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### **Go4VocationalSkills**

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# Analysis of secondary sources concerning standards of competencies



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## INTRODUCTION

There is no single established distinction between skill types shared by VET programmes in European countries. Rather, countries make use of different definitions when structuring knowledge and skills (Cedefop, 2022b). This directly influences common understanding and defining of key competencies, especially related with vocational area.

The aim of this summary is to identify key types of universal competencies preferably for students and graduates of technical vocational schools (secondary level of education). In addition this report will discuss the main issues when it comes to defining competencies, setting up groups and frameworks of competencies.

Presented competencies have been selected based on requirements identified in sectors: logistics, construction, renewable energy. Additional factor which has been considered is the relevance when it comes to changes occurring in the mentioned vocational sectors by 2030.

This report has been prepared by the Partnership within project Go4VocationalSkills in 2022 based on the review of literature, reports, other relevant sources from Bulgaria, Greece, Poland, Spain and European Union.

## VOCATIONAL COMPETENCIES

### COMPETENCIES IN THE FIELD OF LOGISTIC

#### **Introduction**

According to some studies, the demand for people in the field of logistics and supply chain management (SCM) is growing and it is increasingly difficult to find qualified personnel. On the other hand, globalization, scarcity of resources and electronic delivery of goods and services, have significantly influenced the logistics sector which has certainly led to further dynamic developments in the different professions of logistics (Kiessling and Harvey, 2014).

From a work perspective, these changes require the demonstration by individuals of lifelong learning competences and the achievement of certain key competences in terms of knowledge, skills and attitudes that provide added value for the labour market to improve its flexibility and adaptability (H. Kotzab et al., 2018).

Taking this into account, the European Union has developed and introduced the European Framework for Key Competences for Lifelong Learning, in which competences have been defined "as a combination of knowledge, skills and attitudes appropriate to the context" (European Commission, 2014, 2007). Here, key competences are identified as the combination of skills, knowledge, and attitudes that individuals need for personal fulfilment, development, and employment.

According to some research, the logistics sector, however, faces a bright future as regards market developments, with a global market volume for logistics services that will exceed EUR 900 billion and is expected to grow by up to 3% per year over the next five years (H. Kotzab et al., 2018).



This growth is contrasted by the shortage of staff with the skills, abilities, and attitudes necessary to fill important supply chain management roles. In the field of logistics, technology is developing quite rapidly, and this also affects the set of skills and competencies required of workers.

It is critical for an organisation looking for logistics workers to define an appropriate job profile as a combination of skills and competencies that allow you to quickly make changes to your job profile in an increasingly unstable environment.

Several authors and trade organisations intend to define the appropriate job profile, which can be useful both to companies in the sector, as well as to training institutes and to individuals themselves.

An example concerns the Association for Supply Chain and Operations Management (APICS, 2014), an association that offers training, certifications, and professional development opportunities for supply chain professionals, which has defined a competency model and for distribution and logistics managers that corresponds to the knowledge and professional skills required for the sector.

During this work, we will analyse some studies on skills and competences to define what are the basic or professional skills, useful especially to graduates of technical schools who wish to work in this field. After analysing the current literature, we will be intended to define the level of skills based on the scale developed and adopted during the project.

### **Research on competencies in the field of logistics**

Logistics is a labour-intensive industry that involves many types of workers (e.g. truck drivers, warehouse operators) and administrative employees. The degree of qualification, training and retention of these employees is an important factor in logistics performance. Yet, this factor is often overlooked or taken for granted. From a training perspective, the suitable figures to take a role, depends not only on the human resources policies of specific companies, but also on national initiatives to educate and train for professions in the sector.

To explore and identify the skills and competencies required in logistics, the use of surveys among logistics and supply chain managers and students was the most common approach in the current research literature. Numerous studies have investigated the role of individual skills in the logistic context and have identified and classified essential skills. Several studies (McKinnon et al, 2017; H. Kotzab et al, 2018; Mageto & Luke, 2020) have investigated and grouped the competencies in the field of the logistic sector, using different frameworks of reference, like **quantitative/technological skills, basic SCM skills, interpersonal, managerial skills, soft and hard skills, etc.**

A study conducted by the World Bank (Logistics Competencies, Skills, and Training: A Global Overview, 2017) shows that in the logistics sector there is a lack of skilled workers at all levels of employment, both in developed and developing countries. Shortages range from lack of truck drivers to problems in filling management positions in the supply chain, suggesting that this problem is likely to remain the same or worse over the next five years (McKinnon et al., 2017). **The study notes a lack of preparation of the vocational school for logistics work, particularly in IT, requiring new skills that the existing workforce does not possess.**



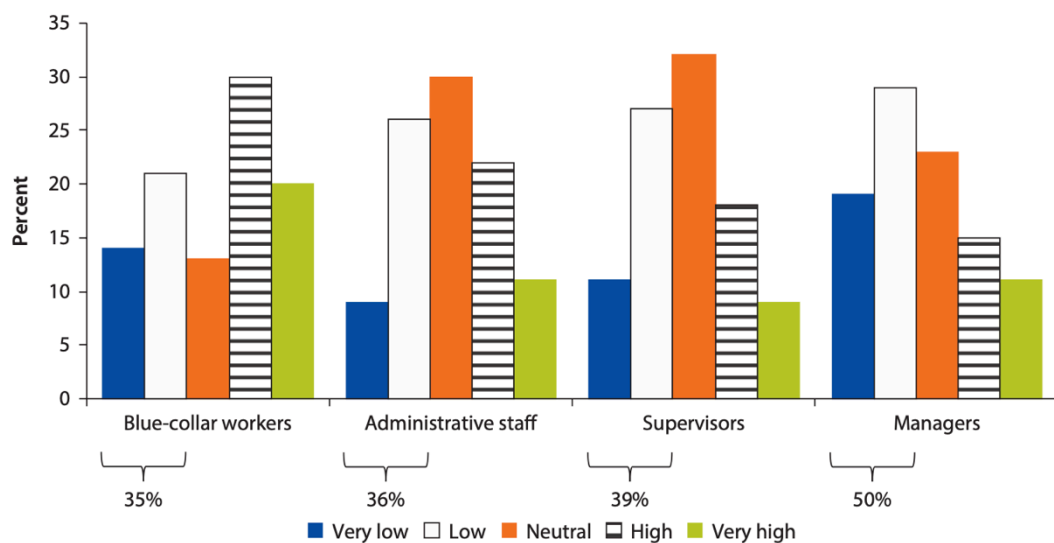
The survey was carried out through the provision of an online questionnaire to examine the views more broadly among all stakeholder groups, those of logistics service providers and industry associations. It involved the countries of Europe, Southeast Asia, the Americas, sub-Saharan Africa, Central Asia, and the Middle East/North Africa.

