D5.1

Report on Training Needs Analysis

skillbill

SKILL TO BOOST INNOVATION & PROFESSIONAL FULFILLMENT IN A SUSTAINABLE ECONOMY

Funded by the European Union

PROJECT INFORMATION

PROGRAMME	Horizon Europe
TOPIC	HORIZON-CL5-2021-D3-02-02
TYPE OF ACTION	HORIZON Coordination and Support Actions
PROJECT NUMBER	101075587
START DAY	1 September 2022
DURATION	36 months

DOCUMENT INFORMATION

TITLE	Report on Training Needs Analysis
WORK PACKAGE	WP5
TASK	T5.1
AUTHORS (Organisation)	Sinergie Soc. Cons. a r.l.
REVIEWERS	**All partners**
DATE	19/04/2023

DISSEMINATION LEVEL

PU	Public, fully open	x
SEN	Sensitive, limited under the conditions of the Grant Agreement	
Classified R-UE/EU-R	EU RESTRICTED under the Commission Decision No2015/444	
Classified C-UE/EU-C	EU CONFIDENTIAL under the Commission Decision No2015/444	
Classified S-UE/EU-S	EU SECRET under the Commission Decision No2015/444	

DOCUMENT HISTORY

VERSION	DATE	CHANGES	RESPONSIBLE PARTNER
1	03/04/2023	First Draft	Sinergie Soc. Cons. a r.l.
2	19/04/2023	Implementation of proposed revisions with regards to data set in chapters 3 and 4, typos correction, syntax editing.	Sinergie Soc. Cons. a r.l.

Table of Contents

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

RES	Renewable Energy Sources
VET	Vocational Education and Training
ADDIE	Analysis, Design, Development, Implementation and Evaluation
SO	Significant Output
STEM	Science Technology Engineering Mathematics
UBC	University-Business Cooperation
HEI	Higher Education Institutions

Executive Summary

The present Deliverable *Report on Training Needs Analysis (D5.1)* provides a detailed description of the preliminary study conducted to determine the target segments of the SKILLBILL project. These segments will be used to tailor the design and implementation on training courses of the end users' actual needs, in the context of WP5 "Skilling, Reskilling and Upskilling: Vocational Education and Training".

The analysis assesses the target users' current and expected skills, their training needs, and expectations. It also benchmarks with comparable extant training experiences, with the aims of increasing awareness and knowledge on Renewable Energy Sources (RES), and improve the overall quality of the courses and materials produced.

The focus of this Deliverable is two-fold:

- Illustrating the main results of a desk analysis, which was conducted with the purpose of investigating the normative / policy framework on the Green Economy and the Green Transition, and their impact on the labour market. In particular, the analysis ponders how the shift to Circular Economy and Clean Energy that characterises the ever-changing economic landscape will push workers and employees from the sectors invested by these transformations to expand and update their skills. This section also outlines the most requested skills, knowledge and competences in the Green Economy.
- Describing the indications derived from a batch of interviews with relevant stakeholders, technicians and professionals from the RES and Public Administration (PA) sector from the nations participating in the project.

A short description of Project SKILLBILL and its objectives, focussing on the activities of WP5 "Skilling, Reskilling, Upskilling: Vocational Education and Training", which rest upon the results of the preliminary analysis of T5.1, is provided in the opening paragraphs.

1. Introduction

1.1 SKILLBILL's project and goals

SKILLBILL (Skills to boost innovation and professional fulfilment in a sustainable economy) is a 36-month project funded by the Horizon Europe programme. Its overall objective is developing a substantial foundation for the growth and acceleration of the deployment of renewable energies. SKILLBILL intends to do so by engaging stakeholders at all levels, diffusing scientific culture, and skilling multi-level workers.

The idea underlying the project is that knowledge should be

- Disseminated at different levels
- Suitable to train a set number of workers
- Instrumental in increasing awareness on Renewable Energy Sources (RES)
- A useful contribution to a more social and inclusive Europe.

The project aims at creating several pathways to foster motivation and involvement in RES, regardless of target groups' initial level of education and working position; the technological potential of RES can be harnessed by developing interest in the business and having clear and adequate approaches, such as tools and learning modules featuring suitable language.

SKILLBILL will propose concrete actions to achieve the goal of accelerating the deployment of renewable energy at multiple levels:

- Engaging the stakeholder community
- Sharing knowledge and peer learning
- Skilling, upskilling and reskilling

The **engagement of the stakeholder community** will take place through a **Stakeholder Joint Initiative**, i.e. the organisation of working groups focused on different RES technologies. The aim of this initiative is two-fold: steering the development of next generation technologies towards

sustainability and circularity, and enhancing the discussion on technology drivers and regulatory recommendations.

Sharing knowledge and peer learning will be conducted through an especially designed **Green Portal**. Validated material on RES, both new and extant, will be uploaded and carefully organised for research and consultation. The portal will include educational videos, interviews and training lectures, open discussion forums, etc. Partners, users, citizens, students and technology providers will have the option to upload materials on the e-platform, and a Scientific Advisory Board comprising experts, researchers, professors of several Universities from different EU countries will validate the material to ensure its quality.

The final goal of SKILLBILL focuses on **skilling, reskilling and upskilling.** It will feature the launch of education programmes for the development of skills on RES in different target user groups:

- Young people interested in learning more on RES skills and technologies for career and professional development;
- Adults (unemployed or at risk of losing their jobs) who need to acquire new competences in order to stay competitive in their workplace;
- People who are already employed (e.g. public administration technicians, professionals from the RES sector, etc.) and willing to update their competences to advance their careers and improve their service.

Flexible provision methods such as modular courses or distance learning, new technologies such as virtual reality, and a dedicated e-learning platform will facilitate the participation in SKILLBILL education programmes.

1.2 Focus on WP5 “Skilling, reskilling and upskilling: Vocational Education and Training”

SINERGIE leads WP5 “Skilling, reskilling and upskilling: vocational education and training”, which lasts from the beginning of the project to Month 33, almost its end.

This WP aims to achieve two Significant Objectives (SOs) at EU level:

- **SO4**: developing a technical, practical, and permanent Vocational Education Training (VET) programme on RES;
- **SO5**: reducing gender gap in Science, Technology, Engineering, Mathematics (STEM).

Broadly speaking, WP5 consists in the implementation SKILLBILL training programme and content targeted to adult learners and professionals. The training actions will be developed using the **ADDIE methodology** (Analysis, Design, Development, Implementation and Evaluation)**.** The leading Partner will design training curricula and analyse the interactions with the e-learning platform, the learning experience and contents following an analysis of the needs and requirements of potential users. The results of the analysis will be developed and integrated into the digital environment provided for the delivery of the training.

WP5 is segmented in the following tasks and subtasks:

- **T5.1 “Segmentation and Training Needs Analysis”**, which Chapter 3 of this Deliverable discusses in greater detail.
- **T5.2 “Curriculum and Content Design”:**
    - T5.2.1 “Training schemes for PA and technicians”: results of T5.1 will help establish the training courses’ programmes and methodologies, and clarify the training objectives of each course.
    - T 5.2.2 “Instructional design”: the goal of this Task is employing storyboard design to define the users’ journey, their interactions inside the platform and the digital learning materials.

- T 5.2.3 “Content design”: implementation of training materials and support inside the platform.

- **T5.3 “Piloting and Validation of Training Courses”:**
  - T 5.3.1 “Train the trainers”: trainers will be selected for each Partner country. Trainers will be introduced to the scope of the project and familiarise with the best ways to use the training material developed thus far during specific training sessions.
  - T 5.3.2 “Replication”: potential adaptation, coordination of translations and replication of the course in other, non-partner countries.
  - T 5.3.3 “Monitoring and evaluation”: training activities will be constantly monitored. The collection of data will be useful to assess criteria such as the usability of digital tools, evaluation of the learning experience, teaching performance of the trainers, user satisfaction, overall evaluation of the course, platform and contents.

2. Desk Research

The desk analysis we performed investigates the current normative and policy framework on Green Economy and Green Transition, and the significant impact that these transformations will have on the labour market. More specifically, it concentrates on how this Double Transition impacts workers and employees of several sectors of the Economy. Besides the more obvious choice of Renewable Energy, it takes into account sectors such as Automotive, Road transportation, Coal, Oil & gas, etc. Workers of these areas need to upskill, reskill, and train to keep up with a constantly changing economic landscape. They need to develop new skills and competences to thrive in their respective careers.

2.1 Normative and Policy Framework

2.1.1 EU-level and National Policies for a Green Transition

The **2030 Agenda for Sustainable Development**, adopted by the United Nations in 2015, introduces the Sustainable Development Goals (SDGs) and sets out a reference for all national and local policy measures on sustainability. Its 17 goals are a call to action to all countries on the necessity to deal with the most urgent topics at an international level. For example, Goal 7 illustrates the right to clean and affordable energy, requiring countries to act and ensure access to reliable, sustainable and modern energy sources for all.

With the **European Green Deal**[1], the EU established the ambitious and binding target of reaching carbon neutrality by 2050 in all member states. It also confirmed the adoption of a sustainable development model through clean digital technologies, and paved the way for a European action aimed at an efficient use of resources. This goal is to be reached through a circular and sustainable economy. Although one of the sectors most directly impacted by the Green Deal is the Energy Sector, the Green Transition will impact on all economic sectors, their business models and related public policies. A shift from a linear model to circular economy is necessary to achieve climate neutrality.

The **Annual Sustainable Growth Strategy 2021**[2] clarified the goals of National Recovery and Resilience Plans (NRRPs). According to this document, the use of clean technologies, renewables and hydrogen is also part of the objectives of the European Green Transition. The Strategy recommends the enactment of significant reskilling and upskilling actions, requiring investments from all Member States to spread and strengthen green skills among the working population and the European citizens.

