontal themes (biodiversity and climate, cities and regions, economic steering instruments and circular procurement). So far, the platform has contributed to keeping the circular economy high on the political agenda. Its ambition for the future is to continue embedding (the principles of) circular economy across economic sectors and territories in close liaison with its 'parent institutions', the EC and the EESC (ECESP, 2023). Among its outputs, the reflection papers, derived from the #EUCircularTalks organised by smaller groups within the platform, are important to feed policymaking.

4.2.8   The European Institute of Technology and Innovation Community initiative on Circular Economy

The initiative is put forward by five of the Knowledge and Innovation Communities (KICs) of the European Institute of Technology and Innovation (EIT). The KICs encompass education, research and business partners and support training and education activities to facilitate the market launch of innovations. This specific initiative is supportive of innovations fostering a circular economy. Among the other objectives of the EIT initiative on Circular Economy is the collaboration with relevant organisations and institutions among which are the EC and the EESC. So far, the impact of this initiative appears to be confined to the categorisation of the KICs' activities related to the transition to circularity. Still, KICs are a way to channel funds to the 'knowledge communities' and this opportunity could be explored further in future talks with the EC and the EESC.

4.2.9   Cedefop Green Observatory

Cedefop green observatory displays the agency's work on skills and jobs for the green transition. In a briefing note released at the beginning of 2022, it is stated that the observatory, expected to be launched

in the same year, '*will generate new insights by blending information from different data sources. It will draw on the Agency's real-time labour market analysis on green jobs and skills, the sectoral foresights, the skills forecast and results from several studies'* (Cedefop, 2022). The observatory includes links to publications, events, news and articles related to the green transition. It also links to the skills forecast and skills intelligence tools of Cedefop that nevertheless do not focus on green skills. In general, the Green Observatory seems still to be in a starting phase compared to its ambition to become the repository of new or existing information on green skills and jobs. A potential area for improvement is the analysis of big data generated by the number of job vacancies posted on the online Skills-OVATE tool. This analytical task could be merged into the forthcoming European Web Intelligence Hub managed by Eurostat (**Box 7**) while keeping its focus on green skills well-distinguished.

Box 7. Web Intelligence Hub

The Web Intelligence Hub analysis of online job advertisement data (WIH-OJA) is a joint initiative of Eurostat and Cedefop. It aims at developing skills intelligence on the basis of the analysis of millions of job advertisements. The WIH is developed as part of the European Statistical System (ESS) innovation agenda.

Source: WIH conference webpage accessed in May 2023.

4.2.10   Net-Zero Industry Academies

As part of the proposed Net-Zero Industry Act, the EC is planning to facilitate the upskilling and reskilling of workers required for net-zero technology industries. It will do so by supporting '*the setting up of specialised European skills Academies, each focussing on a net-zero technology and working together with Member States, industry, social partners, and education and training providers to design and deploy education and training courses'* (EC, 2023c). Importantly, the proposal mentions that '*the Technical Support Instrument can help Member States and regions in preparing net-zero growth strategies'* (EC, 2023c).

In summary, the above review shows the existence of several initiatives at the EU level that are potentially supporting the development of green skills in the European workforce. With the exception of the Net-Zero Industry Academies initiative that cannot be commented at this early stage of 'proposal' of the regulation, the other nine identified initiatives are listed in **Figure 6** highlighting their targeted stakeholders, used instruments and scope.

Overall, there seems to be a balanced mix of initiatives made available to public and private actors. Geographical and industry coverage also seem adequate. In addition, there seems to be a balance between initiatives aimed at sharing and informing, and initiatives aimed at more directly supporting skilling. Among the most evident **shortages** highlighted by looking at the list are the **lack of initiatives exclusively focused on the greening of skills** (on the contrary, there are initiatives focusing on digital skills – see **Box 8**); **of initiatives specifically targeting green skills for the youth** (the European Alliance for Apprenticeship has no focus on green skills even if it can accommodate apprenticeships for greening skills); and **of initiatives with compulsory skilling targets** (the EC is largely relying on voluntary pledges or ambitions). Other noted weaknesses include the **limited scope of some of the identified initiatives** (namely the Cedefop Green Observatory and the EIT initiative on Circular

Economy) and the apparent **low use of some of the instruments suitable for skilling** (in particular, the Technical Support Instrument).

Figure 6. Identified EU initiatives within the study

	Target stakeholders	Instruments	Territorial scope	Industry scope	Skilling commitments of the European workforce?
Just Transition Fund	National and regional public authorities	Projects	Yes	Yes	According to project objectives
The European Alliance for Apprenticeship	Youth	Pledges	No	Yes	Compulsory
Pact for skills	ALL	Large-Scale Partnerships & Regional Skills Partnerships	Yes	Yes	Voluntary
The 100 intelligent cities challenge	Local public authorities (cities)	Local Green Deals	Yes	Yes	Voluntary
Technical Support Instrument	National public authorities	Projects	Yes	Yes	Not applicable
The New European Bauhaus Academy	ALL	Projects	No	Yes	Not applicable
The European Circular Economy Stakeholder Platform (ECESP)	ALL	Platform	No	No	Not applicable
Cedefop Green Observatory	ALL	Observatory	No	No	Not applicable
EIT initiative on Circular Economy	Education, research and industry stakeholders	Projects?	No	No	?

Note: 'ALL' is inclusive of social partners, businesses, education and training providers, associations, sectoral organisations, chambers of commerce, public authorities at all levels.

Box 8. Partnership for digital skills and 'Digital skills and jobs coalition'

Contrary to the green domain, the digital domain is characterised by well-defined targets and initiatives in terms of digital skills development of citizens and workers. The 'Digital Compass: The European Way for the Digital Decade*'* set the target of 20 million employed ICT specialists in the EU by 2030, with a gender convergence. This target adds to the target set in the European Pillar of Social Rights Action Plan of having at least 80% of adults with basic digital skills by 2030. In July 2022, a multi-stakeholder partnership for digital skills was established under the Pact for Skills. This partnership has the goal of contributing to the above-mentioned targets as well as of proposing and implementing commitments in terms of digital upskilling and reskilling of both workers and citizens. One of the foreseen approaches is the up-scaling within the partnership of best solutions or practices (Skills Partnership for the Digital Ecosystem, 2022). Another key EU initiative to promote digital skills is the Digital skills and jobs coalition launched in 2016 under the Connecting Europe Facility Programme. The coalition brings together Member States, companies, social partners, non-profit organisations and education providers with the aim of creating and facilitating training opportunities for all in the digital area. The Coalition had the target of training 1 million unemployed youth by 2020. Among its other ambitions, there is the upskilling and reskilling of the European workforce (no monitoring indicators are specified). The Coalition invites members to take commitments, or make pledges. In return, members get visibility, networking and experience-sharing within the community. In order to take stock of all the digital skills and jobs initiatives in Europe, the EC created the Digital Skills and Jobs Platform as a knowledge base. The platform gives access to the national coalitions of EU Member States, some of which report on results achieved so far. For example, the Italian coalition reports that '*In 2020, the initiatives of the National Coalition for Digital Skills have trained more than 2.7 million students, 70,000 teachers, over 90,000 citizens, and more than 250,000 workers from both the private and public sectors*' (webpage of the Italian National Coalition for Digital Skills and Jobs or 'Repubblica Digitale').

4.3 Sectoral skills alliances: four case studies

The EC launched the **Blueprint for Sectoral Cooperation on Skills** initiative in its 'A new skills Agenda for Europe' ([COM(2016) 381 final](#)). In the 2016 Skills Agenda, the Commission envisaged the creation of sectoral skills partnerships in order to improve skills intelligence and address skills shortages in economic sectors. According to the plan, these partnerships were first to be piloted in specific sectors and then extended to other sectors in successive waves. In 2018, five (i.e., automotive, maritime technology, space, textile and tourism) out of the planned six partnerships received support through the Erasmus+ programme[6]. These blueprint alliances were aimed to embrace all key stakeholders from the industrial ecosystems (e.g., businesses, trade unions, research institutions, education and training institutions, public authorities/bodies); and to roll out strategic cooperation at the national and even regional levels (DG EMPL [webpage](#)).

This part develops four cases on the alliances for automotive, maritime, tourism and construction (see [section 3.1](#) for the rationale of the selection of the cases). The case studies investigate the relevance given by the selected alliances to endowing their workforce with the necessary green skills and/or skills for achieving a transition to circularity. In each case study, the consortium composition is analysed to understand if it affected project's implementation and/or outcomes. Challenges and barriers to skilling, upskilling and reskilling are also investigated. Finally, the future perspective of the blueprint projects and their evolution towards a greener dimension and/or transition to circularity contribute to define the 'highlights' section of the cases.

Desk research based on the publicly available documents and deliverables of the blueprint projects and of their Pact for Skills were integrated by interviews with representatives of organisations involved in the consortia of the projects (see section 3.1 '*Overview of the methodology used and limitations*'). Details of the interviewees are reported in [Appendix II](#), according to the level of public disclosure indicated by the respondents.

4.3.1 DRIVES: the blueprint project on the automotive sector

Scope of the project, partnership and roles of the involved stakeholders

'[DRIVES - Development and Research on Innovative Vocational Education Skills](#)' was a 51-month (1/1/2018-31/3/2022) project in the automotive sector co-funded by the Erasmus+ programme with a grant of €3,987,590. DRIVES was one of the five partnerships piloted in the first wave. Its objectives were to gain Sectoral Skills Intelligence; identify drivers of change, new or emerging job roles and skills, as well as skills gaps in training and education offer; develop a Sectoral Skills Strategy; define actions needed to be taken by sectoral stakeholders; develop a set of training courses; support the closing of the gap in the education and training area; ensure recognition of the skills achievements around Europe; and enable a sustainable collaboration on the skills agenda in the sector. DRIVES aimed at understanding the changing skills needs and trends, developing a roadmap for skills, setting a mutually recognised framework for skills definition that also serves the transferability of skills, and exploring the possibility to create an apprenticeship marketplace. The partnership included 24 partners from 10 EU countries (AT, BE, CZ, ES, HU, IT, NL, PL, PT, RO) plus the UK and 12 associated partners (DRIVES [webpage](#)

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[6] The launch of the partnership on defence was delayed to 2020.

on the Erasmus+ project database). The alliance, comprising partners and associated partners, embraced almost all the key stakeholders from the industry ecosystem, with a **dominance of industry** (represented by European and national business associations among partners and associated partners). The second most represented category included education and training/research institutions (mainly represented by universities). Trade unions and public authorities were involved only as associated partners. A Steering Board, chaired by the three European business associations in the consortium (i.e., ACEA, supported by CLEPA and ETRMA), relied on the expertise and input from 12 associated organisations. The consortium was led by the Technical University of Ostrava from the Czech Republic. The alliance covered the whole value chain, from automotive industry suppliers to vehicle manufacturers (which are usually also car sellers) (**Table 4**).