Four levels of logistic occupation have been defined:

1. **Operative logistics/blue-collar staff.** This group includes all logistics employees who carry out basic operational tasks and do not have any staff responsibility.
2. **Administrative logistics staff.** This level includes traffic planners, expeditors, warehouse clerks, customs clearance officers and customer service employees.
3. **Logistics supervisors.** Supervisors have frontline responsibility, controlling logistics operations on the ground rather than in the office.
4. **Logistics managers.** This category includes managerial staff, with higher-level decision-making responsibility.

Participants in the online survey were asked to rate the availability of suitably qualified personnel in their country at each of the four occupational levels.

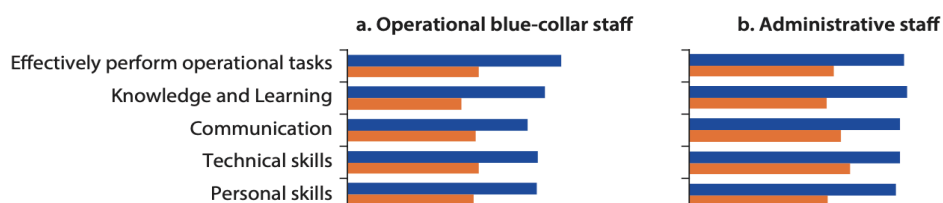
Figure 3.1 Availability of Suitably Qualified Logistics Staff (All Regions)



\*Source from World Bank (Logistics Competencies, Skills, and Training: A Global Overview, 2017)

The survey also shed light on the importance and availability of particular competencies at each of the four occupational levels. These competencies were divided into six categories and rated using the same 5-point scale.

Figure 3.3 Importance and Availability Rating of Logistics Competencies at Occupational Levels





\*Source from World Bank (Logistics Competencies, Skills, and Training: A Global Overview, 2017)

The four graphs show that virtually all competence categories are deemed to be of high importance (average around 4/5). Employees on all levels need to perform these tasks effectively, be communicative, possess technical and personal skills and be able to learn and acquire further knowledge on a regular basis (McKinnon et al., 2017).

The high importance attached to all categories of competence confirms earlier statements related with respect to the lack of qualified personnel, demonstrating that **logistics workers must possess very different skills to master all the challenges of the current system.**

In another study (Key competences of logistics and SCM professionals – the lifelong learning perspective, 2018), the researchers analysed more than 1000 job offers that had been published on German online portals, trying to identify the skills required by companies in the logistics sector. The study involves the creation of the skills catalogue, carried out through the review of the literature and the use of the European Framework for Key Competences for Lifelong Learning.

Based on the notions of lifelong learning and jobs levels literature, in the this study four sets of competences were identified:

1. **Professional skills** refer to knowledge crucial to the specific profession.
2. **Methodological skills** represent the ability and willingness to apply methods to tasks independently. They include information management and systematisation, correlation recognition, problem solving, solution creation, and decision making.
3. **Social aspects**, sometimes referred to as soft skills, imply the ability and willingness to communicate with other individuals to achieve goals and implement concepts successfully. These skills include group- and relationship-oriented behaviour, communicative behaviour, and a willingness to resolve conflicts.
4. **Personal aspects** are related to the development of an individual's personality within a job role. This includes attributes such as the ability to self-reflect and self-organise. These skills support motivation, talent, and willingness to perform.

The result identified 283 skills, general and specific, that companies require most in the logistics sector when recruiting a worker. The results of the analysis identified a thematic mapping and its relevance.

- The first theme refers to the **sense of initiative and entrepreneurship (100% relevance)** which includes concepts related to management areas, such as analysis, organisation, implementation coordination, control and development of support services and projects.
- The second theme concerns specific **role skills (65% of relevance)**, referring to basic skills. They include concepts such as logistics, procurement, production, and stock.



- The third theme **concerns technical skills (relevance of 23%)**, as well as computer and basic and advanced skills.
- The fourth theme concerns **training skills (13% relevance)**, i.e., university degree, professional diploma, training, and work experience.
- The fifth and final theme that emerged from the study of the ads refers to **personal skills (5% relevance)**, such as teamwork, communication skills, problem-solving skills, and conflict resolution.

Adecco<sup>1</sup> (2022) detects 12 job skills to power your career in logistics. A part from Softs skills and People related ones, they identify technical skills such as:

1. **Data Analysis** - all good logistics workers need to be able to read and analyse data to recognise different trends and patterns that are useful to their firms. The ability to use spreadsheets to plan and execute projects is also important, along with strong mathematical skills, which are valuable when it comes to calculating pricing and delivery times.
2. **Knowledge about the Industry** - Being clued up on the latest trends, technologies and developments in the industry can give you an edge at work or during the recruitment process. Industry knowledge helps make sure that a company's processes are competitive, efficient, and delivering the best value for clients.
3. **Ability to embrace new technology** - Technology affects everybody and this is especially true in the logistics sector. With companies looking to remain competitive, the introduction of new technology is especially relevant in this sector. This gives people excellent opportunities to increase their skills as time moves on.

The same trend was pointed out in the recent article published by Novologistica<sup>2</sup> (2022) for some years now, the set of skills required by people to work in the logistics sector is **focused on the latest technologies**. For this reason, some of the most sought-after profiles will be those of experts in areas such as process automation, Big Data and AI. **The most valued profiles will be those who could develop intelligent environments with the use of IoT and provide differential value to the organization.**

## Conclusion

This desk research on hard competences in the field of logistics (vocational theoretical knowledge, practical skills and vocational digital skills) showed that there is not much existing research related to competencies in vocational education and training. Most of the research papers found are describing competences related to higher job positions (managerial and directive), but not specific competences nor competence levels for the job positions which can be achieved with secondary level of education. Furthermore, there is no indication regarding the level of competencies needed for certain positions. In the next

<sup>1</sup> Adecco is a leading company in solutions for temporary and indefinite hiring, selection, evaluation, consulting, training and process outsourcing. More information: <https://www.adecgroup.com/es-es/soluciones/adecco/>

<sup>2</sup> Novologistica.com is a web portal dedicated to the logistics, transport and maintenance and storage sector. More information: <https://www.novologistica.com/sobre-nosotros/>



phase of the study, 5 job positions in the field of logistics will be chosen and that will allow is to look closer to competences related to those positions.

## COMPETENCIES IN THE FIELD OF CONSTRUCTION

### Introduction

The first part of this research will aim to identify competencies of key importance that fall into the category of vocational or “hard” competencies, for each of the three professional fields of study: construction, logistics and renewable energy. The 3 main scopes of professional competencies analysed, specific for the given field of education, include: theoretical knowledge, practical skills and IT competence understood as IT competencies specific to a given field of study (knowledge on specialised software). The competencies that follow to be listed can be obtained by graduates of Vocational High Schools (upper secondary level) for the concrete professions.