[1] Communication from the Commission (COM/2019/640 final) of 11/12/2019: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN

[2] Communication from the Commission (COM/2020/575 final) of 17/09/2020: https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52020DC0575

"*Fit for 55*: delivering the EU's 2030 Climate Target on the way to climate neutrality[3]" is the EU plan for a Green Transition. Its aim is providing the EU with a set of binding norms regarding climate, energy, transportation and tax system. The final goal of these norms is reducing emissions by at least 55% by 2030 at European level, as an intermediate step towards climate neutrality to be achieved by 2050. In the EU, the percentage of energy generated from renewable sources is currently around 19%, with the objective of reaching 32% by 2030. This mission is aided by the fact that the cost of clean energy is now cheaper than that of energy produced from fossil fuels in almost all economic sectors.

The **New Skills Agenda for Europe[4]**, launched in July 2020, testifies to the engagement of the European Commission with the issues of skills development and training. As per the document's own statements, 120 million of European citizens will need to upskill or reskill over the next few years. Therefore, the new pact for skills should be transversal to all economic sectors and open to all stakeholders. The Agenda underlines that some priority economic sectors should be targeted before others, because in their case upskilling and reskilling require ambitious strategies. Constructions, Automotive and Transportation, for example, call for an imminent electrification and the exploration of alternative solutions for the fuel systems.

The Commission sees the role of education and training as crucial, and identifies some priority axes: a green strand within the Erasmus+ Programme, the development of the European Education for Climate Coalition, and a special attention devoted to green skills targets. The Skills Agenda concentrates on five main actions:

- Establishment of a green skills taxonomy;
- Agreement on indicators for the monitoring and the statistical analysing of green skills;
- Development of a European Green Skills Framework;

[3] Communication from the Commission (COM/2021/ 550 final) of 14/07/2021: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2021:550:FIN

[4] https://ec.europa.eu/social/main.jsp?catId=1223

- Development of basic green skills for the labour market to guide training in all economy sectors;
- Integration of environmental and climate considerations at all levels of training, with a special emphasis on raising the level and diffusion of STEM studies, especially among young women and girls.

The European Commission, the European Parliament and EU leaders agreed on a set of policies that will support the Economy's recovery from the social and economic drawbacks of Covid-19 pandemic, and help lay the groundwork for making economies and societies more sustainable, resilient and equipped for the ecological and digital transition.

Next Generation EU[5] is a measure adopted by the European Union which will temporarily feed into the EU balance with new funding form financial markets. At a national level, resources will be used to power the NRRPs, which are especially focused on the green transition of society and economy, with the objective of making the whole system sustainable while at the same time ensuring competitiveness. Each NRRP outlines the goals, reforms and investments that a single country plans to implement through the Next Generation EU, particularly with regards to some strategic axes such as digitalisation, innovation, ecological transition and social inclusion.

For example, one of the missions of the Italian **National Recovery and Resilience Plan**, "Green revolution and ecological transition", tackles Renewable Energy Sources (RES), with the aim of increasing the quantity of energy produced from renewable sources through:

- Investments in agrivoltaic development
- Promotion of renewables for energy communities and self-consumption
- Support to innovative systems

From what we have discussed so far, we can conclude that the Green Transition will impact significantly on both European and national economic models. Its goal is bequeathing greener

[5] https://next-generation-eu.europa.eu/index_en

countries and more sustainable economies to the future generations. To achieve this goal, we should focus on the need to improve the citizens' quality of life, and protect the environment we live in.

2.1.2 Smart Specialisation Strategy (S3)

Smart Specialisation was developed from the reform of the Cohesion Policy of the European Commission. It defines a set of strategies characterised by the identification of areas of intervention that are crucial to increase the potential of the European economy.

It is a place-based approach: it's built on the assets and resources available to regions and Member States, and on their distinctive features and challenges. Its objective is identifying targeted opportunities for development and growth. It is structured around a multi-level and multi-stakeholder governance, which selects the priorities for investment in Research, Development & Innovation, according to the identity of each territory. This can build a competitive advantage in terms of sustainability.

According to the official definition on the S3 platform, a Smart Specialisation Strategy (S3) "*should prioritise domains, areas and economic activities where regions or countries have a competitive advantage or have the potential to generate knowledge-driven growth and to bring about the economic transformation needed to tackle the major and most urgent challenges for the society and the environment.*"[6]

These programmes are a unique opportunity to build a framework of correlated actions in to strengthen competitive development and foster employment over the course of multiple years. This can happen by identifying innovative paths allowing national and local productive activities to keep a high positioning on the market, and also supporting organisational innovation. The main goals of Smart Specialisation Strategies are:

- building dynamic and competitive regions, succeeding in fostering employment and improving the efficacy of their economic ecosystem;

[6] https://s3platform.jrc.ec.europa.eu/documents/portlet_file_entry/20125/Implementing+Smart+Specialisation+Strategies+A+Handbook.pdf/9440b855-4f44-a75a-9c9b-a1f71c3e201e

- promoting the evolution of the productive system.

Within each geographical area, S3 originates from a debate among all communities and stakeholders involved in innovation and skills development in various capacities: universities and Academia, enterprises and start-ups, training centres, research laboratories, associations, enterprises, etc. The core of the strategy are the meaningful transformations characterising our era, to which S3 tries to provide specific answers. These challenges dictated the definition of priority themes within S3, namely:

- Challenging climate change;
- Improving digital technologies and applications;
- Safety at work, in everyday life and social contexts;
- Well-being of people within the community.

A common problem that emerged from the analysis of S3s is **the general lack of professional skills necessary to cope with the double transition (green and digital),** which impacts the nature of labour itself. The labour market is currently undergoing major changes in almost all EU Member States: several jobs are at risk of disappearing, some others are radically changing, while new professional tasks are appearing and will gain an increasing importance over time. The obvious impact on employment notwithstanding, the real challenge lies in ensuring an ethical transition towards a greener and smarter economy.

This challenge will be tackled by investing in **training and development of new skills among workers**, to avoid the creation of a large gap between tasks, skills and salaries. In addition, it is also crucial that employees understand the need to constantly update their own skills and knowledge in order to comply with the rapid changes in their respective professional sectors. At the same time, they need to develop some fundamental soft skills whose importance is rarely emphasised, especially in technical jobs: creativity, organisational autonomy, problem solving, interpersonal skills, etc.

Given this general overview, and after considering the priority axes of S3s, we can conclude that investing in skills development is essential to reduce the growing mismatch between demand and supply in employment. At an educational level, this goal can be achieved by introducing innovative study curricula and learning methodologies, which will include a minimum standard of digital, green and transversal skills. Involving companies and enterprises into educational systems is also part of this strategy.

To **upskilling and reskilling the workforce**, SKILLBILL will launch training courses targeted at workers and employees of different professional levels and sectors. The purpose of these courses is preparing workers and companies to face the increasing innovations and transformations that characterise the economic ecosystem all over Europe. To this end, the training offer targeted to adults and workers will be improved thanks to a close cooperation between regional planning, interprofessional funds, training centres and corporate academies.

2.2 Main Trends in the Economic System

The European Green Deal introduces several interconnected transitions constituting a unique great transition towards a new model of development, which can be linked to the model of **Green Economy** firstly adopted by the United Nations Environment Programme (UNEP) in 2011. With Green Economy we refer to an economic model aimed at achieving social equality and the well-being of people, but also at reducing the impact of economic activities on the environment. In this process, the evolution of the labour market plays a crucial role, as the model promotes a widespread, sustainable and dignified employment system.

Within the **Great Transition**, four different transitions can be identified:

- Decarbonisation, especially in the manufacturing and in the energy production sectors;
- Circular economy;
- Transition to a sustainable and smart mobility;
- **Energy Transition** towards cleaner, renewable, inexpensive, safe and accessible energy – a process that is particularly important in countries where the development of renewables is crucial to reduce dependence on the import of fossil fuels and to minimize emissions.

The Great Transition, and all the challenges it entails, is only one of the reasons why a tighter and more productive relation between industry, Academia and research institutes should be fostered in a Green Economy context. This can be achieved by encouraging Open Innovation and the transfer of knowledge as much as possible. It is a well-established fact that the nature of work is changing. The same can be said of the skills needed to face the current shifts towards a cleaner economy. The increase in the demand for specific **Green Skills** at all professional levels is another key challenge brought forward by the Green Economy. Consequently, the educational system must offer appropriately targeted training paths to respond to this need.

In 2019, as part of the EU Green Deal, the Commission also introduced the **Just Transition Mechanism**[7]. It ensures a fair transition towards a climate-neutral economy by alleviating socio-economic impacts. The idea is leaving no one behind. In particular, this system protects the labour market because the emerging sectors will require new professional skills and roles that will replace the existing ones at greater risk of disappearing. It is thus essential to ensure an ethical development enabling a green and just transition in the labour market. This can be achieved by investing in training and education, and providing targeted financial support to those regions and economic sectors most affected by the Green Transition because of their dependence on fossil fuels and high greenhouse gas (GHG) emissions industrial processes.

Given the EU push towards climate neutrality by 2050, coupled with the shift towards Circular Economy, the Green Transition will be characterised by a **radical transformation of the energy system.** According to the Annual Report on Energy Efficiency published by ENEA in 2020[8], the Energy System is responsible for 75% of GHG emissions at EU level. Efforts should therefore focus both on industrial processes and on energy retrofit of buildings.