Table 4. Profiles of partners and stakeholders in DRIVES

#	Profiles of the 24 partners
7	Universities and other higher education institutions (most of them with a technical/technological focus)
6	Service providers focusing on consultancy for skill adaptation and training, innovation, and sustainability in general with half of them providing services tailored for the automotive industry
4	National business associations (i.e., for automotive manufacturers and importers, for the automotive sector, for the industry in general)
3	European business associations (i.e., for vehicle manufacturers, for automotive suppliers, for tyre and rubber manufacturers)
2	Civil society organisations dealing with vocational education and training (i.e., an association focusing on education, learning and training to increase the professional capacity of specific target groups; a non-profit education cooperative providing higher engineering education, vocational education, long-life learning and research, and technology transfer)
1	European business associations for vocational education and training Institutions
1	Automotive sector suppliers (i.e., for metal components)

#	Profiles of the 12 associated partners
3	European business associations (i.e., for automotive trade associations and brand dealer councils; for metal, engineering and technology-based industries; for the petrochemical industry)
3	National business associations (i.e., for metallurgical employers, for the automotive industry)
1	Automotive manufacturers at the international level (i.e., cars)
1	Automotive sector suppliers (i.e., for car interiors)
1	Trade unions at the international level representing workers in mining, energy and manufacturing sectors
1	Associations of local/regional public bodies (i.e., national association of municipalities)
1	Local/regional public bodies (i.e., municipalities)
1	Companies providing online international business- and employment-oriented services

Source: authors' analysis based on the profiles of partners and associated partners on the DRIVES website.

The core activities of DRIVES were carried out through four operational Work Packages (WPs): *Sectoral intelligence and roadmapping* (WP2), *Skills framework* (WP3), *Skills transferability* (WP4) and *Apprenticeship marketplace* (WP5).

Analysis of needs: relevance given to green skills or skills for circularity

WP2 '*Sectoral intelligence and roadmapping*' (led by Spin360, a service provider focusing on innovation and sustainability) had to identify the changing skill needs of the automotive sector taking into account the main drivers of change. It also had to continuously update a strategic roadmap for future skills needs. Skill gap analysis was carried out through extensive desk research complemented by two surveys: one addressed to the automotive companies and automotive sector organisations (skill demand side) and one to educational organisations[7] (skill supply side). The surveys considered five groups of drivers of change (i.e., changes in the way people use cars; climate goals, environmental and health challenges; new technologies and business models; globalisation and new players; and structural change). Despite the fact that climate goals and environmental challenges were recognised as 'very important' by the stakeholders belonging to the demand side (ranked second) and by stakeholders from the supply side (ranked first), they were far from being considered 'very urgent' by the majority of them (ranked, respectively, fifth and fourth) (**Table 5**). An index combining the urgency and importance of each driver of change was used to prioritise what needed to be addressed in the automotive sector.

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[7] VET schools, colleges, universities, research institutes, accreditation centres/qualification bodies, private companies involved into EQF3 - EQF8 activities and 'umbrella organisations'.

Table 5. Urgency and importance of drivers according to the survey's respondents

Groups of drivers of change	DEMAND SIDE				SIPPLY SIDE			
	'very important' % of respondents	Ranking	'very urgent' % of respondents	Ranking	'very important' % of respondents	Ranking	'very urgent' % of respondents	Ranking
Structural change	**55%**	1	64%	1	48%	2	**46%**	1
New technologies and business models	38%	3	47%	2	39%	3	39%	2
Changes in the way people use cars	34%	4	39%	3	35%	4	19%	5
Globalisation and new players	32%	5	37%	4	28%	5	29%	3
Climate goals, environmental and health challenges	51%	2	37%	5	**51%**	1	27%	4

Note: urgency was defined against three timeframes: by 2020 (very urgent), by 2025 (urgent) and by 2030 or later (not urgent).

Source: authors' representation of DRIVES survey results included in DRIVES (2019) and in DRIVES (2020a).

Through the DRIVES questionnaire addressed to the automotive demand side, respondents were asked to verify, confirm, add, or amend the list of proposed drivers of change; rate them by importance on a scale from 0 to 5; and specify the expected period of impact (i.e., by 2020, by 2025, by 2030 or later). Then, for each driver of change, respondents were asked to indicate current or emerging skills of the workforce and to identify the job roles that will need to evolve as a result of changing skill requirements (DRIVES, 2019).

Achievements and impacts. The way green skills and green jobs are considered.

The comparison of demand and supply as identified through the survey led to the definition of gaps and to a DRIVES training offer to address them. One of the main outputs of DRIVES is a learning platform, that, after the completion of the project, was hosted on the web domain of the Automotive Skill Alliance (ASA). The platform aims at *'bringing training solutions to the mobility workforce of the future embracing the sector transformation with a skilled workforce'* (home page of the ASA learning platform) through a number of Massive Open Online Courses (MOOCs) that can be accessed upon registration. On 31 March 2023, one year after the closure of the project, the platform offered MOOCs responding to the skill needs of 30 job profiles out of the over 70 profiles initially identified in the gap analysis of the DRIVES project. The DRIVES MOOCs last from one to two weeks and are mainly available in English. As stated by Štolfa (VSB-Technical University of Ostrava) during the interview *'the relevance of the DRIVES skilling, upskilling and reskilling impact is witnessed by numbers. For example, through the MOOCs, more than 3,000 persons enrolled, and 2,000 persons were up/reskilled. The regional and national roll-out and mainstreaming of the project results were also done through collaboration with the Pact for Skills' large-scale partnership in the Automotive-Mobility Ecosystem – the Automotive Skills Alliance'.* [8] On 31 March 2023, the registered participants in the MOOCs were 3,532. For 28 MOOCs, a certification is foreseen at the end of the course and after the positive completion of a test. One of the considered job profiles for which a MOOC is provided explicitly relates to green skills: the sustainability manager. This manager is expected to be in charge of developing and implementing a sustainability strategy at the company level and also looks after the implementation of waste reduction practices. The MOOC for this job profile includes six training units dealing with, among other areas: problems that need to be managed through a sustainability approach (e.g., energy management, air and water pollution, waste treatment, textile and leather treatment); sustainability

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[8] The TRAUTOM project (supported by the Just Transition Fund with almost €20 million) is one of the pilot regional projects participated in by ASA and focusing on the achievement of a climate-neutral economy (webpage of the workshop Pact for Skills - Enabling the green transition in automotive regions, at the European Week of Regions and Cities 2022). Planned to start in 2023, the project aims at establishing and maintaining a regional upskilling/reskilling system for the workforce in the Moravia-Silesia region in three main industrial areas: automotive, steel and energy. It includes 88 partners from the region and a key automotive cluster in Czechia with around 30,000 employees. Among its objectives is the upskilling/reskilling of 5,000 people before 2026 (CoR, 2022; ASA presentation dated 8/06/22 on the 'Strategic Erasmus projects in the automotive skills agenda').

solutions for the automotive sector (e.g., waste treatment and disposal methods, metal and aluminium recycling, paper and plastic recycling, electronics recycling, textile and leather recycling); and sustainability in the design processes. On 31 March 2023, the registered participants for the sustainability manager MOOC were 82. There are other job profiles, and related MOOCs, for which skills promoting a greener approach than in traditional jobs are provided. Examples are the MOOC for the rubber technologist (basic) (with one of the six training units aimed at stimulating sustainable or green compounding usage) and for the powertrain engineer (advanced) (with one of the seven training units aimed at presenting issues related to greenhouse gases emissions and the use of fossil fuels as well as to the knowledge of fuel alternatives). On 31 March 2023, the registered participants for these two MOOCs were 61 and 94, respectively. On 30 June 2023, the ASA learning platform offered 44 MOOCs as a result of the integration of the DRIVES training offer with some courses from ALBATTS, the Alliance for Batteries Training and Skills[9] and the EIT InnoEnergy.

Challenges and barriers in ensuring the proper skilling, upskilling and reskilling of the workforce

It is evident that in the automotive sector the demand for green skills and jobs was lower than the demand for digital/technological skills and jobs. As confirmed by Frassinetti (Sistemi Formativi Confindustria) during the interview, *'Skills provided through the MOOCs are mainly related to the fast change led by digital transformation and the increasing relevance of new technologies, digitalisation, robotisation, automation, and technological progress. Lack and shortage of these skills were evident in the results of the gap analysis carried out in DRIVES'*. This explains the lower urgency given to address the drivers of changes related to climate change and the environment compared to those related to new technologies adoption/digital transformation. Thus, the main structural barrier to the provision of green skills and the definition of green jobs profiles in the automotive sector was their low prioritisation by the industry, i.e., the lack of demand. As confirmed by Madaleno (Eupportunity), *'in the call for projects there was no obligation to refer to green skills. Projects had to address the changes in the sector and adapt skills to upcoming transitions. Notably, back in 2019 when the DRIVES skill gap analysis was conducted, the EU policies referring to digital and green transition were not yet very much mature. In the automotive sector, at that time, the two big trends were related to digital and mobility changes (e.g., driverless cars)'.* Štolfa (VSB-Technical University of Ostrava) highlighted that the environmental aspects have always been considered by the DRIVES project among the drivers of change in the automotive sector. *'DRIVES did not specifically address green skills as such, but through its approach to skills intelligence and continuous training, skills and job roles that support the digital and green transitions have been targeted and the environmental component was importantly considered, namely with respect to car pollution; material for tyres and for rubber parts of cars in general; better and greener processing and usage of materials; waste reduction'.* One of the main general barriers experienced in DRIVES, according to Madaleno (Eupportunity), was *'the adaptation time needed to formalise identified training curricula and their skilling contribution at the regional and/or national level. The blueprint designed and developed material, but its roll-out is slow. The update of VET curriculum in some EU countries takes more than two years'.*

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[9] ALBATTS - Alliance for Batteries Training and Skills is a 4-year project co-funded by the Erasmus+ programme with a grant of €3,985,074. Implemented over the period 1/12/2019-30/11/2023, the partnership includes 20 partners from 9 EU countries plus Norway and 12 associated partners (ALBATTS webpage in the Erasmus+ project database).