### DESCRIPTION OF COMPETENCIES:

1. **Vocational – theoretical knowledge:** It includes the knowledge necessary to perform professional tasks at a specific job position.
2. **Vocational – practical skills:** This competence includes the ability to use knowledge in practical activities in the substantive areas indicated for a given field of study.
3. **IT – software literacy:** Describes primarily the ability to use computers to obtain, evaluate, store, create, present and exchange information, and to communicate and participate in collaborative networks via the Internet. This competence includes the efficient use of computer applications and issues related to the Internet.

**Areas and careers in Construction:** The construction industry sector is related to the development, production and repairment of different types of products e.g. buildings, bridges, roads, rails, aircraft runways, docs, power plant buildings, tunnels, etc. In order to discover different job positions, to evaluate the necessary qualifications and come up with common competency profiles for a profession in construction, we consulted different platforms like “Careers in Construction”<sup>3</sup> and GoConstruct<sup>4</sup>, that aim to determine labour market needs in the construction field. According to the most mentioned job positions on these platforms and using as a framework the “National Education Standard” for the acquisition of qualification in the profession "Construction Technician" of the Bulgarian Ministry of Education and Science<sup>5</sup>, we discovered three different areas of specialization and the associated job positions:

- *Construction and Architecture:* Includes the knowledge and skills related to the organisation of building works for rough construction, the installation of metal structures, construction carpentry, tiling, thermal and waterproofing repair works. Can include job positions like: Technician in civil construction; Technician civil engineering and architecture; Technician in metropolitan constructions and more.

<sup>3</sup> <https://www.careersinconstruction.ca/en/careers/career-paths/infographic>

<sup>4</sup> <https://www.goconstruct.org/construction-careers/what-is-a-construction-worker/>

<sup>5</sup> <https://dv.parliament.bg/DVWeb/showMaterialDV.jsp;jsessionid=99B68371BF25FD3F1A769B9A66C88830?idMat=15139>





- Water construction - Includes the knowledge and skills related to the organisation construction, control and operation of water supply and sewerage systems in small settlements and networks in buildings. Can include job positions like: Water supply technician; Technician in hydraulics; Technician in water construction and more
- Transport construction - Includes the knowledge and skills related to the organisation of the execution of road and railway works. Can include job positions like: Technician in road construction, Technician in railway construction, Technician in airway runways and more.

For the sake of this summary of sources, we decided to focus on competencies within the broad term of “Construction technician/worker”, before the specialisation in one of the three areas, that can cover a large number of roles into the industry, but typically would refer to “a person that performs a variety of general construction tasks during all phases of construction”. In order to provide a clear definition of what role and responsibilities we acquire to the term “construction technician” (that is going to be used further to underline the necessary vocational competencies), we gathered descriptions from job portals like “Indeed”<sup>6</sup> and GoConstruct<sup>7</sup>.

#### **The profession Construction Technician includes:**

- The main activities: the construction technician performs technical tasks related to measurement, design, construction, maintenance, reconstruction and repair of buildings and other construction facilities such as water supply and sewage systems, bridges, roads, dams, airports, etc.
- Responsibilities and Duties: The construction technician prepares and organises the work, explains the drawings to the foremen and the workers. Must be able to supervise, measure and evaluate the activities of the construction workers. Provides the site with the necessary construction materials in the correct amounts and knows how to make the construction process more efficient by using proper machinery and equipment. The construction technician must be responsible for his own safety and that of the construction workers, for the equipment, tools and materials entrusted to him, for the quality and timely completion of the construction work. Prepares the primary accounts for the expenditure of labour and material resources and mechanisation and is responsible for compliance with the applicable standards, technical norms and requirements.
- Resources to be worked with: The construction technician uses equipment (theodolites, levellers, stingers). For the preparation of technical documentation and participation in the investment design he uses regulations, reference books, normative documents in construction, computers with specialised software.

Vocational High School graduates that have obtained professional qualification in "Construction Technician" may be employed in municipal administrations, construction companies, design bureaus, "Water Supply and Sewerage" enterprises, in departments for the operation of sewage treatment facilities, hydro melioration systems and hydraulic engineering facilities, in departments for the operation of roads and road facilities, including as technical

<sup>6</sup> <https://www.indeed.com/career-advice/career-development/construction-skills>

<sup>7</sup> <https://www.goconstruct.org/construction-careers/what-is-a-construction-worker/>



supervisors, in positions that correspond to the profession of the National Classification of Professions (MON Bulgaria). After obtaining the necessary level of qualification for the described position, one can choose a specialization and later on can decide to continue further their education for positions that require higher level of qualification like University Diploma. Those positions are in the field of geodesy, cartography, design, architecture, engineering and even though a “construction technician” may need to have basic level of knowledge and understanding of these concepts, to obtain a job position as an engineer, for example, one needs a higher level of qualification that cannot be obtained in Vocational schools, so we will not be focusing on them.

### Qualification

In Europe, qualifications acquired through vocational education and training (VET) are very diverse, as they are shaped by countries’ specific socioeconomic contexts, labour market characteristics and traditions (CEDEFOP)<sup>8</sup>. In order to measure the adequate level of knowledge and skills for a graduate of a European Vocational of technical High School we used the European Qualification Framework’s (EQF)<sup>9</sup> 8-level system of qualifications. The EQF system has eight reference levels describing what a learner has to know, understand and be able to do – “learning outcomes”. In EQF language, learning outcomes are specified in three categories: knowledge, skills and competences. Levels of national qualifications will be placed at one of the central reference levels, ranging from basic (Level 1) to advanced (Level 8). This will enable a much easier comparison between national qualifications. According to the EQF, levels from 5 to 8 correspond to higher education, so we will focus on knowledge and skills for the profession “construction technician” that equal the level 3 and 4 of learning outcomes (or upper secondary education level).

- Knowledge- Factual and theoretical knowledge in broad contexts within a field of work or study;
- Skills: A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study;
- Responsibility and autonomy: Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities

According to the CEDEFOP research on the European Qualification Framework, levels 3 and 4 qualification, those are the common qualification levels that young people acquire either through school-based VET or apprenticeship. It examines the weight given to a competence across these levels and what different jobs graduates can carry out with them. It is important to mention the difference between qualification and occupation: “*qualifications are awarded on the basis of particular knowledge or know-how and may or may not be congruent with occupations, which are associated with a particular division of labour within a sector of any given society*” (Brockmann, 2011)

### **Vocational Competencies for a “Construction Technician” upper- secondary level of education, qualification level 4, according to the EQF**

To be able to identify concrete vocational competency profiles and to assess each type of competency, sources and tools on European level, such as the European multilingual

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<sup>8</sup> [https://www.cedefop.europa.eu/files/5577\\_en.pdf](https://www.cedefop.europa.eu/files/5577_en.pdf)

<sup>9</sup> <https://europa.eu/europass/en/description-eight-efq-levels>



classification of Skills, Competences and Occupations (ESCO)<sup>10</sup>, data collected by the European Centre for the Development of Vocational training (CEDEFOP)<sup>11</sup> were used, combined with official reports and profession-descriptions from national educational institutions, such as the previously mentioned “*National Education Standard*” for the acquisition of qualification in the profession “Construction Technician” of the Bulgarian Ministry of Education.