Changes in the energy system will require:

- Technological innovations
- The ability to set up a financial mechanism supporting investments in energy efficiency
- The involvement of citizens and consumers – who will increasingly participate in the Energy Transition.

To ensure the effectiveness of these changes, the energy efficiency strategy should be integrated in a unique framework for climate neutrality tailored to the specifics of each Member State. This integration will be possible with the implementation of national plans for energy and climate.

[7] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en

[8] https://www.efficienzaenergetica.enea.it/pubblicazioni/raee-rapporto-annuale-sull-efficienza-energetica/rapporto-annuale-sull-efficienza-energetica-2021.html

As per the E.U. definition, **Circular Economy** is “a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the **life cycle of products is extended.** In practice, it implies **reducing waste** to a minimum. When a product reaches the end of its life, its materials are kept within the economy wherever possible thanks to recycling. These can be productively used again and again, thereby **creating further value**”[9].

The goals of Circular Economy can be summarised as follows:

1) Protecting the environment by decreasing the use of natural resources and reducing greenhouse gas emissions.
2) Reducing raw material dependence, in the face of a growing global population requiring access to a finite amount of natural resources.
3) Creating jobs and saving consumers’ money. The projected number of jobs created by 2030 in the EU alone as a result of increased competitiveness and innovation as a consequence of moving towards a more circular economy is 700.000.[10]

2.2.1 Green Jobs and Green Skills

Monitoring the labour market and analysing how it is changing in response to the transformations of the Green Transition and the Circular Economy is indispensable to understand the effects of the Green Transition on the economic system.

In 2021, a growing number of job vacancies were classified as **Green Jobs.** There is a marked difference between the industrial sector, especially constructions and mechanics, and the service

[9] https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits.

[10] https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits?&at_campaign=20234-Economy&at_medium=Google_Ads&at_platform=Search&at_creation=RSA&at_goal=TR_G&at_audience=eu%20circular%20economy&at_topic=Circular_Economy&at_location=IT&gclid=CjwKCAjwrdmhBhBBEiwA4Hx5q1b2rTqfKRymhFkMzI0DmqkJaZ9C3TzdkivXDovO_fpOu9xn6u_vdRoC7xoQAvD_BwE

sector, especially logistics and trade. Green Jobs can be defined as *"decent jobs that improve efficiency in the use of energy and raw materials, limit emissions, minimise waste and pollution, protect and restore the ecosystem, and support adaptation to the effects of climate change"* (ILO:2016)[11]. Unlike other professions, Green Jobs are characterised by the demand of both hard skills, such as mathematics and IT, and soft skills like problem solving, complexity management, etc. For example, the most important company requirements are environmental sustainability and inclination towards energy savings.

The companies' demand for specific **Green Skills** is increasing, and it is not counterbalanced by the presence of a comparable growth of such skills in the labour market. This state of things is exemplified by the EU *Green Deal Industrial Plan for the Net-Zero Age*, published in January 2023: "Demand for talent is acute. Labour shortages, as proxied by the vacancy rate, have doubled in sectors considered key for the green transition between 2015 and 2021 and green transition technical skills are in growing demand"[12]

To offset the risk of experiencing a slowdown of the Green Transition due to the lack of adequately skilled workers, we need a dialogue between the world of education, training and university on the one hand, and the entrepreneurial system on the other.

In 2022, the EU published GreenComp – *The European sustainability competence framework*, part of a policy action set out in the European Green Deal to promote learning on environmental sustainability. The document identifies a set of competences, such as Critical Thinking, Problem Solving, Adaptability and Individual Initiative, that are conducive of a way of thinking, planning and acting with "empathy, responsibility and care for our planet"[13]

[11] https://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang--en/index.htm

[12] https://commission.europa.eu/document/41514677-9598-4d89-a572-abe21cb037f4_en

[13] https://publications.jrc.ec.europa.eu/repository/handle/JRC128040

According to UNIDO (United Nations Industrial Development Organisation)[14], Green Skills can be defined as "*the knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society*".

The more we analyse Green Skills, the more evident their interconnection with digital and transversal skills becomes. For example, the majority of professional groups consider the attitude to energy saving, and the tendency to reduce the environmental impact of the company's activities, essential.

The following table lists the core skills required for Green Jobs[15]:

Table 1: core skills required for Green Jobs

Required across the labour force	Required in medium to high skilled occupations
Environmental awareness and protection, willingness and capability to learn about sustainable development.	Analytical thinking (including risk and system analysis) to interpret and understand the need for change and the measures required.
Adaptability and transferability skills to enable workers to learn and apply new technologies and processes required to "green" their jobs.	Coordination, management and business skills that can encompass holistic and interdisciplinary approaches, incorporating economic, social and ecological objectives.
Teamwork skills reflecting the need for organisations to work collectively on tackling their environmental footprint.	Innovation skills to identify opportunities and create new strategies to respond to green challenges.
Resilience to see through the changes required.	Marketing skills to promote gender products and services.
Communication and negotiation skills to promote required change to colleagues and customers.	Consulting skills to advise consumers about green solutions and to spread the use of green technologies.
Entrepreneurial skills to seize the opportunities of low-carbon technologies and environmental mitigation and adaptation.	Networking, IT and language skills to perform in global markets.

[14] https://www.unido.org/stories/what-are-green-skills

[15] Source: ILO, 2019, "Skills for a Greener Future: a Global View" (Geneva): https://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_732214.pdf

2.3 Skills Development: a Strategy to face the Challenges of Green Economy and Clean Energy Transition

The shift from the current, fossil fuel-based economy to a low carbon economy characterised by a clean energy paradigm entails several challenges and opportunities for the labour market. One of these challenges is ensuring that the workforce acquires the knowledge and the skills necessary to make energy efficiency actions operational – especially in the case of highly skilled technical professionals. Shortages of these occupations are likely to occur, as per the ILO and EU report "Skills and occupational needs in renewable energy" (2011)[16]. In particular, opportunities will arise from new investments in clean energy sectors that will create millions of new jobs all over the world, while challenges will come from disruptions in the workforce in the fossil fuels sector and in ensuring proper skills alignment.

Workers need to be equipped with the skills required by the new Green Economy to make the best out of these changes, as the emerging clean energy sector needs **highly skilled personnel**. The average level of qualifications of professionals in the RES sector is higher than in the rest of the economy, and this will affect workers with lower skill levels, who will thus try to further specialise and look for better opportunities. A marked **job polarisation** is more noticeable in the clean energy sector than in others: the increase in the demand for highly skilled professionals in the industry and service domain, and of low-qualified jobs in traditional services. This phenomenon goes together with a decrease of job demand for middle-skilled workers (administration, sales, etc.), who are also the majority.

As a consequence of the Green Transition, new education and training programmes are starting to appear, as well as the need to upskill and reskill the existing employees, by focusing in particular on under-represented categories within the workforce – particularly women, young people and minorities. The goal is to guarantee that the workforce in the new energy sector is inclusive, gender-

[16] https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_166823.pdf

balanced, and fostering equal opportunities. Several public organisations, companies and training centres have already started to offer comprehensive training programmes aimed at filling the skill gaps of their workers. Technical Vocational Education and Training (TVET) play a crucial role in the transition to cleaner energy.

A **skill gap** can be defined as the mismatch between the skills that the workforce possesses at given time and the skills that are required by employers. Skill gaps can be caused by sudden changes in demand, with some economic sectors declining and new ones emerging[17]. This is exactly what is happening with the transition from a fossil fuel-based energy production to smart and clean energy technologies and digitisation. For this reason, it is important to create a direct link between the needs of the industrial and service sectors and the world of training and education, so that workers are granted direct access to the training opportunities they need in order to develop the skills necessary to carry out their professional tasks.

Green energy policies can affect the labour market differently. A policy shift towards Green Economy will create new jobs and put others at risk in different sectors. As the transition to renewable energies continues, there will be substantial reductions in employment in the fossil fuels industry, and people working in this sector will need to be retrained. Since the development of the Clean Energy sector is strictly dependent on a qualified workforce, a growing demand for Green Skills will lead to the creation of training opportunities in the formal, informal and non-formal sectors.

The transition towards Clean Energy is bringing about momentous changes in the job market. To face these changes, workers need to have the right skills to adapt to a greener economy: for companies, this is an opportunity to capitalise on these changes by training workers and equipping them with all the knowledge needed to thrive in a changing economic landscape. The Green Transition will create 14 million new jobs related to clean energy, with a shift of around 5 million

[17] Zekaria Y., Chitchyan R., 2019, “Exploring future skill shortage in the transition to localised and low-carbon energy systems”.

workers from the fossil fuels sector, and it will require additional skills and training for at least 30 million workers in the world[18].

2.3.1 Gender Gap

IEA's World Energy Employment Report[19] provides an overview of the status of the workforce in the energy labour market at a global level. The Report emphasises that the gender gap in this sector, i.e. the difference in employment between men and women, is higher than in other economic sectors. At a global level, **women employed in the energy domain account for only 16% of the total workforce**. The Energy Transition represents a great opportunity to ensure that the workforce becomes more balanced and inclusive. Therefore, training courses and skills development programmes should specifically target under-represented groups such as women, young people and marginalised communities.

According to an OECD/IEA analysis of data[20] from just under 2500 firms classified in energy-related sectors, women make 14% of the senior managers, with representation strongest in the utility sector. Excluding utilities, women hold less than 12% of leadership roles. This compares with 15.5% of the 30 000 non-energy firms in the sample.