Future perspectives and evolution towards a green dimension or transition to circularity

The Automotive Skills Alliance (ASA) was established in January 2022 as a Large-Scale Partnership under the Pact for Skills, i.e., around two months before the completion of DRIVES. ASA became the natural tool for continuing the collaboration on skills in the automotive ecosystem. As specified in the DRIVES Sustainability & Legacy deliverable, *'the Automotive Skills Alliance (ASA) is a non-profit entity focused on the re-skilling and up-skilling of workers in the automotive sector, developing intelligence and fostering dialogue among all relevant partners and stakeholders in the sector, and supporting the elaboration of specific plans for re-skilling, up-skilling and training of workers in the EU automotive sector'* (DRIVES, 2022). ASA builds upon the collaboration network and achievements of both DRIVES and ALBATTS, and aims at pursuing its mission through the implementation of EU-funded projects. In ASA, ALBATTS introduced a relevant green dimension. For example, the lifecycle approach and environmental footprint are currently investigated in the ASA Working Group 3.7 led by SPIN360 (ASA website), a partner in both DRIVES and ALBATTS. In fact, cooperation between the two alliances was facilitated by the fact that six out of the 20 partners in ALBATTS were also partners in DRIVES. Furthermore, the coordinator of DRIVES became president of ASA and this circumstance ensured continuity to DRIVES. In April 2023, ASA included more than 100 partners contributing to the Pact for Skills of the industrial ecosystem 'mobility-transport-automotive' (ASA proposal updated on 18/02/21). ASA has the ambition of implementing at least five pilot projects in European regions and the yearly upskilling/reskilling of 5% of the workforce in the coming years. Overall, some 700,000 employees are expected to be upskilled/reskilled in the automotive ecosystem (ASA website). Erasmus+ funding is used to provide green-related upskilling and reskilling opportunities. Both VSB and SPIN360 are involved in the Virtual open Course of Automotive Life Cycle Assessment (a 2-year Erasmus+ 'cooperation partnerships in higher education' lasting from November 2021 to October 2023) and in the GREEN project (see section 4.3.5).

Highlights related to the green dimension of the blueprint project

- The **prevalent participation of the industry** in DRIVES allowed a proper mapping of the skill and job profile needs in the automotive sector. However, it may have stressed the **actual needs more than the future ones**, **favouring an urgent market-driven digital up-take rather than mid-term green-oriented practices.**
- Sustainability is recognised as a company-level process that should be implemented through a strategy and monitored across all the production phases. The horizontal job role of the **'sustainability manager' is proposed to introduce circularity in the automotive sector**.
- The European automotive industry mainly needs **technology-driven green job profiles** that also require digital skills (e.g., rubber technologist, powertrain engineer).
- The green dimension of skills and job profiles in the automotive sector and the related roll-out at local and/or regional level was somewhat neglected in DRIVES, but it gained relevance within the **Automotive Skills Alliance** (ASA) formalised through the Large-Scale Partnership in the Transport-Automotive-Mobility Ecosystem within the Pact for Skills. ASA is committed to support both the digital and **the green transitions, including through the implementation of territorial projects**. There is a specific Working Group (i.e., WG4) devoted to the regional implementation of ASA initiatives.
- Wide-scope ambitions of the ASA and of the Pact for Skills rely on the capacity of the ecosystem to identify **funding opportunities to sustain skilling, upskilling and reskilling activities**. The

options offered by the Erasmus+ programme and the Just Transition Fund seem effective for specific initiatives focusing on the greening of skills.

4.3.2 MATES: the blueprint project on the maritime sector

Scope of the project, partnership and roles of the involved stakeholders

The 'MATES - Maritime Alliance for fostering the European Blue economy through a Marine Technology Skilling Strategy' was a 52-month project (1/1/2018-31/4/2022) in the maritime sector co-funded by the Erasmus+ programme with a grant of €3,999,471. MATES was one of the five partnerships piloted in the first wave. Its objective was to develop a skills strategy addressing the main drivers of change of two sub-sectors of the maritime industry, linking and finding synergies between the two: a traditional one, shipbuilding (SB), and an emerging one, offshore renewable energy (ORE). To this end, MATES provided skills intelligence to close existing skills gaps especially in terms of digital and green skills; tested the launch of the strategy through 11 pilot case studies in different regional contexts; implemented awareness raising to increase the attractiveness of maritime careers; and enriched the perceptions about Ocean Literacy initiatives by embedding an appropriate industrial perspective.

The partnership included 17 partners from seven EU countries (BE, EL, ES, IE, IT, NL, PT) plus the UK (MATES webpage in the Erasmus+ project database). The consortium included almost all the key stakeholders from the industrial ecosystems (i.e., trade unions were not represented). Education and training/research institutions were the most represented, followed by businesses (represented by manufacturing and service companies and business associations) and public bodies/authorities (**Table 6**). MATES was coordinated by the public foundation 'Centro Tecnológico del Mar – Fundación CETMAR' (Spain). The consortium covered most of the maritime value chain and included a relevant public component that guaranteed a territorial strategic engagement in the skilling, upskilling and reskilling of the local workforce of the maritime sector.

Table 6. Profiles of partners in MATES

#	Profiles of the 17 partners
4	Universities and other higher education institutions (most of them with a technical/technological focus)
3	Local/regional public bodies (i.e., one public foundation at the regional level, one education department of a regional authority, one managing authority for a regional fund for research and development)
1	National association of public and private organisations involved in the maritime domain (e.g., port authorities, companies, associations, research institutes, universities, public authorities)
1	Service providers focusing on project management and innovation transfer (with a focus on EU-funded projects connected to the maritime domain)
1	Service providers focusing on consultancy for training, innovation (with a focus on the maritime domain)
1	Service providers focusing on consultancy for communication, stakeholders engagement and outreach
1	Service providers focusing on consultancy (including the enviromental aspects in the off-shore domain)
1	National business associations (i.e., metal producers)
1	Research center in transport
1	Association at the EU level of universities in maritime technologies
1	Engeneering service company in various industries (including maritime and energy)
1	Manufacturers in the shipbilding domain

Source: authors' analysis based on the profiles of partners on the MATES website.

The core activities of MATES were carried out through five operational WPs: *Mobilisation of stakeholders* (WP1), *Strategy baseline: identification of present and future skills needs* (WP2), *Identification of priorities and lines of action* (WP3), *Pilot Experiences* (WP4) and *Long term action plan and sustainability* (WP5).

Analysis of needs: relevance given to green skills or skills for circularity

A six-step methodology designed in WP2 *'Strategy baseline: identification of present and future skills needs'* (led by CERTH-HIT, a research institute in transport) was at the basis of the analysis carried out to assess the skills demand and supply mismatch and to identify the main gaps and shortages in terms of competencies in SB and ORE. The process started with the mapping of the job profiles across the maritime value chain. Afterwards, such evidence was compared with the skills demand and supply. Desk research (e.g., about job vacancies), workshops, surveys, interviews and focus groups with experts were used to depict the overall picture. The analysis of digital skills, green skills and the 21st century skills led to the identification of a general skills mismatch in both SB and ORE sub-sectors (MATES, 2020a). Focusing on the green skills, during the interview Soto (CETMAR) underlined that *'MATES usually referred to green skills and took circular economy aspects into account. All the pilot experiences framed their activities within the main EU policies including the circular ones related to the maritime sector such as green retrofitting, minimising environmental impact in shipbuilding (e.g., sustainable practices, reduction of polluting emissions, innovative construction materials, antifouling systems) and optimising the processes of decontamination and recycling of decommissioned vessels'*.

The analysis of skills needs was carried out through a critical review of existing needs in Europe for education, training and skills in SB and ORE sub-sectors, coupled with the identification of potential key paradigm shifters (led by AQUATERA, a service consultancy focusing on offshore projects under WP3 *'Identification of priorities and lines of action'*). Identified paradigm shifters for ORE were: automation & advanced robotics; 3D printing; smart grid & smart sensors; big data; and energy storage. Identified paradigm shifters for SB were: vessel automation, vessel autonomy and advanced robotics; exploitation of alternative fuels and renewable energy sources; digitalisation; 3D printing; green retrofitting**;** and drones. Delphi[10] exercises carried out with sectoral stakeholders aimed at shortlisting the most significant identified key paradigm shifters and at mapping them with the effects on current and future jobs, analysing the demand of related occupations and identifying the most effective educational methods to address skills gap (MATES, 2020b). This process led to a Maritime Technologies Skills Strategy based on the identification of 10 Lines of Actions (LoAs) in SB and 12 in ORE.

Achievements and impacts. The way green skills and green jobs are considered.