Searching occupation as a “construction worker” is ESCO, it provides us with a set of 21 different occupations, such as: *building construction worker, road construction worker, sewer construction worker, road marker, shipwright, civil engineering worker, waterway construction labourer, electricity distribution technician, lift technician, rental service representative in construction and civil engineering machinery, structural ironworker, sheet metal worker, carpenter, house builder, grader operator, excavator operator, scraper operator, asphalt plant operator, ornamental metal worker.*

According to a research for: skills and competences on ESCO<sup>12</sup> for construction technician, we found a set of knowledge and skills that include: *construction industry, construction methods, construction products, manage construction archive, commission set construction, check construction compliance, construction product regulation, order construction supplies, advise on construction materials, mix construction grouts, calculate needs for construction supplies, monitor construction site, construction legal systems, install construction profiles, prepare construction documents, monitor lift shaft construction, coordinate construction activities, communicate with construction crews, transport construction supplies, supervise mine construction operations.*

In order for us to compile all those skills and knowledge compiled in the ESCO tool, we used the Word Skills Occupational Standard for a “Concrete Construction Work”(WSOS)<sup>13</sup> that specifies the knowledge, understanding, and specific skills that underpin international best practice in technical and vocational performance. The standard for “Construction Work” presents a distinguished set of skills and knowledge into different sections, marked by their importance for the analysed work role. In the following part we will mention the sections of knowledge and skills that have received the highest mark for importance.

## VOCATIONAL COMPETENCIES

### Competency 1: Construction of formworks and reinforcement

#### Theoretical knowledge:

- The impact of Health, Safety, and Environment requirements and legislation on projects
- How to use and apply tools, equipment, construction machinery, and working aids (e.g. instruments, measuring devices, etc.) in accordance with operating and handling instructions
- How to use and handle manual tools such as hammers, saws, planes, etc., to work with materials such as wood, metal, and plastic
- How to use and handle machinery such as drills, saws, sanders, etc., to work with materials such as wood, metal, and plastic, in compliance with safety guidelines

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<sup>10</sup> <https://esco.ec.europa.eu/en>

<sup>11</sup>

[https://www.cedefop.europa.eu/en/data-insights/construction-workers-skills-opportunities-and-challenges-2019-update#\\_edn1](https://www.cedefop.europa.eu/en/data-insights/construction-workers-skills-opportunities-and-challenges-2019-update#_edn1)

<sup>12</sup> [https://esco.ec.europa.eu/en/classification/skill\\_main](https://esco.ec.europa.eu/en/classification/skill_main)

<sup>13</sup> ([www.worldskills.org/WSOS](http://www.worldskills.org/WSOS))



- Scaffolding requirements
- The individual formwork components such as form lining (plywood, frame elements, screed protection cover), formwork girders, formwork supports, bolts, formwork clamps, and bracing
- The components (formwork girders, tubular steel props, supports, bracings, reinforcements, formwork anchors) and materials (wood, steel) for scaffolding
- How to make formwork, including erection, bracing, forming recesses, and stripping formwork
- Types of formwork, areas of use and usage methods for foundation formwork, wall formwork, column formwork, beam formwork, slab formwork, staircase moulds, formwork for face concrete, climbing formwork, sliding formwork, recesses, etc.
- Strengthening steel and reinforcement, categories, and types of strengthening steel plus their designations, categorizations, and delivery forms
- Cutting steel and bending steel bars according to standard specifications
- Concrete coverings
- The various types of joint (expansion joints, settling joints, construction joints, and dummy joints), what they do and how they are made
- Face concrete surfaces, in terms of porosity, colour consistency, smoothness, creation of construction joints, formwork element joints, formation of edges, impressions due to the attachment of formwork lining, anchor points, anchor hole separation, frame impression, formwork lining joints, formwork lining as a smooth or rough concrete surface (texture)

#### Practical skills:

- Work manually with materials such as wood, metal, and plastic (for separating, reshaping, connecting)
- Measure, lay out and cut wood and work with it manually and using machinery
- Make simple trestles, working platforms plus auxiliary equipment, set up protective nets and use them in compliance with the relevant regulations
- Make and put together every type of formwork
- Make supports and reinforcements (concrete pressure)
- Make face concrete formwork
- Make slits, apertures, openings, and recesses
- Move anchors as directed
- Make various joints in combination with the appropriate joint sealants (profiles, sealing strips, expansion joint tapes)
- Cut to length, bend, interweave, lay, and anchor structural steel according to bending and reinforcement diagrams and in compliance with reinforcement directives (specifically those concerning bending, radius of curvature, end hooks, brackets, distributors, separators, joints, and connection reinforcements)
- Prevent the following problems through correct construction:
  - Build-up of rust stains on vertical components and of traces of rust caused by reinforcement residues being left on the undersides of horizontal components
  - Mortar residues running down through unsealed construction joints on vertical components
  - Unclean edge formation due to damaged, misaligned, and unsuitable triangular or trapezoidal profiles
  - Offset beyond a given standard between formwork element joints and component connections
  - Heavy bleeding at formwork board and element joints and on component connections and anchor holes (e.g. core structure exposed as a result of cement paste leakage)
  - Very noticeable entrainment water effects
  - Differing surface qualities (colour/texture) due to inappropriately stored formwork



- Use scaffolding appropriately and safely and apply health and safety requirements and legislation

## **Competency 2: Setting out and measurement**

### Theoretical knowledge:

- The importance of thinking “top down” to ensure all features can be set out at the start of projects
- The implications for businesses/organizations of not setting out correctly
- The templates/building aids which may be helpful for construction
- Calculations to assist in measurement and checking projects
- Geometry principles and techniques to assist with projects

### Practical skills:

- Visualize and think through projects, identifying potential challenges early and taking the necessary preventative action
- Set out the locations, starting points and lines of projects according to plans and specifications
- Accurately interpret dimensions from drawings and ensure designs are set out within a given tolerances
  - Check all horizontal and vertical angles
  - Produce any templates/building aids that may be helpful when constructing
- Set out datum points of reference for projects
- Carry out setting out work using the necessary surveying equipment (pocket rule, tape measure, distance meter, set square, level, etc.)
- Set out and check angles
- Create horizontal levels and measure heights using spirit levels, water level gauges, and optical devices
- Set out and measure up formwork manually from plans
- Measure predetermined structures, joints, and materials for the subsequent face concrete surfaces (anchor holes, shuttering frames, board inserts, distribution, and alignment of formwork boards, etc.)