According to the IEA[21], "the barriers women face in the energy sector are similar to those they face elsewhere in the economy. However, the challenges of the energy sector are more pressing since the sector is going through a process of transformation. Clean energy transitions will require innovative solutions and business models to be adopted and greater participation from a diverse

[18] IEA publication "Net Zero by 2050 – A Roadmap for the Global Energy Sector": https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf

[19] https://iea.blob.core.windows.net/assets/a0432c97-14af-4fc7-b3bf-c409fb7e4ab8/WorldEnergyEmployment.pdf

[20] Women in senior management roles at energy firms remains stubbornly low, but efforts to improve gender diversity are moving apace – Analysis - IEA

[21] Energy and gender – Topics - IEA

talent pool". The gender gap in the energy sector is common to several countries, partly as a consequence of the under-representation of women in STEM fields. Only a low percentage of female students choose an academic career in the domain of STEM disciplines – which represents a potential loss of talent and of economic profit.

2.3.2 Women and Stem - Education and Employment

As of 2017, the global pace of increase in the enrolment ratio in tertiary education doubled in comparison to its 2000 level, growing from 18% to 38%. On average, female enrolment exceeded male enrolment by 4%[22]. The phenomenon of the strong growth in female participation to higher levels of educations is detectable in the EU by looking at the available Eurostat data concerning graduates in tertiary education by educational level. The following maps indicate the distribution of women per 100 men in 2015 (upper map) and 2020 (lower map).[23]

[22] https://unesdoc.unesco.org/ark:/48223/pf0000370738

[23] https://ec.europa.eu/eurostat/databrowser/view/EDUC_UOE_GRAD09/default/table?lang=en&category=educ.educ_outc.educ_uoe_grad

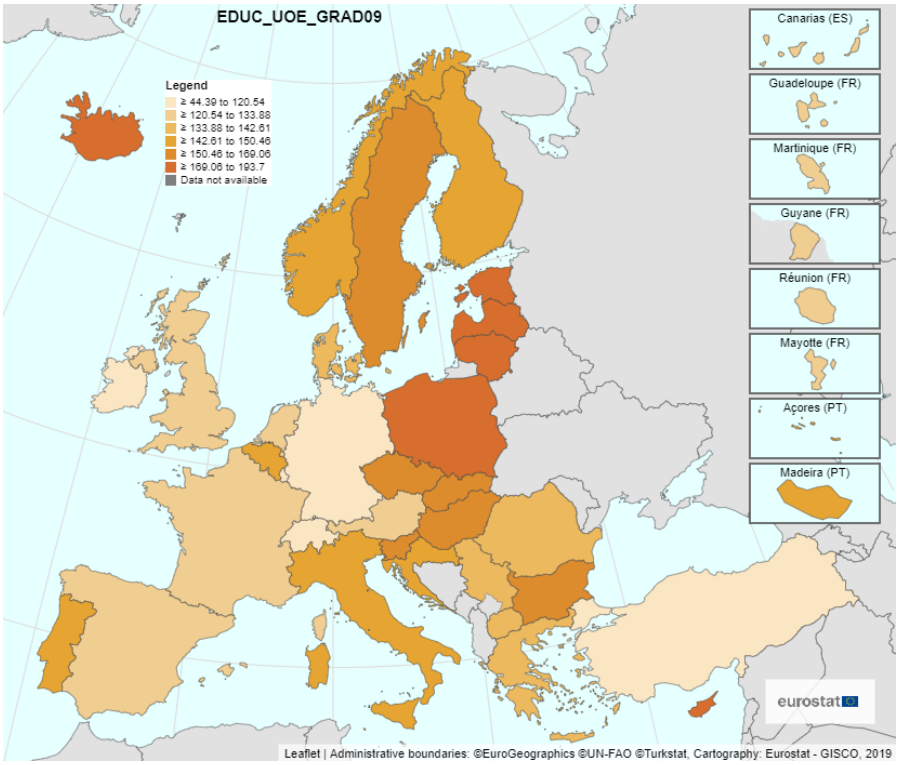

Figure 1: distribution of women per 100 men in 2015

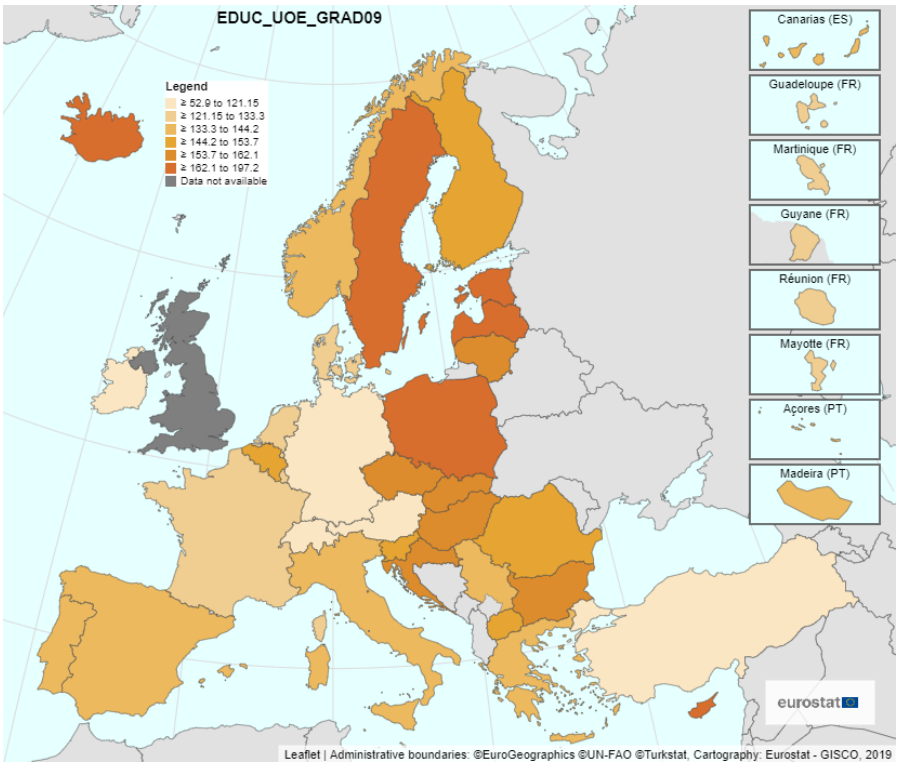

Figure 2: distribution of women per 100 men in 2020

Globally, women obtain 53% of STEM university degrees, but in the EU only 34% of graduates in the field are women[24]. In 2018, 41% of the EU's scientists and engineers were women (Eurostat 2020), and just 5 EU Member States had more women scientists than men: Lithuania, Bulgaria, Latvia, Portugal, and Denmark.

Looking at the countries involved in the SKILLBILL project, the following table shows the difference between women graduating in STEM subjects and women employed in STEM subjects in 2019, as derived from the *World Bank Gender Data Portal* and the *Gender Equality Index*. The data clearly indicates that women graduating in STEM subjects are significantly more numerous than those who actually pursue or obtain a position in STEM-related fields.

Table 2: women graduated in STEM and employed in STEM

	Degree in STEM (2019)[25]	Work in STEM (2019)[26]
Belgium	26%	6%
Finland	27%	8%
Greece	40%	4%
Italy	40%	6%
Slovenia	33%	9%
Spain	30%	5%

If we consider the situation in Italy, for example, we will notice that Italian women are more educated than men: 56% of graduated students and 59,3% of researchers and PhD students are women

[24] https://esthinktank.com/2022/03/24/women-in-stem-in-the-european-union-facts-and-figures/#:~:text=Globally%2C%20women%20obtain%2053%25%20of,(Girls%20Go%20Circular%202022).

[25] Share of graduates by field, female (%) - World Bank Gender Data Portal

[26] https://eige.europa.eu/gender-equality-index/2019/domain/work/FI

(CENSIS data). However, they are still a minority in STEM studies because 59% of students in these fields are men (Almalaurea, 2018). Furthermore, recent PISA (Programme for International Students' Assessments) tests emphasised that Italian 15-year-old students are in line with OECD average in mathematical skills, while they underperform in reading and scientific studies. Moreover, in mathematics there is a marked gender gap with Italian male students obtaining much better results than those of female students.

2.3.3 Training in the Energy Sector

Workers from the coal industry, heavy industry and the sectors of fossil fuels and oil & gas will be especially affected by the Green Transition of energy industry, and thus be exposed to market volatility and employment crisis. The same could possibly happen to the automotive industry, when the number of vehicles with electric engines supersedes the number of those with internal combustion engines. Workers from these sectors need to be **reskilled,** and acquire the competences in highest demand for the new Green Jobs. Companies that foresaw the shift and started preparing their employees in advance have already activated training initiatives to this effect. Another interesting approach involves **skills transferability** among workers, which allows to safeguard the existing workforce and provide it with stable employment opportunities in the new sector by maintaining and increasing its skillset.

2.3.4 On the interactions between Businesses and Universities

With regards to students and their preparation for a green economy, investing in the skilling process by including energy education and awareness into school and college curricula is critical, as it will provide opportunities for innovating the whole ecosystem. Graduate students will be much better equipped for the labour market and will possess skills and talents required in the innovation-driven, ever-changing energy sector. **Schools and training providers should collaborate with the business world, so that the school programmes are aligned with the actual demands from**

the labour market. *The State of the University-Business Cooperation 2016-2018*[27]*,* which encompasses a set of researches prepared for the European Commission, offers interesting insights into the current state of affairs of University-Business Cooperation (UBC). Dedicated twin-reports, one from the business perspective and one from the university perspective, were prepared for every member country of the EU. The table below only lists results from countries currently engaged in the SKILLBILL project. Results refer to researches conducted in 2017.

Table 3: insights into University-Business Cooperation (UBC).