In the prioritization process carried out in MATES, out of the 10 LoAs identified in SB, the two directly relating to the green dimension (i.e., SB3, *Training, reskilling/upskilling workforce in the use of technologies for minimising environmental impact in shipbuilding e.g., sustainable practices, reduction of polluting emissions, construction materials and antifouling systems;* SB4, *Optimizing the processes of decontamination and recycling of decommissioned vessels)* ranked third and seventh, respectively. Out of the 12 LoAs identified in ORE, the one directly relating to the green dimension (i.e., ORE2, *Training, reskilling/ upskilling workforce in order to increase technical knowledge on energy storage)* ranked second. The digital-related LoAs gained the top positions in both rankings. Each LoA was then

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[10] *'The Delphi method is based on the principle that forecasts from a structured group of individuals are more accurate than those from unstructured groups. Participating experts respond to questionnaires in two or more rounds. After each round, a facilitator provides an anonymized summary of the experts' forecasts from the previous round as well as the reasons on which their judgments were made'* (MATES, 2020b).

connected to one or more of the 11 pilot experiences developed in MATES (MATES, 2020c). Among the pilot experiences, Green Move promoted the professional mobility of students and workers to encourage the use of green technologies in SB and in ORE. Green Move provided competencies at EQF 3-8 level related to the environmental impact of shipbuilding and offshore renewables energies and to techniques and technologies to reduce it. The pilot had more than 440 participants (teachers, students and companies' staff) who exchanged knowledge and increased their professional networks through online events and activities in presence; more than 30 education centres/institutions and 16 companies involved; and nine types of technical knowledge acquired (i.e., *sustainable ship and shipping, offshore structures manufacturing; automation and robotics, environmental impact and solutions for the tidal energy sector, eco-painting, future prospects for offshore wind energy, sustainable wooden boats, innovation and sustainability in the shipbuilding sector, renewable energy generation*) (MATES, 2021). As for all the pilot experiences, guidelines to replicate the pilot were published and used as reference practices in other projects. The H2020 project BRIDGE-BS, launched in June 2021 and participated in by CETMAR, adopted the Green Move guidelines in the Black Sea context. Another relevant pilot experience concerned the definition of new occupational profiles in SB and in ORE. This pilot experience aimed at contributing to the European Skills, Competences, Qualifications and Occupations (ESCO) Classification[11] by feeding the ESCO database with new profiles in SB and in ORE and by updating existing occupations in the two sub-sectors. Some 95 occupational profiles related to SB and ORE value chains were reviewed together with the associated skills and competences. This activity led to the identification of 14 new relevant skills, the update of skills for 46 job profiles and the identification of 10 new job profiles, out of which five did not exist in the ESCO database. The offshore renewable energy engineer, the offshore renewable energy technician, the offshore renewable energy plant operator and the drone pilot (for ORE), as well as the alternative fuels engineer (for SB) were included as MATES contribution in the updated ESCO v1.1 classification released in February 2022 (MATES, 2022a).

Overall, the green dimension and circularity aspects were, at least to a certain extent, included in most of the MATES pilot experiences. Examples include the short courses in ORE, encompassing a renewable energy crash course treating the technical, financial, business and environmental aspects of the marine energy sector; and the training seminar in additive manufacturing and risk management in the shipbuilding and ship repair sectors designed to support the SB workforce through upskilling and reskilling in green technologies. Across the 32 recommendations included in the sustainability and long-term action plan of the MATES project, foreseen actions include the update of the occupational profiles with new green competencies and the integration of green skills contents in trainings (MATES, 2022b).

Challenges and barriers in ensuring the proper skilling, upskilling and reskilling of the workforce

The maritime industry is based on a unique and non-serial process of high-value products with long manufacturing periods. In addition, the maritime sector in general, and SB and ORE in particular, are characterised by a complex environment that combines multiple industries, technologies, skills, and education domains. This makes it quite challenging to have in place a participatory approach aimed at developing a joint sectoral skill strategy. An interviewed representative of CERTH-HIT also highlighted the relevance of the time lag existing between the emergence of skills needs in the industry and the availability of training/education arrangements providing such skills. In addition, '*In SB, there is a lack*

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[11] ESCO (European Skills, Competences, Qualifications and Occupations)) is the European multilingual classification of skills, competences, qualifications and occupations.

of adequate skilling, reskilling and upskilling at VET level, while the lack of recognition of VET certifications/qualification obtained in a specific Member State across the EU hinders the mobility of workers. The ORE sub-sector is characterised by a highly geographically concentrated demand for jobs (i.e., mainly in the North Sea) and this limitation contributes to exacerbate the already existing skills mismatch – although this is now changing and investments are forthcoming in the Mediterranean region as well'. All these peculiarities, including the fact that the industry is concentrated in some regions across the EU, make it, according to Soto (CETMAR), *'challenging to map in a systematic way the current skills in the industry'*. Language barriers also represent an obstacle for a comprehensive skills intelligence analysis at the EU level. *'Moreover, skill developments in maritime technologies can be a challenge if long-term and sustainable funding is not secured, especially in times of drastic technological changes, growing automation, and use of robotics and Artificial Intelligence (Industry 4.0) that affect competence models and curricula'* (Soto, CETMAR).

Future perspectives and evolution towards a green dimension or transition to circularity

In April 2022, the MATES project ended with an already established path for the continuation of its skills strategy built over more than four years. Two parallel streams for exploiting and making the skilling, upskilling and reskilling actions defined in MATES more concrete characterise this path where the green dimension is fundamental. The first stream is the Pact for Skills. Under the Pact, large-scale partnerships were created for both the sub-sectors considered in MATES. The one related to ORE, led by CETMAR, has made the commitment *'to support the qualification process for the new jobs in the sector (estimated between 20,000 and 54,000 new workers in the next five years) and contribute to improved upskilling opportunities for the current ORE workforce'* ([webpage](#) of the ORE Pact for Skills). Key performance indicators were proposed to monitor and measure achievements in each of the four clusters of lines of actions, namely, running an observatory on training needs and offer in the ORE sector; promoting life-long learning in ORE for all; promoting careers in the ORE sector; and building durable skills partnerships for the ORE sector. The large-scale partnership related to SB, led by SEA Europe (partner in [SkillsSea](#), the blueprint alliance in maritime shipping) and IndustriAll Europe, has set the ambition to '*up- and re-skill 7% of their employees each year, for the next 5 years, totalling 201.600 people, and attract 234.000 new talents by 2030'* ([summary of the EU Social Partners' Proposal for the shipbuilding Pact for Skills](#)). The public-private investments needed to meet this ambition is estimated at €1 billion. Four pillars guide the future actions of the SB Pact for Skills: skills analytics; upskilling and reskilling of over 200,000 workers in the next 5 years; attracting 230,000 new workers to the industry in the next 10 years; and improving the sectoral education and training offer.

The second stream relies on accessing funding under the Erasmus+ programme. Submitting project proposals under Erasmus+ calls is a way to fund the activities aimed at achieving the commitments made under the Pact for Skills. In addition to the usual collaborative projects under Key Action 2 (KA2), the Erasmus+ 2022 call included a new type of projects, named Forward Looking Projects, allowing large-scale partnerships to submit joint proposals. The first example of this type of projects is [FLORES](#) (Forward Looking at the Offshore Renewable EnergieS). FLORES aims at creating a future vision of the Marine Renewable Energies sector through the stimulation of training for new jobs, while improving training opportunities for the current workforce. FLORES is a 2-year project started in January 2023 and coordinated by CETMAR. It foresees regional pilot actions adapted to the different needs of European sea basins (i.e., the Atlantic, the Baltic and the Mediterranean basins). In the future, such pilot actions are expected to initiate mirror working groups in the Pact for Skills in the ORE sub-sector. Other

examples of Erasmus+ funding raised in the maritime sector include the Green Diving project (a 2-year project co-funded through Erasmus+ and started in May 2022) aimed at enhancing green skills, sustainability and attractiveness of Maritime VET (also participated in by CETMAR), and the GREEN project (see 4.3.5).

Highlights related to the green dimension of the blueprint project

- The **presence of public actors in the MATES consortium** led to the endorsement of the alliance's skill strategy especially in those regions/areas in which the maritime industry was a key economic sector for sustainable local development (i.e., in Spain and in Portugal).
- According to a representative of CERTH-HIT, a larger **participation in the consortium of umbrella associations of businesses at the international level** would have expedited the data collection process and analysis of the actual and future skills of the maritime sector across the EU.
- The **green dimension embedded in ORE** and the **compliance with the environmental legislation and practices** sought **in SB** are increasing the demand for green skills as well as the need for new and updated green job profiles.
- The follow-up to **skilling, upskilling and reskilling is based on** MATES seeking financial support through projects granted on a competitive basis such those launched under the Erasmus+ programme. The participation of the MATES coordinator (i.e., CETMAR) in these projects guarantees a certain continuity to the MATES actions, especially when green skills are concerned.

4.3.3 NTG: the blueprint project on the tourism sector

Scope of the project, partnership and roles of the involved stakeholders

The 'NTG - Next Tourism Generation Alliance' was a 54-month project (1/1/2018-30/06/2022) in the tourism sector co-funded by the Erasmus+ programme with a grant of €3,896,367. NTG was one of the five partnerships piloted in the first wave. The project's focus was on five tourism sub-sectors (visitor attractions, food and beverage operations, accommodation providers, destination management and tour operators and travel agencies) and on three sets of skills (digital, green and social skills). NTG was expected to improve the collaboration between the industry and training institutions; assess current and future skills needs as well as shortages, gaps and mismatches; develop a method to anticipate future needs; indicate priorities for reviewing or setting new qualifications; and develop skills-related products and tools. The partnership included 14 partners from 7 EU countries (BG, DE, ES, IE, HU, IT, NL) plus the UK and a number of associated and affiliated partners (NTG webpage in the Erasmus+ project database). The

Table 7. Profiles of partners in NTG

#	Profiles of the 14 partners
6	Universities and other higher education institutions (most of them with a focus on tourism and also providing VET)
3	National business associations (i.e., for companies in the tourism sector)
2	Associations at the international level promoting training, research and exchange of best practices in the tourism sector
1	National VET providers/training centres (most of them focusing on training for the tourism sector)
1	National associations of chambers of commerce
1	Service providers focusing on consultancy for skill adaptation and training

Source: authors' analysis based on the profiles of partners on the NTG website.

consortium encompassed almost all types of stakeholders from the industrial ecosystems (**Table 7**). Trade unions and local/regional public authorities were not represented. Education and training institutions were the major representative group of the consortium, followed by businesses (represented by national associations in the tourism sector). In order to gather key stakeholders of the industry ecosystem, National/Regional Skills Partnerships were established in each of the countries of the NTG partners. NTG was coordinated by the Italian Travel and Tourism Federation 'Federturismo Confindustria'.[12]

Analysis of needs: relevance given to green skills or skills for circularity

Green skills in the NTG project are defined as those skills related to *'resource management to recycle and manage waste, water and energy services including principles of circular economy in the design and management of tourism value chains, sustainable design and management techniques of hotels and sustainable tour packages'* (NTG, 2019). From the proposal stage, green skills were included as one of the types of skills (together with digital and social) to be investigated for the future of the tourism industry. For what concerns skills related to circularity, they were only marginally considered. As stated by a representative of a NTG partner, *'In 2017, when NTG was proposed, the focus on the circular economy was not included as the topic was not at the top of the EU policy agenda. If we were to present NTG today, the focus on the circular economy would certainly be there'*. Green skill needs in the five tourism sub-sectors were investigated through desk research, job vacancy scanning, surveys and interviews with stakeholders (stakeholders' engagement was primarily from employers' networks) in each of the eight NTG countries. At the EU level, the analysis of green skills requirements, completed in January 2019, concluded that there was *'very little mention of specific green skills required for jobs in all NTG tourism sectors'* (NTG, 2019). In terms of sub-sectors, there were very limited references to green skills or sustainability skills in 'Travel agents and tour operators' and 'Visitor attractions'. Instead, skills for environmental sustainability were found relevant in 'Accommodation providers' and 'Food and beverage operations', especially when concerning resource efficiency and waste management. However, this relevance was not really translated *'into clearly defined green skills'* (NTG, 2019). Evidence from some EU countries indicates that environmentally-friendly behaviours in the tourism industry are led by legally binding practices or by cost-saving considerations. Actions include, for instance, energy saving, separate waste collection and water saving. The NGT project also found that the delivery of green skills for the tourism workforce is mostly outsourced to external training providers and is usually connected to the achievement of voluntary certifications related to environmental management practices.