## **Competency 3: Interpretation of drawings**

### Theoretical knowledge:

- The essential information that must be included in construction drawings
- Principles, symbols, and protocols used in construction drawings
- The importance of checking for missing information or errors, anticipating problems and resolving in advance of the “setting out” process and construction
- The role and use of geometry in construction processes
- Mathematical principles, processes, and problem solving
- The standardized representation of structural components in outline and in section and dimensioning (determination of heights from set measuring points)

### Practical skills:

- Prepare site measurement drawings
- Prepare the materials requirements, taking into account increased requirements due to compression, wastage, breakage, etc.
- Calculate formwork surfaces and materials requirements
- Calculate formwork surfaces and materials requirements for face concrete formwork



- Interpret, analyse, and work with construction plans (e.g. design plans, formwork plans, reinforcement plans, detail drawings, etc.), and material and parts lists
- Relay information in plans to other professionals, work colleagues, and clients
- Prepare sketches from the necessary perspectives, sections, and other representation formats

#### **Competency 4: Filling of formworks and treatment**

##### Theoretical knowledge:

- The impact of health and safety requirements on projects
- Concrete technology and concrete processing on construction sites (ordering, transporting to formwork, application and compression, aftertreatment)
  - Concrete additives such as concrete liquefiers, plasticisers, sealants, antifreeze, hardening accelerators, etc.), how to use them and their effect on the concrete
- How to prevent problems
- Additional measures to take when concreting in summer and winter
- Prerequisites for concrete application, such as the removal of contaminants from the formwork, pre-wetting, checking for stability, using sufficient separators, smoothing gauges, etc.)
- The compression process according to the consistency of the concrete
- The possibilities of processing concrete surfaces by smoothing/removing/leveling, and the tools required to do this
- The need for after-treatment of the concrete (to counter drying-out, temperature differential, frost, leaching, vibrations) using covers, spray, humidification, use of after-treatment aids or by leaving fresh concrete in formwork beyond the stripping times
- Face concrete surfaces in terms of porosity, colour consistency, etc.

##### Practical skills:

- Produce unreinforced and reinforced concrete (mix and transport formula concrete = site-mixed concrete)
- Order ready-mixed concrete for the site and transport it using concrete pumps, crane buckets, or conveyors
- Apply means of separation before concreting, depending on the formwork lining, using high pressure sprays, brushes, cloths, or mechanically
- Apply concrete in prepared formwork
- Compress concrete using various compressors
- Process concrete surfaces by smoothing/removing/leveling, using the tools required to do this
- Carry out after-treatment of concrete using covers, spray, humidification, use of after-treatment aids, or by leaving fresh concrete in the formwork beyond the stripping times
- Prevent incorrect application and compression of concrete (“honeycombing”, highly visible layers, etc.), by ensuring correct construction.

The rest of the competencies mentioned by WSOS: Work organisation and management, Communication and interpersonal skills won't be analysed in this sector since we consider them part of the so-called “Soft-competencies” and not so much Vocational or “Hard Competencies”.

#### **Summary of the results**

In order for us to be able to use this research as a framework in assessing further on the competency profiles for each profession, we decided to create a list of the most commonly



required knowledge and skills for a “construction technician/ worker”, that were mentioned in both ESCO and WSOS, also were included in the National Education Standard for “Construction Technician” (MON Bulgaria) and are in compliance with the maximum level 4 qualification according to EQF.

1. Knows and applies *the health and safety requirements*, measures, the means of signalling, the regulatory provisions. Skills: is able to follow or give instructions on the health and safety requirements.
2. Knowledge on *construction materials* and their application: is able to identify basic building materials, suppliers, brands and types of products and goods available on the market, can describe their purpose. Skills: Is able to use them and consider their characteristics
3. Knowledge on *construction equipment* and their application: is able to identify what is required for handling building materials in all stages of construction, from foundation work to external and internal finish.
3. Knowledge on *building codes* and is able to work in compliance with them: construction rules, laws, standards and regulations. Skills: must be able to apply that knowledge
4. Understands and is able to read *technical drawings, writings, assembly plans, specifications*: knows the various symbols, perspectives, units of measurement, notation systems, visual styles and page layouts used in technical drawings. Identifies methods for preparing drawings, assembly plans and specifications. Skills: Interprets different types of drawings, assembly plans and specifications, locates catalogue data, produces drawing, assembly plans and specifications, maintains documentation entrusted.
5. Possess *technical skills* and is able to apply them throughout the implementation of the construction phases: stonework, tiling, surveying, metalwork, plumbing, electrical wiring, painting, etc. for the specific area of specialization
6. Preparation for the development of *technical documentation* for an investment project and for the issuance of a construction site. Knowledge: Defines the nature of geometric and projection drawing, Names the tools and methods required for measurement, lists basic types of load-bearing and non load-bearing building elements and describes their purpose, lists the types of building construction products and describes conditions and procedures. Skills: draws sketch, works with tools, applies measurement methods, draws existing building site graphically to scale from a hand sketch
7. Possesses knowledge required for specific *construction methods*, processes and techniques for erecting buildings and other constructions. Construction of formworks and reinforcement, Is able *install, repair and test* different systems and their components in buildings and other structures/ installation of interior or exterior infrastructure/ installing plumbing or piping equipment/installing heating and ventilation systems
8. *Cognitive knowledge*: algebra, geometry, technical vocabulary, to be able to calculate the volume of work, material measurements, estimated costs, estimated time for building construction implementation

### **IT, software literacy**

In order for us to come up with specific IT competencies, we used the CEDEFOP data insights on skills opportunities and challenges for construction workers.<sup>14</sup> According to CEDEFOP: Workers in building and related trades must possess sufficient qualifications and take up professional development opportunities to use new IT-based, or automated, equipment, such as remote controlled vehicles and smart tools. One key IT-based technology

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[https://www.cedefop.europa.eu/en/data-insights/construction-workers-skills-opportunities-and-challenges-2019-update#\\_which\\_drivers\\_of\\_change\\_will\\_affect\\_their\\_skills](https://www.cedefop.europa.eu/en/data-insights/construction-workers-skills-opportunities-and-challenges-2019-update#_which_drivers_of_change_will_affect_their_skills)



that is expanding its influence throughout the industry is *Building Information Modelling* (BIM). BIM is used to design and manage construction projects at all stages of the production process and is also used to inform project workers. Use and combination of materials in building construction is also evolving along with innovation in the sector; consequently, this increases the demand for specific skills. For example the Very Tall Building (VTB) construction will become more common in Europe, rising the demand for specialised skills such as extreme construction engineering techniques or new ways of crane building. (Linespacespace).