	Businesses	Higher Education Institutions (HEI)
Belgium	Belgian businesses see the variation in their cultural peculiarities with universities, such as different motivations and time horizons, as the major obstacles to collaboration. Belgian business representatives also note, that the lack of business funding and people with business knowledge within universities hinders the intensity or quality of joint activities.	Those stakeholders surveyed in this study (HEI representatives, collaborating and non-collaborating academics) indicate rather similar major factors that hinder UBC. For collaborating and non-collaborating Belgian academics as well as HEI management the barriers related to culture, such as the focus on producing practical results by business and insufficient work time allocated by the university for academics´ UBC activities appear to be the most pressing. Certainly, lack of funding is seen as a barrier for Belgian collaborating academics as well, especially from the business side, but is perceived as slightly less inhibiting for non-collaborating academics.
Finland	The strongest barriers identified by respondents relate to universities. Their focus on producing scientific outcomes and their lack of people with business knowledge hinders cooperation from the business perspective. Additionally, the cultural such as differing time horizons and differing motivations between universities and businesses are interested in UBC activity, but perceive that HEIs are not as forthcoming and active as they could be.	All Finnish HEI respondents, including cooperating and non-cooperating academics as well as HEI representatives, state that they are considerably hindered by limited business and university funding. Both, cooperating academics and HEI managers identify limited resources of SMEs as the main barrier obstructing cooperation, while non-cooperating academics are more concerned about

[27] https://www.ub-cooperation.eu/index/reports

		the difficulty in finding the appropriate collaboration partner. Cultural related barriers such as differing time horizons and differing motivations between university and business also inhibit UBC in Finland.
Greece	Primary barriers identified by respondents relate to funding obstacles and hindrances they perceive within universities. Lack of government and business funding and lack of university awareness of opportunities arising from collaborating with businesses people with business pose as top three barriers to UBC. The existence of these barriers can be explained by academic scientific orientation and differing priorities of universities and businesses. Businesses also mention lack of people with business knowledge within universities.	Independent of whether academics are currently cooperating with business or not, the lack of business funding for UBC activities is identified as an important barrier to cooperation. As Greek business fails to realise how UBC can benefit them, there is no strategic resource allocation for UBC related activities. While cooperating academics identify business' lack of awareness of university research activities and bureaucracy related to UBC as relevant barriers, non-cooperating academics are concerned with the limited resources of SMEs and the lack of governmental and university funding available.
Italy	Italian businesses see their cultural differences with universities, such as varying time horizons, as the major obstacle to collaboration. Italian business representatives also note that the lack of government funding and bureaucracy related to UBC in universities hinder the intensity and/or quality of joint activities. Different professional staff profiles in the business world and academia, and thus the lack of university staff with business knowledge are reported to serve as an important barrier for businesses to collaborate with universities.	Italian academics identify their capabilities for UBC as moderate. They believe it is their and university's role to collaborate with businesses in research. They also state that they have a lot to offer in R&D collaboration to companies. Italian academics, however, admit they do not know enough about what businesses need and want and they do not have sufficient support to undertake UBC, despite having positive attitude towards UBC in general. Italian academics seem to be satisfied with the joint activities with businesses in research, however the education-related UBC has significantly lower satisfaction rates, which corresponds to European average. Nonetheless, 99,6% of Italian academics show very strong commitment to maintain or increase their collaborative activities in the future. This shows a positive momentum for UBC in Italy that still, however, has a large room for improvement.

Slovenia	Slovenian businesses perceive themselves as supportive towards cooperation with universities. In particular, they identified their strengths in the ability to absorb the knowledge and technology coming from HEIs. Furthermore, they highlight they have enough university contacts to establish collaboration and they are convinced that they have a lot to offer to universities in developing and delivering research. Yet, Slovenian businesses believe that it is not their responsibility to collaborate with universities in research, placing thus the initiation in the hands of universities.	Cooperating academics point out that the main barriers pertain to the lack of funding (top 4 barriers are funding related), in particular government funding. Slovenian higher education is primarily funded by the government and the general expectation is that UBC should also be funded from the public purse. While non-cooperating academics also point out the lack of government funding as one of the barriers, they give more prominence to the differing motivations/values between university and business. The non-cooperating academics are likely to be coming from disciplines where practical applicability may be challenging and therefore the values and motivations preclude them from forging cooperation with businesses. HEI representatives' side with non-cooperating academics in detecting differing values and motivations between university and business as the main obstacle to UBC.
Spain	Primary barriers identified by respondents relate to a lack of people with business knowledge within universities and missing financial support mechanisms from government. Moreover, business respondents point towards cultural differences between the two organizations (e.g time horizons and motivations) as well as the universities' high level of bureaucracy. Spanish businesses perceive themselves to be supportive towards UBC. They report having the capability to absorb knowledge and technology from universities and sufficient support to undertake UBC. Spanish businesses recognise the important role played by HEIs in their innovation efforts. They also state that they have the and that they have a lot to offer to universities regarding research. However, Spanish businesses are less supportive towards UBC in education and find themselves least inclined towards taking the responsibility to collaborate with universities in this field.	Independent of whether academics are currently cooperating with business or not, lack of resources, insufficient funding and bureaucratic procedures are perceived as the primary barriers to UBC. Cooperating academics stress funding problems to a greater extent, while non-cooperating academics emphasise cultural factors such as differing motivations between businesses and universities and the business' lack of awareness of university research activities. Aligned with the academic perception, barriers most strongly perceived by Spanish HEI representatives also relate to lack of funding, differing motivations and the business' lack of awareness. Spanish academic respondents who already collaborate with business have a positive view of their abilities and roles in undertaking UBC. They identified their strengths in the research area and they believe it is university's role to

	Generally, they are less satisfied with collaboration in education than in research.	collaborate with business. However, they perceive they have insufficient support to undertake UBC. Spanish academics seem to be satisfied with the joint activities with businesses in research, however the education-related UBC has significantly lower satisfaction rates, which corresponds to European average

2.4 Current Training Programmes

Overview

A range of training options are available for people interested in improving their skills, or acquiring new ones, with regards to Renewable Energy Resources. However, the general consensus is that the RES sector is chronically lacking in both qualified and non-qualified manpower, which seems to indicate some sort of misalignment between demand and offer.

2.4.1 Characteristics

We utilised several of the most common search engines and ran a research to collect information about the characteristics of the currently available RES training courses (see the comparative Table 4 for the details). The results of the research can be summarised as follows:

Typology: aside from relevant Academic courses, available training options often come in two broad categories: very specialised courses that offer hands-on, practical knowledge circumscribed to certain tools or a certain operational field, or broad-ranging courses that cover multiple subjects and offer a wider, albeit less focussed, exposure to numerous topics. Well-planned courses tend to offer a mix of practical activities and theoretical information.

Duration: extant training courses vary wildly in terms of duration, with some of them lasting for a few days and others spanning hundreds of hours over several months.

Accessibility: backed by an increasingly efficient technology, the recent trend of distance learning has multiplied the options for online training. The use of digital e-learning tools caters for the needs of those potential students who need to organize their training time around other engagements such as family and working hours. However, limitations in terms of participant interaction and the physical practice required for attaining proficiency in certain practical skills necessitates at least some part of the training to be held on-site, which in turns has a negative impact on accessibility for the aforementioned categories of potential students.

Costs: extant training courses come free, subsidised, or at prices ranging from hundreds to thousands of euros. This is another major factor in determining the interest and accessibility of the course from potentially interested students.

Qualification: the vast majority of courses do offer completion certificates, but only a certain number of them are properly recognised by reputable institutions or have actual value in the job market.

2.4.2 Where could SKILLBILL fit?

Evaluating the SKILLBILL courses niche properly requires taking into account the content of Paragraphs 3.2, 3.3 and 3.4, and the related conclusions drawn in Chapter 4. Also, estimating the potential future cost of the courses is not within the purview or the ability of the author. However, based on the available data, following considerations can be made:

1) With regards to length, considering the potential target audience and the need to produce results in a reasonable time, courses should last neither mere days nor years. A duration span ranging between 3 and 6 months could perhaps be ideal.
2) Most technical courses are on-site. Using VR technology could make it possible to realise a technical course in a digital learning environment
3) The vast majority of the courses examined are either eminently practical or concentrate on the managerial aspects or RES. There is little to no content covering the 21st-century skills

as defined in the *Global framework on core skills for life and work in the 21st century*[28], particularly with regards to Social and Emotional skills. Some level of engagement with these skills would help distinguish SKILLBILL courses from other available proposals.

While some qualifications of the courses examined are Master-level, therefore too high for the VET, others are only valid for a certain period of time. If attending SKILLBILL courses could result in the possession of a life-time or long-term qualification, it could help increase the attractiveness of the courses themselves.