Achievements and impacts. The way green skills and green jobs are considered.

A number of tools were developed during the project life: the NTG governance framework, the NTG skills assessment methodology, the NTG tourism sector skills toolkit and the quality skills standards framework, the NTG skills matrix and the NTG skills lab. A detailed NTG mapping exercise provided the indication of the needed standard competencies for each of the European Qualification Framework (EQF) levels (from 1 to 8) related to digital, social and green skills. The nine categories of green skills

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[12] The NTG project was initially led by the Cardiff Metropolitan University. However, in order to avoid any possible issues related to the project continuity due to Brexit, it was decided to change the coordinator. The Cardiff Metropolitan University remained in the NTG project as a partner.

include: ability to minimise the use and maximise efficiency of energy and water consumption; ability to manage waste, sewage, recycling and composting; conservation of biodiversity; promotion of sustainable forms of transport (e.g., public transport); promotion of environmentally friendly activities and products; knowledge of climate change; environmental legislation; food waste management; and management and coordination of green policies among tourism stakeholders. For each category, a detailed list of competencies was given against the eight EQF levels.

Within the human resources framework, 19 examples of existing occupational profiles across the tourism sub-sectors were described (with roles, responsibilities, working environment and hours, entry requirements and progression pathways) and integrated with knowledge and understanding (i.e., know it), competencies (i.e., show it) and behaviours (i.e., live it) with respect to digital, social and green aspects. Although each of the 19 occupational profiles requires one or more of the categories of green skills (with the related competencies) there is only one green-specific occupational profile in the framework: the environmental education officer.

Within the NTG Sector Skills Toolkit, examples of training curricula were developed using the competency matrix for EQF levels 3, 5 or 7 and by profile (i.e., operational staff, supervisor/lower management, senior management/executive). Curricula are available for skilling, upskilling and reskilling with respect to digital, social and green aspects. They are structured in modules, with 63 modules covering 38 topics. 14 topics (28 modules) relate to digital skills, 19 topics (28 modules) relate to social/transversal skills and only five topics are structured into seven modules that concern green skills. These modules are: reducing plastic waste, communicating sustainability, climate change (2 modules), food waste (2 modules) and sustainable tourism. Rexworthy (People 1st International) highlighted that *'the NTG toolkit is very useful for several different stakeholders that typically would not use that type of documentation'.*

The NTG Skills Lab provides training material and guidance for employees and job seekers, employers and SMEs, as well as for education and training institutions. The online NTG Skill Matrix is available for businesses of different sizes of the five sub-sectors and can be used to understand which types of competencies are needed for each type of skills (green, digital and social). According to Tetley (People 1st International), *'although the matrix was driven by industry and written in language that the industry understands, it is a tool that can be picked up by academics and used within education'.*

As indicated during the interview with representatives from 'People 1st International', the main target of the project was to create a standard framework for skilling, upskilling and reskilling the workforce of the tourism industry rather than to achieve specific quantitative targets (e.g., in terms of number of skilled, upskilled and reskilled persons). At the end of the project, ten case studies were piloted in order to favour the usage, test and adoption of the NTG Sector Skills Toolkit. One of these cases had a specific focus on green and environmental management skills, namely on the introduction of an advanced training module on 'Tourism and green innovation' (Isnart Union Camere case study, Italy).

Challenges and barriers in ensuring the proper skilling, upskilling and reskilling of the workforce

The charter of the Pact for Skills in the Tourism sector confirms that the '*collapse of global tourism during the COVID pandemic (loss of 80% in 2020) affected around two-thirds of direct tourism jobs, whilst the entire tourism ecosystem struggles to attract and recruit qualified people for specific jobs'.*

Rexworthy (People 1st International) highlighted that the pandemic disrupted the industry globally. Some businesses were unable to reopen and many people working in the industry chose to go into new, emerging and 'secure' industries such as logistics. '*We ended up with a skills deficit when businesses tried to reopen'*. With regard to skills mismatches in the sector, Rexworthy (People 1st International) highlighted that *'There are always a lot of mismatches between skills demand and supply and the interesting thing in this project was that it was implemented during the pandemic and in a period in which climate change issues were becoming more prominent globally and started affecting the hospitality and tourism industry. The digital skills mismatch was more evident during this period of time'*. Tetley (People 1st International) added that *'COVID also precipitated the social skills, because you had to approach customers in a totally different way. COVID made traditional or "historical" mismatches a lot more acute'*. According to Rexworthy (People 1st International) *'This made the project very timely. Actually, the value of the project stands so high today as what was created was future-proofed'*.

People 1st International representatives also stressed as a barrier the actual mindset of employers who have to properly consider the advantages of having skilled workforce, as well as of policymakers who should be aware of what is needed in such a strategic sector for the EU. *'Joining-up policies is important. Education policy is often not supported by workforce development policy of governments. There is a mismatch between what the governments want in terms of business growth and how they run the education system in the country. We are talking about a sector that does not necessarily need university degrees. The sector needs accessible, flexible, relevant training and qualifications which do not always sit with the academic education policy that a country may be pursuing'* (Tetley, People 1st International).

Future perspectives and evolution towards a green dimension or transition to circularity

The Pact for Skills in Tourism was created in January 2022 also with the aim of supporting the recovery of the sector after the COVID-19 pandemic. It works towards the implementation of a shared upskilling/reskilling framework and the maximisation of the tourism sector potential versus the challenges derived from the green and digital transitions. The NTG outcomes are considered '*key inputs to the future work of the skills partnership'* (charter of the Pact for Skills in the Tourism sector). Among the key performance indicators set within the Pact for Skills in Tourism, there are concrete commitments in terms of skilling, upskilling and reskilling of the workforce. They include: '*training/education and up/reskilling a mean 10% of the tourism workforce each year from 2023 until 2030 to tackle the skills gaps in the tourism ecosystem both for the current workforce and new entrants'* and for an increase of '*the up/reskilling activities and participation by 40% for the employed workforce, and by 80% for unemployed until 2025, focussed on job retention / job offers'* (charter of the Pact for Skills in the Tourism sector). To favour a standard mechanism for the implementation of the Pact for Skills, the establishment of National/Regional Skills Groups participated in by all the stakeholders of the industry ecosystem (e.g., businesses, social partners, training providers, public authorities) is foreseen by the end of 2023 in all the European tourism regions. The green dimension (together with the digital dimension) is emphasised when referring to the increase of blended training concepts (e.g., apprenticeships, internships) in formal training curricula. In March 2023, the Large-Scale Partnership in Tourism, coordinated by NTG and by the European Association of Institutes for Vocational Training (EVBB), included more than 70 signatories.

The follow-up to NTG is the PANTOUR (Pact for Next Tourism Generation Skills) project, which is also a 4-year project co-funded within the Erasmus+ programme. The project started in January 2023, is led by CEHAT (one of the NTG partners) and is participated in by 13 partners (eight NTG partners including Federturismo Confindustria, the NTG coordinator). PANTOUR builds on previous knowledge and tools produced by NTG and aims to develop new tools and methodologies to address strategic and sustainable approaches and cooperation between vocational education, training, higher education and enterprises of the tourism sector (PANTOUR webpage). It is also in charge of providing an online skills platform for the Pact for Skills for Tourism (NTG news dated 22/12/22).

Highlights related to the green dimension of the blueprint project

- Education/training partners were the biggest representative group in the consortium, but **the industry side led the design and implementation of skilling, upskilling and reskilling initiatives in the NTG project**. For this reason, the skilling needs were specifically tailored to the five tourism sub-sectors addressed by the blueprint alliance.
- **From the drafting of the blueprint proposal, green skills were considered** as one of the sets of skills needed by both existing and new employees in the tourism sector. In addition, the definition of green skills adopted by the alliance **includes explicit references to the principles of circular economy.**
- The **environmental education officer** is the only green-specific occupational profile developed within the NTG.
- The outbreak of the **COVID-19 pandemic** in 2020 became a key challenge for the tourism sector and impacted on the implementation of the NTG project. It **amplified the skills mismatch** between skill offer by the education/training institutions and industry skill needs. The mismatch was especially relevant in terms of **digital skills and social skills**.
- **The green dimension** is still explicit in the commitments made under the Pact for Skills in Tourism, in terms of **formal training curricula for potential employees of the tourism sector**. Under the Pact, Erasmus+ is confirmed as one of the **funding options to sustain skilling, upskilling and reskilling activities** with a wider scope across the whole tourism sector.

4.3.4 The Construction Blueprint

Scope of the project, partnership and roles of the involved stakeholders

The 'Skills Blueprint for the Construction Industry' was a 51-month (1/1/2019-31/03/2023) project in the construction sector co-funded by the Erasmus+ programme with a grant of €3,999,665. The Construction Blueprint belongs to the second wave of blueprint projects that were initiated in 2019. Recently completed, it had a twofold aim: setting up a sustainable sectoral alliance among key stakeholders in order to reduce skill gaps in the construction industry; and contributing to the industry's growth, innovation and competitiveness by means of a sectoral skills strategy able to both anticipate skill needs of the future and address the current skill shortages.