Using also the National Education Standard for “Construction Technician” (MON Bulgaria) and the WSOS report, we came up with the following IT competencies for particular software:

- 1.Ability to use a computer application program for working and creating drawings such as *CAD*: enables the development, modification, and optimization of the design process. The CAD softwares are the most commonly used in the construction industry and have different variations depending on the specific field e.g. ARCHICAD, MCAD, CADIS, TPLAN
- 2.Ability to create presentation drawings with perspectives using *REVIT*: geared towards civil construction, allowing in addition to an accurate 3D simulation of the work, the coordination of different design disciplines, in addition to work in a team.
- 3.Ability to use BIM to analyse potential design solutions for building services clashes
4. Able to use computer application programs to estimate the cost of construction work such as ProEst,STACK,Clear Estimates
5. Uses software products to prepare investment projects under the guidance of architects and civil engineers
6. Knowledge on computer systems for capturing, storing, checking, and displaying data related to positions on Earth's surface, such as the different GIS softwares

## Conclusions

Construction workers fulfill a variety of different roles in the demolition, repair, construction, maintenance of buildings/roads/water constructions and more. There are so many types of occupations: according to the specialization area, according to the qualification, according to the role in construction, etc. A range of specialised skills are required, which are heavily dependent upon the specific job tasks carried out. The technological advances of modern society require the mastering new technologies, building and related trades workers will require collaborative skills and the ability to work in better-connected interdisciplinary teams. Technical skills are also very important in off-site building and construction roles, such as computer aided design or computer aided manufacturing. New practices have already been implemented as a result of technological advances, and in response to regulatory changes related to material waste and pollutant emissions, knowledge and use on new materials, methods and technology will probably follow to be introduced. Current and future workers will need to have relevant skills to work with new and “green” material and techniques.

## COMPETENCIES IN THE FIELD OF RENEWABLE ENERGY

### Introduction





It is not an exaggeration to say that in the last few years, we are experiencing unprecedented worldwide events which have significantly influenced our mundus vivendi. The COVID-19 pandemic familiarized us with the notions of social distancing, wearing masks, testing ourselves, quarantining, being restricted from travelling and by triggering major health, social, and economic disruptions.

As if that was not enough already, we are now facing a significant humanitarian and energy crisis, as a consequence of the 2022 Russian invasion of Ukraine. According to the Executive Director of the International Energy Agency, Mr. Fatih Birol, Russia’s invasion to Ukraine has caused tremendous disruptions to supply and demand patterns, has pushed up energy prices, and also obstructs the endeavor to “tackle the world’s critical challenge of reducing global greenhouse emissions quickly enough to avoid catastrophic climate change”(IEA 2022).

However, the renewable energy sector has proved to be noticeably resilient. The renewable energy sector includes technologies that acquire energy from renewable resources such as: solar, wind, hydro, geothermal, and marine power, and biofuels (OECD). These technologies are more than essential in order to reduce CO<sub>2</sub> emissions and as the technologies continue to develop for example with the “inclusion of smart sensors, robots, and automation entailed by Industry 4.0” (Bongomin et al., 2019) , there will be a high demand for a change in the skills of the sector’s workforce.

In the following figure, one can notice the evolution of renewable energy employment from 2012 to 2020. In 2020 the renewable energy sector employed 12 million people, directly and indirectly, while the number of people working in the sector is steadily growing since 2012. In 2020 in Europe, there will be a total of 1.6 million renewable energy jobs, with 1.3 million of them concerning the EU member countries (IRENA, 2021).

Figure 1: Global renewable energy employment from 2012 to 2020



Source: IRENA jobs database

In this context, the renewable energy sector will need qualified and skilled professionals such as technicians, engineers, and scientists to work “in all types of energy generation, transmission, and distributions jobs” (CEWD 2019). While, the renewable energy sector is generally an under-researched area since “there is no clarity on the skills associated with its



business models”<sup>15</sup>, it is widely known that technical-oriented roles within the sector are more attractive than the management-oriented. Currently, there is a shortage of skills and competences in the renewable energy sector, “which in many cases comes from a general trend of students not to follow engineering studies” (Malamatenios, 2016). The truth is that skills are often difficult to identify and measure since “they are a socially constructed concept, intangible and often unobservable” (CEDEFOP, 2012).

However, in this report three core competencies which are conventionally called “hard competences” will be identified for five different occupations within the renewable energy sector. Those “hard competences” are the following: a) vocational – theoretical knowledge, b) vocational – practical knowledge, and c) IT – software literacy.

In order to identify the renewable energy sector related occupations, the keywords “renewable”, “wind”, “geothermal”, “hydro”, and “solar” have been searched through the ESCO database managed by the European Commission. The National Organization for Certification of Qualifications & Vocational Guidance in Greece was also searched; however, no job outlines were found for the renewable energy occupations.

## **Renewable Energy job positions**

### **1. Renewable Energy Consultant**

Alternative labels: Renewable energy market consultant, sustainable energy research consultant, renewable energy survey consultant, renewable energy technical consultant.

According to the ESCO database, a renewable energy consultant is charged with the task of providing advice to clients on the advantages and disadvantages of different renewable energy sources. Additionally, they conduct research surveys and interviews on the demand and views on renewable energy and subsequently inform clients on the most suitable source of renewable energy for their purpose (ESCO). Renewable energy consultants must also be able to assess studies on emerging technologies in the sector, understand the environmental consequences of energy production, convert their knowledge to business strategies, and communicate with stakeholders, NGOs, government representatives, scientists, and the general public (Purdue University).

According to IRENA (2021), a renewable energy consultant can be employed in any of the following technologies: solar photovoltaic, liquid biofuels, hydropower, wind energy, solid biomass, biogas, geothermal, solar heating/cooling, municipal and industrial waste, and CSP. Solar photovoltaic gathers the highest number of employment (4 million worldwide), while liquid biofuels (2.4 million), hydropower (2.1 million), and wind energy (1.2 million) follow. Unfortunately, gender inequality has been tracked to renewable energy workplaces, since women account only for 32% of the overall renewable energy workforce. In addition to that, women employed in the sector tend to be lower-paid, and work in management-oriented, administrative or public relations positions, while having no technical-oriented work and STEM roles (IRENA, 2021).