[28] https://digital-skills-jobs.europa.eu/en/inspiration/research/global-framework-core-skills-life-and-work-21st-century-2021

Table 4: VETs

Institution	Course	Typology	Duration	Content	Accessibility	Costs	Qualification
The Renewable Energy Institution	Developing Hydrogen Energy Projects	Accredited intensive training course, including GMC Exams	3 months	Effective technical and financial management of hydrogen energy projects	Live Virtual Classroom OR Online on-demand	565 €	Galileo Master Certificate
Coursera	Renewable Energy Specialization	Specialization course (no university credits)	3-6 months	Renewable Energy concepts, tools and Applications.	Online	360 € (estimated)	Certificate
Solar Energy International	Vol101: Solar Training - Solar Electric Design And Installation (Grid-Direct)	Practical skills course	6 weeks	Components, system architectures, and applications for PV systems.	Online	895 dollars	Part of the required courses for industry certifications
Trade Skills 4U	BPEC Solar PV	Course for skilled professionals	5 days	electricians and domestic installers looking to up skill and provide services to the growing renewable energy sector.	On-site	720 pounds	5-year qualification
Niceic	Solar Photovoltaic (PV) Maintenance	Course for skilled professionals (minimum Level 3 qualification in PV panels installation)	2 days	provide the necessary skills for the design, installation, testing, commissioning,	On-site	365 pounds	Not specified

				handover, servicing and fault-finding of solar photovoltaic systems.			
Bpec	Awareness of Environmental Technologies	Course for skilled electricians (N/SVQ Level 3 in Electrical Installation or equivalent)	3 days	skills and knowledge required to install small scale photovoltaic (PV) systems. Meets the requirements of the National Occupational Standards, recognised for the Microgeneration Certification Scheme (MCS)	On-site	Not specified	5-year valid certificate
Florence School of Regulation	The EU Green Deal	Course for professionals and academics	11 weeks	fundamentals of energy and climate policy in the EU Green Deal	Online	1100€	Certificate depending on performance
The Renewable Energy Institute	Energy Storage	Personnel and consultants who are interested in implementing energy storage systems in their projects.	1-day	Types and costs of energy storage, Integration into electrical grids, architecture and sizing	Live Virtual Classroom	411 pounds	Certification of Participation
Eucena	Course 7 – Technical Components	Any interested citizen	53 weeks	Part of a 7-module course. Practical aspects	Self-paced, online	Free	None

				of PV and Advanced renewable energy production			
CEER – Council of European Energy Regulators	Introduction to EU Energy Regulatory Framework & Policy	Members of institutions and National Regulatory Authorities who want to oversee the energy landscape	4 days (32 hours)	Economic and legal frameworks that have developed in European energy regulation, including an explanation of the main institutions and participants involved	On-site	1920 €	CEER Academy Certificate
New Energy Business School	European Energy Strategy, Trends in Transition	Not specified	3 days	Energy&Power Engineering, General Engineering and Technology, Sustainable Energy	On-site	3740 €	Not specified

3. Task 5.1: Segmentation and Training Needs Analysis

The main goal of T5.1 is identified and define the user segments that will be the target of the training courses. For each segment, the training needs will be analysed in terms of current and expected skills, emerging needs, ability to use digital media and expectations around the course. Besides providing useful information for the design of training programmes, the analysis provided benchmark data to assess the effectiveness of the project and the quality of the courses and materials produced.

3.1 Synergies between T5.1 and T2.1

To optimise Partners' efforts and avoid asking the same questions to the involved stakeholders in two different project tasks, we identified a possible synergy between T5.1 and **T2.1 "Stakeholder community mapping and user research to better appreciate current training needs and skilling practices"** (leader: White Research). In the context of T2.1, Partners are required to implement a series of semi-structured interviews with stakeholders and enquire about technological advances, with the potential to create the need for new skills, and discuss current good practices for integrating circularity and sustainability principles in education and training.

Sinergie provided White Research with some questions to be included in the template for the semi-structured interview. The goal was collecting some feedback from potential target groups participating in the VET before setting up the focus groups. This was done to avoid asking the same questions in two different circumstances, and ensure that the focus groups have sufficient time to discuss other issues.

3.1.1 Questions included in Task 2.1:

1. Does your current job require that you improve your current skills (upskilling) and/or develop new skills (reskilling) in the energy / RES domain, in order to keep updated with the continuous innovations characterising your professional sector?
   - Yes
   - No
   - If yes, please specify in which sector you work
2. What are the most demanded green skills in your professional context? What green skills would you feel ready to acquire to improve your current position at work? List at least 3 skills:
   - Skill n°1
   - Skill n°2

- Skill n°3

3. Do you normally attend training courses related to your professional domain?
   - Yes
   - No
   - If yes, clarify which kind of courses they are
4. Are you satisfied with the training opportunities offered by your company? Mark your level of satisfaction from 1 to 5:
   - 1. Very unsatisfied
   - 2. Unsatisfied
   - 3. Neutral (neither satisfied nor unsatisfied)
   - 4. Satisfied
   - 5. Unsatisfied
5. If you are used to learn new skills on your own, what kind(s) of training do you usually participate in? (Multiple answers are possible):
   - Webinars / events / conferences
   - Online course / e-learning
   - Hybrid courses
   - In-presence courses outside of my working hours
   - Other: please specify
6. Do you think there is a gender skills gap in the domain of green jobs (energy / RES, sustainability, etc.)?
   - Yes
   - No
   - If yes, how do you think the gender skills gap could be reduced through targeted training?

3.2 Interviews

We decided to include information drawn from raw, anonymised results of the Interviews conducted by each Partner in its own territory, and collected by White Research as part of a larger effort on T2.1. This is intended to increase the completeness of the discussion and strengthen its reliability by referring to factual statements from stakeholders in the field.

3.2.1 Lack of Awareness and NIMBY

Two factors are recognised across the board as obstacles for the development and diffusion of RES technology, and related jobs: a general lack of awareness and a fundamentally recalcitrant attitude from the public.

In spite of the recent surge in RES popularity and a very strong communication drive at a European level, much of the information about incentives, training opportunities and future labour market developments seem to escape both the general public and at least a significant percentage of the companies and business operations.

Participants in the interviews frequently point out that the so-called NIMBY (Not In My BackYard), which is the rejection or opposition to the deployment of structure and facilities perceived as practically or aesthetically harmful to the local environment, is a major source of difficulties for many RES programmes. The most striking example is the backlash against energy-generating windblades.

However, all available indicators point to RES as one of the greatest job-creating sectors in the near future, therefore great care should be taken to put in place communication strategies and training programmes that cater for the need of greater acceptance of RES and RES-linked professions.

As far as SKILLBILL's training courses are concerned, participants from the interviews broadly agree that their effectiveness and marketability lie in the interplay of three major items:

- identifying **Target Users**
- laying out **Motivational Factors**

- crafting a suitable **Delivery Methodology**.

3.2.2 Target Users

When discussing Target Users for SKILLBILL's VET courses, there needs to be a balance between the understandable social aspiration towards greater inclusion and the concrete limitations imposed by internal and external factors.

There is certainly room for greater female participation to RES-related jobs, as the current state of affairs shows a significant prevalence of male workers in the field. Given projected size and pace of the RES market labour growth, it obviously has the potential to absorb large swathes of unemployed people, which would therefore make ideal candidates for participation in the training courses.

However, there are counterbalancing facts to ponder.

The first one is that the sheer diversity of the RES fields means it is not possible to train everyone to do everything. There must be some sort of specialisation, of segmentation, to funnel the didactics of the courses. Since RES isn't just a very large field, but also a deeply technical one, students some of the VET courses will likely need at least a certain degree of knowledge in determined subjects to attend the courses properly and make the most of them. This is particularly true for those who would join the courses to acquire new skills with the purpose of re-entering the job market, whereas those already employed in RES would need to work on their pre-existing set of skills rather than starting from scratch.

Therefore, the Target Groups should be:

- as broad as possible
- comprising both employed and unemployed people
- set up in such as way as to encourage female participation
- provided with pre-defined minimum requirements for those VET courses that will delve into technical matters that need specialised skills.

3.2.3 Motivational factors

As mentioned before, RESs are expected to contribute massively to the creation of new job opportunities in the next decade. This potential requires a coherent amount of adequately skilled workforce to be properly tapped, which means that targeted strategies will be needed to reverse the current imbalance between industry demand and workforce shortage.

Defining accurate motivational factors and communicating them effectively will be crucial to ensure the attractiveness of SKILLBILL's VET courses.

The fact that participants will be able attend free courses with a reasonable probability of boosting their chances of improving their career or re-enter the labour market are among the most immediate assets of the SKILLBILL's VET programmes, since many of the best non-university courses available are quite expensive.

However, there are additional factors that can be leveraged to good effect in addressing the promotion of female participation, which is one of the Project's goals.

One of the interviews suggested playing on the "green" nature of the SKILLBILL VET courses, and the skills that can be acquired through them, as a possible strategy to stimulate female workers to enrol, since females tend to be more interested in environment and sustainability than their male counterparts even after equalizing issues such as industry bias, pay gap etc. An ancillary factor to the aforementioned strategies is structuring courses in such a way that they are sufficiently flexible for people to be able to fit them in their schedules, which would be a particularly useful feature for those attendees who are also working parents.

3.2.4 Delivery Methodology

Several facets factorise into the construction of a training methodology capable of delivering impactful and time-worthy courses. The overall quality of the courses directly influences students'

retention of their didactic content, and this in turn determines at least partially the training cost-effectiveness.

The first thing to consider is the exponential surge in digital, on-line training solutions in the wake of the Covid-19 Pandemic. Once a promising yet fairly uncommon training medium, e-learning became by far the most widely used of the few options available during months of lockdowns and heavily regulated social interactions. Several interviewees pointed out the benefits e-learning courses, such as

- They are easily accessible
- They possess a degree of flexibility that makes them suitable for employed people and caregivers, as the final users can regulate the pace of content fruition.
- They are more interactive.

Several participants in the interviews suggested that the individual qualities of the trainers are important to the success of any training course: in addition to their knowledge and expertise, trainers should be empathetic subjects able to inspire their audience and offer powerful, engaging lessons. Some interviewees mentioned the need for the courses to be informative and fun.

There also seems to be a certain degree of consensus around the fact that SKILLBILL's VET should entail some level of practical, hands-on activities such as visits to sites, direct observations and such. In spite of all its advantages, a fully digitalised training course with no direct human contact doesn't meet the unanimous favour of the participants in the interviews.