The partnership included 24 partners from 12 EU countries (BE, DE, EL, ES, FI, FR, IE, IT, LT, PL, PT, SI) (Construction Blueprint webpage in the Erasmus+ project database). The consortium was participated in by almost all the key stakeholders from the industrial ecosystem (**Table 8**). The education and training institutions (mainly represented by 10 national VET providers/training centres) are the most

represented group, followed by national business associations (7). The participation of trade unions/workers associations and of universities/higher education institutions is limited, while public authorities are absent. During the project, **National Advisory Groups** (NAGs) were established to support the project activities with external expertise. Around 100 experts and almost 20

Table 8. Profiles of partners in the Construction Blueprint

#	Profiles of the 24 partners
10	National VET providers/training centres (most of them focusing on training in the construction industry)
7	National business associations (i.e., for construction companies)
2	Associations at the EU level of the construction companies
1	National chambers of commerce (involving its branch for the construction industry)
1	National organisations of social partners involved in construction domain (e.g., business associations, trade unions) also providing VET
1	Associations at the EU level of of the construction workers (also providing VET)
1	National trade unions (i.e., for construction workers)
1	Universities and other higher education institutions (most of them with a technical/technological focus and also providing VET)

Source: authors' analysis based on the profiles of partners on the Construction Blueprint website.

organisations were involved. The involved expertise was organised according to a Quintuple Helix approach where collaboration for growth and innovation was fostered through the involvement of five components, namely, industry, academia, public sector, civil society and environment. The Construction Blueprint is coordinated by 'Fundación Laboral de la Construcción' (i.e., a not-for-profit organisation of social partners representing businesses and workers in the Spanish construction sector). The whole value chain involvement is guaranteed by a wide range of companies (i.e., from crafts to large businesses) that are members of the business associations included as partners in the consortium.

The core activities of the Construction Blueprint were carried out through four operational WPs; *Status Quo and Sectoral Skills Strategy* (WP2), *Enabling transnational sector-wide new skills* (WP3), *Watchtower of skills needs in the construction industry* (WP4) and *Identification of occupations and professional profiles to be updated* (WP5).

Analysis of needs: relevance given to green skills or skills for circularity

As pointed out by Santos (FLC), *'The circular economy aspects and the green dimension (referring to energy efficiency in particular) were included by design in the analysis of the skills needed in the Construction Blueprint project. The consortium included a certain number of partners from the industry who are well aware of the relevance of the issues related to circularity and energy efficiency that the sector is facing'*. The skills analysis and the related identification of new/updated professional profiles (WP4) built on the outcomes of WP2 (e.g., based on structured interviews and surveys) (Construction Blueprint, 2022a) as well as on the results of desk research. The outcomes of the survey on skills needs of the construction businesses carried out in 2021 are based on 1,715 responses from 12 countries (Construction Blueprint, 2021). In the energy efficiency domain, the skills most demanded by companies relate to insulation (more than half of the respondents), ventilation, air tightness, heat pumps, photovoltaics, smart home automation, geothermal energy, smart meters, aerothermal energy, biomass and wind energy. In the domain of circular economy, the most requested skills refer to the estimate of the construction and demolition waste to be generated at the design stage (62.7% of the respondents); to the sorting of the construction and demolition waste on site at the construction stage (66.2% of the respondents); and to the recycling of the recovered items at the demolition stage (37.4% of the respondents). In addition, desk research at the country level found that in the energy efficiency domain

additional skills needs relate to, for example, sustainability; assessment of environmental, economic and legal factors of construction projects; climate change adaptability; green public procurement; and resource management. Upskilling and reskilling needs in this domain are identified in a number of existing job profiles (e.g., electricians, plumbers, carpenters and joiners, bricklayers, technicians). In the circular economy domain, skills needs relate to, for example, sustainability, recycling materials, waste management, use of raw materials, dismantling procedures and wood in construction. Also in this case, upskilling and reskilling needs in this domain are identified in a number of existing job profiles (e.g., architects, planners, craftspeople, construction managers) (Construction Blueprint, 2022b).

Achievements and impacts. The way green skills and green jobs are considered.

Concerning skilling, upskilling and reskilling of the industry's workforce, the main results of the Construction Blueprint are three VET curricula (i.e., energy efficiency, circular economy and digitalisation) (Construction Blueprint, 2022c). The proposed curricula are intended to be tailored to the needs of the six main professional profiles identified in the sector: bricklayer, carpenter, electrician, plasterer, plumber and site supervisor. The curriculum in energy efficiency (EQF 4) includes 15 training modules for a total of 25 hours of theory to be delivered in four days. The curriculum in circular economy in construction (EQF 5) is organised in 14 modules for a total of 28 hours of theory to be delivered in four days. In addition, some of the modules of the curriculum on digitalisation in construction integrate knowledge of the other two curricula. Examples are the modules devoted to digital tools for energy efficiency and to digital tools for circular economy (Construction Blueprint, 2002c).

Some of the developed curricula are available as online courses on the e-learning platform of the Construction Blueprint. Curricula and other outcomes of the Construction Blueprint are accessible through the **Construction Skills Observatory**. The observatory has been developed as an online tool for *'providing relevant information for all those active in the construction sector, for companies, and especially VET providers, who will find significant and up-to-date information on current and future skills needs to support them matching their training offer'* (webpage of the Construction Skills Observatory). During the interviews, both Santos (FLC) and representatives of FIEC highlighted the need for financial resources to sustain it after the end of the project. The project has also identified more than 100 European good practices and innovative initiatives (at regional and national levels) dealing with skill gaps and skills mismatches in energy efficiency, circular economy, digitalisation, occupational health and safety; facilitation of mobility in Europe; and promotion of the attractiveness of the construction industry. Factsheets describe the good practices and the innovative initiatives that are also available through an online map on the Construction Blueprint website. New occupational profiles, not included in the ESCO skills database, were identified during the skills gap analysis and the review of the ESCO professional profiles related to the construction industry. Among them is the deep renovation specialist.

Challenges and barriers in ensuring the proper skilling, upskilling and reskilling of the workforce

The lack of skilled workers and the importance of the upskilling and reskilling of the existing workforce is one of the seven challenges faced by the sector and identified during the project implementation. According to Santos (FLC), *'the main barriers to the proper skilling, upskilling and reskilling of the workforce of the construction sector are the micro size of most of the businesses and the resistance to change favoured also by the limited attractiveness of the sector for young people'.* A representative of

FIEC highlighted also the fragmentation on the skills supply side: *'There is a high number of different VET courses that make it difficult for young people willing to be qualified to work in the sector to decide on an education path. This occurs also at the country level'.* In the Roundtable on 'Skills in the Circular Economy' organised during the [Construction Blueprint final event](#) held in Brussels on 22 February 2023, Hoyne (TUS, a university partner in the Construction Blueprint) highlighted that *'concerning skills for the circular economy, there are two gaps to face. We have to upskill our trainers and educators. This is a new area and we have to make sure to have the right people in front of the classroom [...] Then, we also need to ensure that workers can access that training'.* When referring to educational programmes, Hoyne (TUS) highlighted the need to promptly act '*to modify and change the programmes we deliver now, so that circular economy is embedded within our programs and becomes a natural language for our graduates to understand. [...] The reality is that when we look at programmes provision in a five-year perspective, we will see circular economy as normal and integrated into VET lectures and academic training for construction'.*

Future perspectives and evolution towards a green dimension or transition to circularity

The Construction Blueprint project ended in March 2023. However, more than one year earlier, in February 2022, FIEC, EFBWW and EBC (i.e., the three associations at the EU level that are partners in the Construction Blueprint) signed [the charter for the Pact for Skills in the construction ecosystem](#) and became the coordinators of the related Large-Scale Partnership (LSP). The ambition is *'to upskill and reskill overall at least 25% of the workforce of the construction industry in the next 5 years, to reach the target of 3 million workers'.* Under the Pact, the contribution of the Construction Blueprint is acknowledged and, more importantly, recognised as baseline when referring to the main domains of knowledge, skills and competences (i.e., digitalisation, energy efficiency and circular economy) for which monitoring of demand and supply is envisaged. In March 2023, there were 22 LSP members for the construction ecosystem (Construction LSP [list](#)). The Construction Blueprint missed the opportunity to continue activities through the calls for follow-ups to the blueprint projects published in March 2022. During our interview, Santos (FLC) made evident the fact that one of the requirements of the call was that the proposal had to be led by the coordinators of the LSP under the Pact for Skills. Therefore, a proposal from Fundación Laboral de la Construcción would not have been eligible and at that time none of the LSP coordinators were able to take the leadership. In 2022, FLC started coordinating the [Pact4Youth](#) (*'Supporting the Pact for Skills. Foundations for youth employability in the construction sector'*), a Forward Looking Project co-funded by Erasmus+. The Pact4Youth consortium is composed of eight organisations, of which five are partners in the Construction Blueprint. According to Santos (FLC), this project supports the Pact for Skills, especially for what concerns the commitment aimed at encouraging young people to work in the sector.

Highlights related to the green dimension of the blueprint project

- **The construction sector is one of the most impacted by the transition to circularity.** Europe's new Circular Economy Action Plan (EC, 2020) directly targets the sector as it requires vast amounts of resources (about 50% of all extracted material) and is responsible for over 35% of EU's total waste generation. Other current and expected policy initiatives and legislation provisions (e.g., Strategy for a Sustainable Built Environment, the 'Renovation Wave' initiative) are guiding the sector towards a circularity path.

- The **prevalent participation in the consortium of VET providers at the national level** and the involvement of key stakeholders through the National Advisory Groups had the positive effect of promptly addressing the upskilling and reskilling of the sector's workforce and of reducing the skills mismatch between demand and supply.
- The **recent closure of the Construction Blueprint** has so far prevented the partners from identifying accessible funding opportunities needed to **follow up the skilling, upskilling and reskilling activities** of the project.