#### A) Vocational – Theoretical knowledge

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<sup>15</sup> Baruah, Bidyut Jyoti, Ward, Anthony Edward, Gbadebo, Adeyosola Adekunle et al. (2018) Addressing the skills gap for facilitating renewable energy entrepreneurship- an analysis of the wind energy sector. In: Majan International Conference. MIC 2018, Muscat (Oman), <https://doi.org/10.1109/MINTC.2018.8363156>, p.2



A renewable energy consultant must have the following essential theoretical knowledge, skills and competences:

- Understands the principles of STEM (Science, Technology, Engineering, and Mathematics)
- Understands the concepts of energy and renewable energy
- Understands physical principles such as force, friction, and energy
- Be able to use mathematics and physics to solve problems
- Takes measurement of time, temperature, distance, length, width, height and perimeter
- Understands tables and graphs
- Understands basic engineering principles
- Understands the basics of electricity
- Understands compatible and incompatible substances
- Understands the basics of solar energy
- Is able to define the characteristics of products, such as materials, properties, and functions
- Is able to define the characteristics of services
- Is able to identify the emerging renewable energy technologies, such as hydro, wind, solar, biofuel, and biomass energy
- Has a basic knowledge on the market analysis and its different research methods
- Is able to identify means of energy efficiency
- Has a basic knowledge on biomass energy and its application
- Understands the main problems of the renewable energy sector

#### B) Vocational – Practical knowledge

A renewable energy consultant must have the following practical knowledge, skills, and competences and perform the following tasks/duties:

- Identifies customer's needs according to product and services
- Carries out sales analysis
- Informs customers on energy consumption fees and/or any additional charges
- Negotiates terms with suppliers and ensures quality of products
- Identifies energy needs to provide the most cost-effective energy services to a customer
- Performs market research/analysis
- Promotes environmental awareness and sustainability
- Informs on government funding and grants
- Carries out feasibility studies and energy surveys
- Oversees the installation or upgrade of customer's energy systems
- Undertakes the tasks of energy use estimations, business strategies, and project costings
- Provides information on solar panels
- Provides information on wind turbines
- Provides information on geothermal heat pumps
- Advises on heating systems energy efficiency
- Attracts new customers
- Answers requests for quotation
- Develops professional network

#### C) IT – Software literacy



A renewable energy consultant must have the following IT competence – software literacy:

- Uses personal information management (PIM) applications to increase work efficiency
- Uses technological tools such as: email, internet, electronic calendar, spreadsheets, databases, word processing, and multimedia presentations
- Logs data into specialist software for analysis
- Uses renewable energy related tools such as: HOMER, SolTrace, PV syst, and RETscreen
- Uses general computer tools such as: FEM and MATLAB
- Uses computer-aided design such as: CAD, AutoCAD, and Dassault Systemes SolidWorks
- Uses customer relationship management software such as: Salesforce
- Uses database user interface and query software such as: SQL, and Microsoft Access
- Uses Microsoft Office, Outlook, Visio, Excel, Word, and PowerPoint
- Is familiar with the e-commerce
- Uses digital communication tools

## 2. Solar Power Plant Operator

Alternative labels: solar energy plant worker, solar farm worker, solar array worker, solar farm operative, solar array operative, solar farm operator, solar power plant maintenance operator, solar power plant safety operator, solar electric power plant operative.

According to the ESCO database, a solar power plant operator operates and maintains equipment which produces electrical power from solar power. Additionally, they react to systems malfunctions and repair them, and also monitor the equipment in order to ensure the safety of operations (ESCO).

As already mentioned in the previous section, solar photovoltaic technology employs the highest number (4 million) of professionals in the sector worldwide. For Europe, it is estimated that, “PV employment is at 239,000 in 2020, of which 194,000 are in EU member states” (IRENA, 2021). According to the Fraunhofer Institute for Solar Energy Systems, the creation of a 10 GW photovoltaic production could make Europe competitive in the sector, and subsequently create up to 7,500 full-time jobs, while the installation of photovoltaic systems could create 3,500 full-time jobs per gigawatt (Fraunhofer ISE, 2021).

### A) Vocational – Theoretical knowledge

A solar power plant operator must have the following essential theoretical knowledge, skills and competences:

- Understands the principles of STEM (Science, Technology, Engineering, and Mathematics)
- Understands solar panel principles
- Understands the principles and structure of solar power generation
- Understands the principles of solid-state physics
- Understands core photovoltaic technology
- Understands the main problems of solar industry
- Understands the concept of solar energy
- Has a basic understanding of the electrical power safety regulations
- Understands the principles of electricity and electrical power circuits
- Understands the principles of electric generators such as dynamos, alternators, rotors, stators, armatures, and fields



- Has a basic knowledge of electric currents
- Can distinguish fuel gases such as oxy-acetylene, oxy-gasoline, and oxy-hydrogen
- Has a knowledge of electricity consumption and how it can be calculated and estimated
- Can identify the battery components such as: wiring, electronics, and voltaic cells
- Can identify the characteristics and properties of battery fluids
- Has a basic understanding of the science of hydraulics
- Can identify the different battery types and components such as: zinc-carbon, nickel-metal hydride, lead-acid, and lithium-ion
- Has a basic understanding of the technology for control systems

### B) Vocational – Practical knowledge

A solar power plant operator must have the following practical knowledge, skills, and competences and perform the following tasks/duties:

- Maintains the electrical equipment and test it for potential malfunctions
- Monitors electric generators to ensure their functionality and safety
- Installs concentrated solar power systems such as: lenses, mirrors, and tracking systems
- Installs and maintains photovoltaic systems
- Responds to electrical power contingencies
- Maintains records of maintenance interventions, including information about the parts and the materials used
- Applies health and safety standards
- Maintains concentrated solar power systems and performs routine maintenance
- Can work with high voltage equipment
- Operates hydrogen extraction equipment
- Operates steam turbine
- Maintains sensor equipment
- Develops strategies for electricity contingencies
- Prevents marine pollution
- Operates battery test equipment
- Sets up machine controls and regulates conditions such as: temperature, pressure, and material flow
- Can explain the differences between passive polar and active polar
- Can apply weather sealing to array, building or support mechanisms
- Understands solar cell material type and characteristic differences
- Understand the relation between solar panel power generation and the environment

### C) IT – Software literacy

A solar power plant operator must have the following IT competence – software literacy:

- Understands the Internet of Things (IoT)
- Can study data through traditional data-processing application software
- Uses Microsoft Office, Word, Excel, Visio, PowerPoint
- Uses database user interface and query software such as: Microsoft Access and Structured query language (SQL)
- Uses object or component-oriented development software such as: C++, Python, and R
- Uses mobile location-based services software such as: GPS
- Uses operating system software such as: Bash, and Linux



- Uses computer-aided design such as: CAD, AutoCAD, and Dassault Systemes SolidWorks

### 3. Geothermal technician

Alternative labels: Geothermal energy installer, geothermal installer, geothermal energy technician.

According to the ESCO database, a geothermal technician can install and maintain geothermal power plants and also commercial and residential geothermal heating installations. Additionally, they can perform inspections, analyze problems, and make repairs. Their job is also to participate in the initial installation of the geothermal power plant, test it and maintain it and ensure its compliance according to safety regulations (ESCO).

In 2020, 96,000 jobs will be created in geothermal energy technology, with 40,000 of them concerning the European Union member countries (IRENA, 2021).