3.3 Focus Groups

The initial plan envisaged two different focus groups comprising two different set of potential stakeholders: technicians/members of the private sector, and member of the Private Administration. While there was a reasonably good response from the former, the latter proved much harder to involve in sufficient numbers, so we opted to morph the P.A. Focus Group into a smaller DELPHI, details of which are available on Paragraph 3.4.

3.3.1 Structure

The “Private Sector” Focus Group was scheduled to last around 60 minutes with a number of participants not exceeding the 12 units. Two members of the Sinergie’s team were assigned the roles of Facilitator and Secretary.

To help guide the discussion, a set of questions was compiled and agreed in advance by the Sinergie’s team, and distributed to attendees beforehand to give them a chance to prepare. The questions were organized in four batches: Training Content, Methodology, Critical Points, Risks and Opportunities, with a number of questions assigned to each batch. Because of time constraints, it was not possible to go over every single question, but the panel did discuss at least two questions from each batch.

Sinergie’s team members aside, eight participants accepted the invitation. Project Coordinator Ilaria Bientinesi and members of the Project’s Advisory Board were also in attendance.

We prepared a snap PowerPoint presentation as a way of recapping the salient aspects of the project and visualise questions as we discussed them.

Participants were divided in two sub-groups and asked to select a “speaker” that would report to the wider group upon completion of the discussion of the first batch of questions, on the assumption that smaller groups could help ensuring adequate room for all attendees to actively engage in exchanging

ideas. Once it became clear that the participants were more than willing to share their insights, we continued the Focus Group as a plenary activity only.

3.3.2 Questions

Table 5: questions on training content

FIRST BATCH - TRAINING CONTENT
A) Relevant Topics
Can you identify the new skills related to the most innovative developments in technology that are badly needed in the current labour market?
Can you list some technological developments (currently available and future) in the renewable energy sector you think must be included in training?
B) Need to upskill / reskill in your job
Does your current job require that you improve your current skills (upskilling) and/or develop new skills (reskilling) in the energy / RES domain, in order to keep updated with the continuous innovations characterising your professional sector?
On which topics?
C) Potential Benefits
In your opinion which are the potential benefits of receiving educational training on RES?

Table 6: questions on methodology

SECOND BATCH - METHODOLOGY
A) Delivery method
The course will be delivered mostly using VR (Virtual Reality). Do you think this method is suitable for the course content?
Would you suggest any companion delivery system? (e.g. documents, more traditional multimedia training, synchronous classroom)
B) IT equipment to attend the training
The VR sessions can be attended using a smartphone (either inserted in a VR holder or not) or a PC. Do you think this equipment could be easily available and is suited for the purpose?

C) Computer literacy requirements
Considering the skilling/upskilling/reskilling nature of the SKILL BILL programme, which computer skills do you anticipate participants will need to attend a VET successfully?

Table 7: questions on critical points

THIRD BATCH - CRITICAL POINTS
A) Trainees age range
Thinking about the situation of your country, which age group do you consider potentially more interested in the programme? Which age group would be less interested?
B) Previous knowledge for trainees
Based on your experience, what elements do you think are crucial to ensure the success of a VET?
Namely, which are the enabling factors you judge relevant to successfully attend the training?

Table 8: questions on risks and opportunities

FOURTH BATCH - RISKS AND OPPORTUNITIES
A) Barriers
According to your opinion, what are the major barriers that may hinder the acquisition of new skills in the sustainable and circular RE development domain?
B) Course effectiveness
In your opinion, what will make a VET training course “effective” and “time-worthy”? Can you state some elements that cannot be missed?
C) Course effectiveness
What do you think could be the strongest drivers for joining a SKILL BILL programme?
D) Expectations
What expectations should an enrolled student have with regards to the training itself? How can we rise these expectations and how can we fulfil them?

3.3.3 Results

The following is a summary of the various contributions the participants offered over the course of the discussion. The information has been compounded and anonymised.

1. Skills and knowledge

According to the participants, many technical profiles in the RES field, such as technical engineers, lack deep, technical knowledge on subjects like electrical installations, environmental impact, current regulations and legal requirements. In addition, the fast-paced technological advances are creating the needs for sets of skills that are partially or wholly new: for examples, those concerning batteries, storage systems, and hydrogen. The mechanics of the market and the ancillary services are also useful.

Those who already possess a strong technical background could benefit from gaining expertise in all the elements needed to manage a project successfully.

The whole panel identified soft skills, such as negotiation, conflict resolution, communication, as an indispensable element of any envisioned training course.

There is a certain tendency towards searching for “unicorns”, as in people who are equally competent and skilled in several different areas, but the amount of knowledge and technical complexity of the sector, coupled with its advanced, makes it impossible to be an expert in everything. What’s more, the training course should also enable the trainees to cultivate a flexible and open mindset to make them better recipients of change.

2. Training methodology and delivery mode

As a general principal, the panel concurred on a recommendation for a blended learning environment combining theoretical instruction with practical experience. With regards to the delivery modes, the consensus across the board was that in-person training is the best way to maximise engagement

and proactivity. However, the benefits of online distance learning are unquestionable as it would guarantee maximum flexibility to all the potentially interested trainees. VR could be very useful in this regard as a sort of middle ground between extremely beneficial but difficult to organise activities, like on-site visits, because they are excellent opportunities to ask questions and experience things directly, and be trained on problems that could potentially occur and how to react to them, and more convenient in terms of safety concerns, and theoretical courses run entirely online. VR could be used to prepare for situations do not exist at the moment. Some participants to the focus group pointed out that it may be necessary to have physical infrastructures, such as a dedicated room, to run the VR simulations.

Using digital learning tools could also useful if they are set up in such a way as to allow interactions with other trainees from different countries, exchanging ideas and experiences.

In addition, making provision for a sort of archive or repository for training material and additional resources would contribute to enriching the added value of the training courses.

3. Who should we target

The group devoted a significant amount of time to discussing the selection target groups, as part of a broader recommendation of taking into account duration, target audience and expected skills when envisioning a given training course. The necessity for inclusion notwithstanding, the broad consensus was that it is not possible to train everyone to do everything, and at the same time, just a general knowledge of any given subject is insufficient. Therefore, the platform of potential participants should be narrowed down using some practical criteria.

Because RES comprises very diverse industries, the selection of the target groups is at least in part dependant on which of these industries are selected as a focus.

Broadly speaking, the panel identified two categories of potential stakeholders: people to be directly involved in the practical, physical operations related to RES services, such as panel installers, and people who oversee such operations. Among these, and depending on the minimum requirements

of the selected RES, there could be both people who are already engaged in the industry, for example workers that need to upskill or re-skill, and people who are currently outside the industry. These could be unemployed people in need of re-skilling, on young people that need to be integrated into the labour market and could benefit from acquiring additional skills.

4 Course Content

The panel agreed on four major content categories:

- Soft skills. These should be transversal across all training courses, albeit perhaps in different proportions, because the need to be able to communicate effectively, manage problems and negotiate solutions is going to be a common constant among all RES-related professions.
- Project Management. This category pertains to those who would be involved in overseeing RES-related practical operations, rather than those who will physically do the work on-site.
- Legal/regulatory framework knowledge. This category is also transversal, even though to different extent, because both people engaged in overseeing operations and people physically performing them will need to be aware, at least to a certain degree, of both the EU and the national current regulations.
- Technical skills, depending on the RES industries identified as those of greater interest for the training courses. This category would interest primarily the participants in the more “practical” training courses, but the panel agreed in saying that people employed in more white-collar professions, like engineers, could benefit from a dedicated training in the more practical aspects of RES-related professions.

5 How we can make the proposal attractive

Key motivating factors for promoting participation in the training courses are:

- *Employment prospects*. Given the projected exponential growth of the RES sector in the coming years and the subsequent job openings, people could be drawn to SKILLBILL courses as a way to access a sector of the labour market where many jobs are available.
- *Money*. At least some of these jobs could offer competitive salaries.
- *Connection benefits*. Taking part in a SKILLBILL course could help participants to establish useful connections, particularly if the course results in an internship.
- *Eco-friendliness*. RES is one of the drivers towards a more sustainable future. This could be a selling point for those participants that are more sensitive towards environmental issues.
- *Quality and fun* of the training courses themselves.

3.4 DELPHI

To make up for the missing P.A. Focus Group, which could not be organised due to the insufficient numbers of engaged stakeholders, we submitted a questionnaire to the available ones. The questionnaire was articulated in four parts:

1. Training content

2. Methodology

3. Critical Points

4. Risks and opportunities

The questionnaires were then elaborated using the Delphi method.

Delphi method is based on the principle that forecasts from a structured group of individuals are more accurate than those from unstructured groups. The experts answer questionnaires in two or more rounds. After each round, a facilitator provides an anonymised summary of the experts' forecasts from the previous round as well as the reasons they provided for their judgments. Thus, experts are encouraged to revise their earlier answers in light of the replies of other members of their panel. The process ends when consensus is reached on the results produced by each round, and the mean scores of the final rounds decree the outcome.

Results from the questionnaires and the relative responses can be summarised as follows:

- **Training content**

Respondents identified technical skills in the RES sector, particularly those pertaining to solar energy such as PV panels, and IT skills, for example those needed to manage platforms to access national or EU funding, as important. In addition, training on energy savings in buildings could be of great interest. Participation in the training programmes could be beneficial in terms of new skills learned or refinement of those already possessed.

- **Methodology**

Respondents stressed the need to balance the flexibility of online training with the benefit of practical, hands-on experience. Some of them also pointed out that the availability of extra content in the form of a digital repository could be an added value to the training courses. Some others indicated that they, while endorsing the use of digital technology for logistical reasons, they would still favour the use of some sort of physical training material, such as a book, for very specific topics like regulations.