4.3.5 Joint exploitations by the alliances

The four blueprint projects selected as case studies led to five LSPs under the Pact for Skills, covering, respectively, automotive, construction, tourism, offshore renewable energy, shipbuilding and maritime technology. A good number of the partners of the blueprint projects became signatories of the charters for these LSPs. The networking opportunities and collaborative environment across the LSPs also led to other horizontal/thematic collaborations. The [GREEN](#) (GreeneR EuropEan vet Network) project is an example of an intersectoral exploitation of what has been created in the green domain in terms of skilling, upskilling and reskilling by the blueprint alliances. Started in December 2022, GREEN is a 2-year project aiming '*to identify, develop, test and assess innovative policy approaches for a "greener" education that have the potential of becoming mainstreamed among systems, countries and contexts. GREEN is setting core green skills for the labour market by integrating this set into VET curricula as well as into training of teachers, trainers and professional development'*. GREEN relates to six industrial sectors, two from the first wave of the blueprint projects (i.e., Automotive, Maritime), one from the second wave (i.e., Additive Manufacturing) and three from the third wave (i.e., Defence, Energy, Batteries). Out of the nine partners involved in GREEN, three were/are the coordinators of the corresponding blueprint alliances i.e., VSB, CETMAR and the European Federation for Welding, Joining and Cutting (EWF), with EWF acting also as the coordinator of GREEN.

5. Conclusions and recommendations

5.1 Opportunities for filling key data and information gaps

It is not possible to influence skilling processes and strategies at the policy level if a monitoring system of the state of art of these skills does not exist. Harmonised statistics on skills for circularity should be made available regularly and in a timely fashion through Eurostat as part of a data collection process fed by EU Member States. As reported in a recent study by the OECD, the design of effective polices requires better data on jobs created or destroyed by the green transition and on the skills/competencies of concerned workers (OECD, 2023). In addition, it is important to recall that improved metrics to monitor progress towards circularity are a **requirement of Europe's new Circular Economy Action Plan** (EC, 2020). We consider this information gap as an opportunity to improve the EU monitoring framework for CE through the inclusion of a human capital component, similarly to what has been done for the Digital Economy and Society Index (DESI) used to annually measure the progress made by EU Member States in the digital transition.

- *Strength*. There is ongoing work led by Eurostat towards the development of a suitable framework to measure EU countries' progress in their transition to circularity.
- *Weakness*. The existing monitoring framework for CE misses a focus on skills.

- *Opportunity.* The introduction in the monitoring framework of a human capital component that is agreed among relevant stakeholders.
- *Threat.* The lack of coherence of definitions of green skills or skills for circularity across Member States and industry sectors may jeopardise the outline of a human capital component.

> **Recommendation #1. Considering the inclusion of a human capital component in the EU monitoring framework for CE**
>
> It is necessary to **include a human capital component in the EU monitoring framework for circular economy whose development by Eurostat is currently underway**. The EESC should propose to start the development process of this component that shall include **indicators related to skills for circularity.** This process should be based on **an inclusive exercise**, also open to the input and opinion of social partners, including the representatives of workers and employers, as well as to other associations and organisations that are active in the circular economy. The inclusion of a human capital component in the framework will have policy implications because Member States are likely to become accountable for the greening of their economies according to this framework.

In addition, it is important to start using new data generation processes. As explained in a recent press release, Cedefop relies on quantitative and qualitative approaches to provide information on skills that are supportive of the green transition (Cedefop news dated 28/03/23). The quantitative approach is based on skills forecasts (providing a long-term perspective), VET and skills statistics and indicators, as well as an analysis of online job ads (providing an emerging skills perspective). The qualitative approaches include the collection and production of evidence based on consultation of experts and networks. All these outputs related to the green transition should be accessible from the Green Observatory. In addition, the Green Observatory should become the hub of the knowledge on green skills and jobs derived from the different EU agencies such as Eurofound, the European Training Centre and the European Environment Agency (that is also working on monitoring progress in Europe's circular economy, the so-called Bellagio process). Around mid-December 2022, the involved EU agencies got together in an online seminar on 'Skills and quality jobs as drivers of a just green transition'. During the seminar it was stated that the green transition '*calls for a transformation of the state of play, so Agencies need to translate the implications into interactions and interdependencies between them*' (Cedefop news dated 15/12/22).[13]

- *Strength.* The Green Observatory is already conceived as an instrument by Cedefop.
- *Weakness.* The Green Observatory's content is limited, occasionally produced and often based on the compilation of existing material rather than on the generation of new knowledge.
- *Opportunity.* Introduction in the Green Observatory of original quantitative analyses generated by Cedefop using new data generation processes, including in liaison with other EU agencies.
- *Threat.* Compilation of existing information overwhelms the generation of new knowledge.

> **Recommendation #2. Making the Green Observatory a one-stop-shop in the EU for knowledge and information on green skills/jobs and skills/jobs for circularity**

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[13] Eurofound and Cedefop already collaborate on reporting on the European Company Survey, for which they delivered a joint report in March 2023. In June 2023, Eurofound and the European Environment Agency jointly published an analysis of the socio-economic impacts of the transition to a climate-neutral economy (Eurofound and EEA, 2023).

EU institutions should empower Cedefop to make its **Green Observatory a reliable and updated repository of information and knowledge related to green skills/jobs and skills/jobs for circularity**. The Green Observatory should not only be based on the compilation of existing information/knowledge but also on the creation of new information/knowledge and foresights. The OVATE tool could be operated regularly within the Green Observatory to create real-time analyses/forecasts (as a self-standing tool or as part of the Eurostat-led initiative 'Web Intelligence Hub analysis of online job advertisement data'). The Green Observatory should also reflect the interactions and interdependencies of the various EU agencies that are working on green skills and/or jobs from different perspectives.

5.2 Appropriateness of the Erasmus+ programme for reskilling and upskilling initiatives to embrace circularity by EU industry

In 2016, the Erasmus+ programme set the blueprint alliances as an unprecedented instrument to structurally involve key stakeholders of the European industrial ecosystems in the adaptation of the skills of the workforce to the changes implied by the twin transitions. The first wave of the resulting blueprint projects was also the first to explore follow-up opportunities for the results achieved through these investments. Evidence shows that limited follow-up funding options for the blueprint project partners may put at risk the exploitation of what has been achieved through the blueprint projects. Among the available instruments, the Knowledge Hub provides the signatories of the Pact for Skills with access to an online database and search tool for existing EU funding opportunities. In 2021, the Forward Looking Projects were introduced in the Erasmus+ Programme as a new type of action suitable to further exploit the blueprint projects' outcomes. The follow-up actions related to the greening of skills are explicitly targeted by these 2-year Forward Looking Projects 'supporting education and training systems to adapt for the green transition' (Lot 1, priority 2) and for 'Green skills in the VET sector' (Lot 2, priority 5). Moreover, as anticipated in Box 3, the link between the Erasmus+ funding opportunities and the Pact for Skills was strengthened with the Erasmus+ Programme 2023. In order to be eligible for an Erasmus+ grant, project proposals for 'Lot 2 - Alliances for Sectoral Cooperation on Skills (implementing the 'Blueprint')' must include only organisations that are already partners in LSPs under the Pact for Skills and be led by an organisation that is coordinating one of the ecosystem-based LSPs. Similarly, for the Forward Looking Projects supporting the Pact for Skills (Lot 3, priority 7), the consortium should be composed only by organisations belonging to an LSP, and be led by the coordinators of an existing charter under the Pact.

- *Strength*. The Erasmus+ programme is a well-established EU instrument that is flexible enough to introduce new types of actions such as the Forward Looking Projects and more binding participation rules aimed at strengthening the medium-term implementation of the Pact.
- *Weakness*. Changes of eligibility rules may prevent the mid-term exploitation of/follow-up to the first round of the blueprint projects.
- *Opportunity.* Facilitate the access to Erasmus+ funding by the organisations belonging to the LSPs for the exploitation/follow-up of/to the investments made in the blueprint projects.
- *Threat*. Exploitation of the blueprint projects' results is limited if the coordinators of the LSP are not going to apply for further funding.

> **Recommendation #3. Making the EU industrial ecosystem stakeholders aware about the 'rules of the game' within the Erasmus+ programme**

Provided that the Erasmus+ actions supportive of blueprint projects should be defined at least with a mid-term horizon in mind, thus avoiding changing the eligibility rules every year, EACEA **should be invited to publicly present the strategy on existing funding opportunities for the exploitation/follow-up of/to the blueprint projects co-funded within the Erasmus+ programme**. Rules for accessing follow-up co-funding should be clearly explained to the organisations already belonging to the LSPs and willing to continue exploiting the results of the blueprint projects. At the same time, new stakeholders willing to participate should be properly informed about existing opportunities. Clearer rules could also work towards the enlargement of the LSP.

The review of 21 sectoral alliances co-funded by Erasmus+ shows that the greening of skills is considered in a variety of ways by the various industries. With some exceptions such as in the automotive industry, several sectors already acknowledged the importance of green skills in 2016 when preparatory actions started. They then used the blueprint projects to begin including them in the existing occupational profiles or to develop new profiles along their value chains. Still, a gap in the value chain is noted especially with regard to the sales/operation, outbound logistic and post-purchase service stages. These stages are the ones concerning end-users or consumers the most. This evidence may open the opportunity to include the civil society perspective and to have more balanced partnerships in the blueprint projects in order to positively impact on circularity outcomes.

- *Strength*. Sectoral alliances cover most, but not all, of the value chain stages.
- *Weakness*. Unbalanced partnerships may not favour skilling, upskilling and reskilling for circularity.
- *Opportunity.* Make the inclusion or engagement of civil society and/or consumers' representatives compulsory in Erasmus+ blueprint projects.
- *Threat*. The voice of civil society or of consumers is insufficiently represented at the EU level.

Recommendation #4. Involving representatives of civil society/consumers in Erasmus+ blueprint alliances

In order to make the 'right to repair' a reality, it is **suggested to include the voice of the civil society or of the consumers in Erasmus+ alliances-based projects**. Even more ambitiously, partnerships of the blueprint projects should follow the Quintuple Helix Model, involving education/research institutions, businesses and their associations, public authorities/bodies, civil society and 'environment-related' or 'green-related' actors. In addition to direct involvement in the consortia, this can alternatively be achieved by requiring compulsory consultation or engagement with these relatively new stakeholders during the project timeline. In particular, by including the viewpoint of the civil society or consumers, the outcomes of the blueprint projects are expected to better reflect the greening of the whole value chain.

5.3 The way forward with regard to circularity-related skilling programmes and long-term planning of training

The overview of EU skilling initiatives made in Section 4.2 highlights that some instruments are apparently less known, or used, than others – or that there is less evidence available on their use because of their recent introduction. In particular, three of these instruments are **excellent to plan and implement skilling projects for the European workforce at the institutional level**. Thus, it is worthwhile to disseminate information on the existence, use and impact of these three important

instruments supporting the development of green skills. The JTF is a structural support to the challenges derived from the climate transition and has a specific focus on the skilling, reskilling and upskilling of workers. Contrary to the ERDF and the ESF+, whose scope is well-known to all, the JTF has been introduced in the current programming period and its potential in the greening of skills may still be insufficiently recognised. The TSI may support reform processes for the greening of the skills of workers, but according to the projects funded so far, its use in this sense seems limited. The proposal for a regulation on Net-Zero Industry will contribute to raising awareness on the TSI potential. Finally, Regional Partnerships under the Pact for Skills are powerful instruments made available to territorial stakeholders.

- *Strength*. JTF, TSI and Regional Partnerships are available to institutional actors to support initiatives aimed at the greening of skills of workers.
- *Weakness*. They are new (Regional Partnerships and JTF), or insufficiently known (TSI) instruments.
- *Opportunity.* Increase their use for funding projects related to green and/or circular skills.
- *Threat*. Little evidence of their use and impact may limit their uptake.

> **Recommendation #5. Producing evidence on the use of JTF, TSI and Regional Partnerships for skilling/upskilling/reskilling initiatives towards circularity**
>
> The EESC may consider inviting the ECESP Coordination Group to start collecting evidence of projects funded through the JTF, TSI and Regional Partnerships under the Pact for Skills. The ECESP is the ideal platform to report on the use made by national and regional authorities of these instruments. Institutional actors may be invited to upload their projects using a standard project form. The European Committee of the Regions may be invited to publicise this evidence-collecting initiative on its website.

Amongst the EU initiatives reviewed under Section 4.2, the scope of the EIT initiative on circular economy seems narrow. The EIT works through Knowledge and Innovation Communities (KICs) that by default include education, research and business actors. These communities are smaller than the alliances supported under the Erasmus+ programme or the Pact for Skills, and represent an opportunity to widen EU support to small groupings that focus on the greening of skills for the transition to circularity in the education and/or private sector.

- *Strength*. KICs include by design education, research and business actors.
- *Weakness*. Apparently narrow scope of the EIT initiative on CE.
- *Opportunity.* The EIT initiative on CE could provide funding opportunities to small-scale alliances**.**
- *Threat*. Availability of funding to launch projects.

> **Recommendation #6. Exploring the opportunities offered by the EIT initiative on CE**
>
> The EESC could ask for clarifications to the EIT on the nature and scope of their initiative on circular economy and discuss the possibility to turn it into an instrument providing funding opportunities to small alliances of businesses, education and research entities. The EIT initiative could be a suitable scheme to provide support to the private sector and training/education entities at a smaller-scale for the skilling/upskilling/reskilling of the workforce.

5.4   Ways to strengthen the activities framed by the Pact for Skills

The Pact for Skills is based on **voluntary commitments, or ambitions,** by stakeholders within their partnerships. Large-Scale Partnerships are powerful aggregating instruments for those industrial ecosystem stakeholders that are pursuing the objective of skilling/upskilling/reskilling their workers to properly address the twin transitions, **but provide low certainties of having a significant impact if commitments are not made, voluntary commitments are not respected, or ambitions are not achieved**.

- *Strength*. Stakeholders involved in the LSPs have a direct interest/role in skilling, upskilling and reskilling towards the transition to circularity**.**
- *Weakness*. Impact of skilling/upskilling/reskilling activities foreseen under the Pact on the transition to circularity is uncertain.
- *Opportunity.* Increase the visibility of progress made by LSPs versus the transition to circularity.
- *Threat*. Stakeholders may be reluctant to sign the charters or make commitments under the Pact if their performance is going to be monitored.

Recommendation #7. Creating a CE dashboard measuring progress of the commitments or ambitions made by LSPs under the Pact for Skills versus the transition to circularity

The EC provides online the links to the charters agreed across the 14 industrial ecosystems of the renewed EU Industrial Strategy. However, only an aggregated and general overview of commitments/ambitions made by all the LSPs and of progress made towards the achievement of these commitments/ambitions is available. The EESC could consider suggesting the development of a CE dashboard showing the progress made against the key performance indicators/other metrics defined in the charters by LSPs and having a focus on the green/circular dimension. This would increase transparency and information-sharing, including among the same signatories under the charter. It could also boost performance towards the achievement of the green transition or circularity. Filling the dashboard with data could be a voluntary option for the signatories of the charter.

In most of the charters of the LSPs under the Pact for Skills, the outcomes of the related blueprint projects are considered as the starting point and/or the baseline instruments to be used for meeting the commitments made in terms of skilling of the workforce. In addition, the LSPs provide the necessary conditions for rolling out the blueprint outcomes at the national or regional levels. The latter was one of the expected outcomes of the blueprint projects that nevertheless in most of the alliances was limited to piloting short-term initiatives or implementing one-shot activities because of the COVID-19 outbreak.

- *Strength*. Most of the blueprint projects designed and implemented pilots on the ground**.**
- *Weakness*. Roll out activities in several blueprint projects were downsized compared to plans.
- *Opportunity.* LSPs are composed of a high number of sectoral stakeholders, greater than that of the blueprint consortia.
- *Threat*. Signatories of LSPs may not be willing to support the cost of roll out activities.

Recommendation #8. Making the roll out of the blueprint projects' outcomes related to the greening of the skills of the workforce compulsory for LSPs

Signatories of the charters are committed to certain ambitions in terms of skilling, reskilling and upskilling of the workforce and, at the same time, they are the beneficiaries of the outcomes and knowledge resulting from the blueprint projects in terms of green skills foresight and/or development. Thus, signatories to the LSPs are in the ideal position to roll out these outcomes and knowledge at the local/regional/national level, possibly in collaboration with public authorities. Costs for sustaining roll out activities may be funded through the instruments within the Erasmus+ programme, including those recently set up (see Recommendation #3). Moreover, the involvement of public authorities may facilitate synergies with other funding opportunities related, for example, to education or employment (e.g., the ESF+).

5.5 Possible actions for future work of the EESC, including during the European Year of Skills 2023

The ECESP is a mature virtual repository of knowledge and practice related to circular economy. In this regard, there is an enormous potential to build on the knowledge gathered in the platform.

- *Strength*. ECESP is a mature and updated knowledge hub on circular economy.
- *Weakness*. There is a lack of systematic analysis of the information stored in the ECESP.
- *Opportunity.* Use the knowledge and practice gathered in the ECESP to inform policymaking.
- *Threat*. Challenges to identify and define research questions every year.

Recommendation #9. Building on the knowledge collected through the ECESP

Together with the Coordination Group Members, the parent institutions of the platform (the EC and the EESC) should explore the possibility to regularly take stock of and use the knowledge included in the platform. These activities, which might include studies, reports or webinars, should respond to specific research questions that are agreed between the Coordination Group Members and the parent institutions of the platform, for example in the context of the Annual Work Plan. Such activities should be carried out in accordance with the arising policy priorities and be implemented accordingly on a short time span.

The overview of EU skilling initiatives made in Section 4.2 highlights the lack of European initiatives solely focused on the greening of skills, including those of the youth. This focus gap may be partially filled by the EESC by initiating a pledge targeting youth across the industry, education and training sectors. The pledge would have the double aim of being a concrete contribution to the European Year of Skills 2023 and of actively promoting youth participation in the transition to circularity.

- *Strength*. Greening the skills of the youth is a way to strengthen a just transition.
- *Weakness*. Lack of specific EU-wide initiatives focused on youth green skills.
- *Opportunity.* Exploit youth attitude towards greener behaviours.
- *Threat*. It is too late for implementation given the fact that the European Year of Skills has already begun.

Recommendation #10. Youth Skills for Circularity Pledge

In the European Year of Skills, the EESC may consider inviting companies from all industries to take a voluntary pledge for the skilling/upskilling/reskilling of their young workers towards circularity. Similarly, training and education organisations could make pledges indicating the number of young

people trained/educated in circular economy domains. Participants and their pledges would be published on the ECESP, ensuring them high visibility within the circular economy community.

Appendix I: List of References

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Appendix II: List of Interviews

Note: displayed information is according to the level of public disclosure indicated by the respondents.

Blueprint Alliance	Surname and name	Name of the organisation, acronym and country	Role in the blueprint alliance	Date of the interview
DRIVES	Štolfa Jakub	VSB Technical University of Ostrava (VSB-TUO)[Czechia]	Coordinator and WP Leader	31/03/2023
DRIVES	Madaleno Utimia	Eupportunity (EUPPY)[Spain]	Partner and WP Leader	31/03/2023
DRIVES	Frassinetti Luisa	Sistemi Formativi Confindustria (SFC)[Italy]	Partner	24/03/2023
MATES	Soto Rey Amaya	Centro Tecnológico del Mar – Fundación CETMAR (CETMAR)[Spain]	Coordinator and WP Leader	22/05/2023
MATES	-	Hellenic Institute of Transport - Centre for Research and Technology Hellas (CERTH-HIT)[Greece]	Partner and WP Leader	01/06/2023
NTG	Rexworthy Jane	People 1st International (PEOPLE1ST)[United Kingdom]	Partner and WP Leader	23/05/2023
NTG	Tetley Kate	People 1st International (PEOPLE1ST)[United Kingdom]	Partner and WP Leader	23/05/2023
NTG	-	-	-	16/05/2023
Construction Blueprint	Santos Silvia	Fundación Laboral de la Construcción (FLC)[Spain]	Coordinator and WP Leader	01/06/2023
Construction Blueprint	-	European Construction Industry Federation (FIEC)[Belgium]	Partner and WP Leader	06/06/2023
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