Respondents agreed across the board on the necessity to employ multimedia tools both for on-site and online lessons. None expressed perplexity with regards to the use of VR, albeit none of them has any pre-existing experience with the technology. With regards of computer literacy requirement, the respondents found that basic knowledge of common items like internet browser and programmes like MS Word should be sufficient to follow the courses.

- **Critical points**

Most respondents identified the age range of the participants that could be most interested in attending the course as people in their 30s and 40s, and at least legal age.

With regards to the previous knowledge, one responded mentioned that local regulations should be considered when planning the courses, as some of them mandate having graduated in certain subjects of having attended certain schools to perform certain jobs. In Finland, for example, people can’t work as electricians unless they have graduated from a high-school that guarantees training in the related subjects.

- **Risks and opportunities**

The respondents identified three main potential barriers to the fruition of the course.

- The first is that technical jobs in RES which involve working outside entail a certain degree of physical activity, and are typically performed by people who can meet the minimum physical requirements set by the law.

-The second is fitting the course into one's work-life balance. This issue requires careful consideration in light of the fact it can wield a particularly powerful impact on female attendance, as a consequence of the fact that women are more likely to take up roles as caregiving roles in addition to their professional commitments[29]. Flexible, distance learning technology can be used to mitigate this factor to some extent.

-The third potential difficulty is a lack of sufficient motivation on the side of the course attendees.

With regards to the time-worthiness of the course, the majority of the respondents agreed that it stems from course's practical usefulness, in its being immediately applicable to solve problems that participants might face at work.

The respondents agreed that the necessity to comply to local regulations and the perspective of accessing the labour market after attending the course.

While finding expectations rather self-evident, namely learning new skills and perfecting those already possessed, the respondents determined that offering high-quality courses will be important to ensuring meeting the participants' expectations.

[29] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4804270/

https://arborsassistedliving.com/the-gender-gap-women-predominate-among-caregivers-of-the-elderly/#:~:text=Although%20some%20studies%20suggest%20that,for%20whom%20they%20provide%20care.

4 Conclusions

The conclusions detailed in the next paragraphs are derived from the results discussed in Paragraphs 3.2 (Interviews), 3.3 (Focus Groups), and 3.4 (Delphi round).

4.1 Target groups

The identification of target groups should take the following principles into account:

- **Inclusivity**: the Energy Sector in general is still predominantly male-oriented, and RES as no exception. Greater female involvement is desirable not only on ethical grounds, but also as a way of expanding the talent pool to be tapped into. A SKILLBILL course could be significantly beneficial for those seeking to re-enter the labour market.
- **Pragmatism**: the variety and complexity of the RES field means that it is not feasible to train everyone to do everything. A small number of industries should be selected and courses planned accordingly. Participants in the Focus Group concurred on the need to envisage at least two levels in the training courses: the more practical ones, that would require some sort of pre-existing knowledge or training to conform to national regulations, and those designed to train the personnel who will oversee and / direct the operations of those work on the ground. People without pre-existing technical skills to conduct practical activities on the ground could more easily fit in the latter category.

Some participants in the Delphi round remarked that physical requirements should be considered when setting the parameters for accessing the courses for those performing hands-on activities in the field, as these professions are typically more physically demanding than desk jobs. They also identified people in their 30s and 40s, and at least legal age, as potentially more probably interested in the courses. However, no age-based restrictions will be embedded in the courses. , with the exception of those mandated by the law of the land.

4.2 Training methodology

The definition of the training methodology and the appropriate tools to bring it to fruition must reflect the following elements:

- **Flexibility**: the courses' set-up needs to be sufficiently flexible to allow those people who would attend it while also having a job to fit it into their work-life balance. This is especially important to boost female participation because of the added complexity deriving from the responsibilities of those who are also home-makers and/or parents. For this reason, the consensus is that e-learning would be the best option.
- **Accessibility**: lessons and didactic materials should be readily and easily accessible, preferably in digital form. A dedicated digital repository has also been mentioned as a valuable resource.
- **Engagement**: there is a broad consensus across the board on motivation being a critical factor in ensuring the success of the course and its time-worthiness. The training methodology should therefore be conducive of a strong motivation across a given time-span. One of the ways in which this can be achieved is embedding some level of gamification into the training methodology, so that the content is not just interesting, but also fun to acquire.

Several participants in the Focus Group and the interviews pointed out that for a course to be truly effective theoretical instruction must be complemented by hands-on experience in the field. Some advocated field trips and visits to actual facilities as excellent opportunities to ask real questions. Others suggested that the use of VR could help bridge the gap between theory and practice, and it could be used to train people how to react appropriately to a determined set of problems in a completely safe environment.

Other participants with trainer's background opined that while the flexibility afforded by e-learning technology is key to ensure participation, trainees have a tendency of being more active during in-person activities, and that cooperation and interaction between them holds great didactic potential, and recommended building some level of peer-interaction into the training methodology.

4.3 Training content

Following the discussion on Target Groups detailed in Paragraph 3.3.3, participants in the Focus Group agreed on the need to differentiate the training content for those who will take the Field Agent-oriented courses and those who would take the Overseer courses.

However, participants also agreed that at least one module in each area should be dedicated to transversal soft-skills, with particular attention to communication, negotiation, conflict resolution.

They also agreed that the two areas need not be completely different and unrelated. Content overlapping to some degree could be mutually beneficial: engineers for example could benefit from exposure to the more practical aspects of PV panel installing, and vice-versa manual workers could take advantage of some elements of project management.

Therefore, they envisaged two different areas sharing an overarching module on Soft Skills, and a number of modules the majority of which would be specific to a given area, with provisions for overlapping where appropriate and potentially beneficial.

Additional considerations include:

- The training content should be selected and organised to ensure that is practically useful.
- Content should be high quality in both design and information
- Practical examples and case studies should be provided to clarify the course's perceived utility and value.
- Provision should be made for hands-on experience, either directly or in the form of VR simulations.

4.4 Driving factors

Participants in the Focus Group, Delphi round and Interviews all share the view that motivation is a major driving factor towards participating in a SKILLBILL course. Motivation can be built and maintained through a combination of factors:

- The overall quality of the course
- The ability and professionalism of trainers
- Effective communication of the courses' characteristics and benefits.

With regards to communicating the "selling points" of the SKILLBILL courses, participants in the Focus Groups and the interviews suggested the following:

- **Job perspectives**: given the projected growth of the RES field and the subsequent creation of jobs, trainees can expect to access more easily the labour market with the skills and knowledge acquired with the SKILLBILL courses.
- **Green**: by working in the RES after attending a SKILLBILL course, the trainees could contribute to impacting the environment positively. A growing body of contemporary research reports a consistent, cross-cultural gender-based difference in men's and women's attitude towards environmental topics, with the latter being more interested in fighting climate change and displaying a higher degree of negative emotions towards it compared to the former[30]. This could be leveraged as a drive for a greater inclusion of female workers.
- **Qualification**: attending the course could result in a useful qualification, if such provisions are made beforehand with the competent authorities.
- **Flexibility**: the course can be taken at one's pace taking full advantage of digital learning environments, allowing potential participants to integrate the course into their work-life balance.

[30] https://climatecommunication.yale.edu/publications/gender-differences-in-public-understanding-of-climate-change/

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9266259/

https://www.cambridge.org/core/journals/american-political-science-review/article/facing-change-gender-and-climate-change-attitudes-worldwide/38688C0CA6DF889475FDB52C06DD7FF9

The project

SKILLBILL's overall objective is to develop a large and strong foundation for the growth and acceleration of renewable energy's deployment, thanks to engaging with stakeholders of the whole chain, diffusing scientific culture and skilling multi-level workers. The basic idea underling the project is that the knowledge should be diffused at several different levels and qualitatively appropriate both to train the adequate number of workers and to increase RES awareness and to reach a more social and inclusive Europe. The project aims at creating several pathways to induce target groups to get interested or involved in RES besides their initial level of education and their working position. It's important, beside the creation of instruments for the upskilling and reskilling of workers, technician and designers, to have awareness modules for unspecific public in order to fight against ignorance, fake news, gender gap and the phenomenon of functional illiteracy: it is widely documented that lifelong suitable learning process is the fundamental driver to support the development, maintenance and update of skills. Thus, SKILLBILL proposes concrete actions to accelerate the deployment of renewable energy at different levels to analyse and involve all the interested parts in open discussion using adequate language; create several different pathways to increase skills after having mapped knowledge gap and without gender prejudice; develop and implement innovative learning method; and evaluate the work performed.

Coordinator: **AZZERO CO2 SRL (AzzeroCO2)**

PARTNER		SHORT NAME
AzzeroCO2 climate in our hands	AZZERO CO2 SRL	AzzeroCO2
Q-PLAN INTERNATIONAL	Q-PLAN INTERNATIONAL ADVISORS PC	Q-PLAN
WHITE	WHITE RESEARCH SPRL	WR
UNIVERSITÀ DEGLI STUDI DELLA TUSCIA	UNIVERSITA DEGLI STUDI DELLA TUSCIA	UNITUS
UNIVERSIDAD DE SEVILLA	UNIVERSIDAD DE SEVILLA	USE
Metropolia University of Applied Sciences	METROPOLIA AMMATTIKORKEAKOULU OY	METROPOLIA
Utrecht University	UNIVERSITEIT UTRECHT	UU
EREF European Renewable Energies Federation	EUROPEAN RENEWABLE ENERGIES FEDERATION	EREF
SINERGIE	SINERGIE SOC CONS ARL	SINERGIE
PEDAL CONSULTING	PEDAL CONSULTING SRO	PC