#### A) Vocational – Theoretical knowledge

A geothermal technician must have the following essential theoretical knowledge, skills and competences:

- Has basic knowledge of mathematics such as: algebra, arithmetic, geometry, calculus, statistics
- Has basic mechanical knowledge such as: machine and tools, including their designs, uses, repair, and maintenance
- Has basic chemistry knowledge such as: chemical composition, structure, and properties of substances
- Has basic knowledge of physics such as: physical principles and laws, atmospheric dynamics, mechanical, electrical, atomic, and sub-atomic structures and processes
- Can identify the types of heat pumps
- Can identify the switching devices such as: disconnecting switches, interrupter switches, and circuit breakers
- Can distinguish the geothermal power generation methods
- Understands the notion of electric current
- Has a basic understanding of thermodynamics
- Understands the concept of geothermal energy systems
- Understands the principles of electricity and electrical power circuits
- Understands the concept of electrical generators
- Knows the electrical equipment regulations such as: general risk management, electrical equipment manufacture, electrical equipment testing, electrical equipment installation, warning labels, and certificates
- Understands the geothermal power plant operations
- Understands the rules and procedures of health and safety in the workplace

#### B) Vocational – Practical knowledge

A geothermal technician must have the following practical knowledge, skills, and competences and perform the following tasks/duties:

- Identifies how geothermal energy can be used for generation
- Can explain the process used for Geothermal Heat Pumps (GHP) and geoexchange



- Identifies the malfunctions of geothermal plant equipment and electrical systems
- Operates drilling equipment
- Maintains electrical equipment
- Prevents pipeline deterioration
- Tests procedures in electricity transmission
- Tests the electrical equipment
- Applies health and safety standards
- Conducts machinery checks
- Tests pipeline infrastructure operations
- Checks compatibility of materials
- Responds to emergency calls for repairs
- Promotes sustainable energy
- Performs energy simulations
- Promotes environmental awareness
- Adjusts power production systems to meet load and distribution demands
- Backfills piping trenches to protect pipes from damage

### C) IT – Software literacy

A geothermal technician must have the following IT competence – software literacy:

- Uses Microsoft Office, Word, Excel, PowerPoint, and Visio
- Uses computer aided design software such as: CAD, AutoCAD
- Uses enterprise resource planning ERP software
- Uses analytical or scientific software such as: ClimateMaster, GeoDesigner, Geothermal Properties Measurement Tool, Thermal Dynamics Ground Loop Design GLD, WaterFurnace International Ground Loop Design PREMIER
- Uses email software
- Knows the Internet of Things (IoT)
- Has basic digital skills
- Uses digital communication tools
- Is familiar with data analysis
- Is familiar with the augmented reality

## **4. Onshore Wind Energy Engineer**

Alternative labels: onshore wind energy technology engineering specialist, onshore wind energy specialist, onshore wind energy engineering specialist, onshore wind power engineer, onshore wind energy engineering expert, onshore wind energy systems engineer.

According to the ESCO database, an onshore wind energy engineer designs, installs, and maintains wind energy farms and equipment. In addition to that, they do research and test different locations to find the most productive, and also test equipment and its components such as wind turbines. They also develop strategies for environmental sustainability and energy efficiency (ESCO).

According to IRENA, the wind energy sector significantly expanded in 2020. The capacity additions have reached 111 GW, thus almost doubled from 2019 where they were 58 GW. Subsequently, employment also came up to 1.25 million jobs worldwide, with the percentage representing Europe being 27% of the wind jobs (IRENA, 2021).

### A) Vocational – Theoretical knowledge



An onshore wind energy engineer must have the following essential theoretical knowledge, skills and competences:

- Has a basic understanding of mathematics, recognize and apply standard SI Units for length, mass, volume, electrical current, and temperature
- Can recognize and apply basic electrical units: volts, amps, ohms, watts
- Converts units within the metric system such as milliliters to liters
- Has a basic understanding of wind turbine concepts such as: thermodynamics, statics dynamics, and basic meteorology
- Has a basic understanding of fiber optics
- Has an understanding of basic rigging
- Describes wind energy
- Defines kinetic energy
- Explains hydraulics (brakes and/or blade/tip pitching)
- Identifies renewable energy technologies such as: wind turbines, hydroelectric dams, photovoltaics, and concentrated solar power
- Describes electric generators such as: dynamos and alternators, rotors, stators, armatures, and fields
- Is aware of the organization of data storage such as: hard-drives and random-access memories (RAM) and remotely, via network, internet or cloud
- Identifies the types of wind turbines, namely those which rotate along a horizontal or those which rotate along a vertical axis, and their subtypes
- Has a basic knowledge of the engineering principles
- Knows the concept of electrical discharge
- Can perform technical drawings
- Knows the trends in the energy market
- Has a basic understanding of aerodynamics
- Knows the electrical power safety regulations
- Has a basic knowledge of civil engineering
- Identifies mining, construction and civil engineering machinery products

### B) Vocational – Practical knowledge

An onshore wind energy engineer must have the following practical knowledge, skills, and competences and perform the following tasks/duties:

- Tests wind turbine blends
- Designs automation components
- Performs scientific research
- Assembles electrical components such as: switches, electrical controls, and circuit boards
- Runs simulations and detects potential errors
- Coordinates electricity generation
- Promotes sustainable energy
- Advises on potential machinery malfunctions
- Designs wind farm collector systems
- Tests procedures in electricity transmission
- Design wind power systems
- Develops strategies for electricity contingencies





- Monitors electric generators
- Operates meteorological instruments such as: thermometers, anemometers, and rain gauges
- Performs feasibility studies
- Reviews meteorological forecast data
- Responds to electrical power contingencies
- Utilizes decision support systems
- Checks fasteners and guy cables for proper tension
- Verifies proper wiring practice, polarity or phase, grounding and integrity of terminations
- Inspects mechanical installation for structural integrity
- Identifies and corrects performance issues and safety concerns
- Identifies and describes the various types of electrical drawings (schematic, wiring, single line, etc.)
- Interprets and uses common terminology, symbols, formats, etc. used in electrical, hydraulic and mechanical schematic drawings
- Demonstrate ability to distinguish between pieces of physical hardware and features in drawings and schematics
- Identifies hazardous energy sources and other obstruction hazards represented in facility schematics

### C) IT – Software literacy

An onshore wind energy engineer must have the following IT competence – software literacy:

- Uses Microsoft Office, Word, Excel, PowerPoint, Access, and Visio
- Uses general computer tools such as: FEM software and MATLAB
- Uses computer-aided design software such as: CAD, AutoCAD, and Dassault Systemes SolidWorks
- Uses SQL
- Used development environment software such as: Microsoft Visual Basic for Applications (VBA) and National Instruments LabVIEW
- Uses industrial control software such as: SCADA
- Is familiar with the Internet of Things (IoT)
- Is familiar with Artificial Intelligence
- Is familiar with Machine Learning
- Knowledge and understanding of quality procedures related to digital transformation
- Uses technical drawing software
- Is familiar with the concept of augmented reality

## **5. Hydropower Technician**

Alternative labels: Hydroelectric plant technician, marine energy technician, hydroelectric technician, wave power technician, hydropower mechanical engineer, hydropower mechanical technician, hydropower plant technician.

According to the ESCO database, a hydropower technician installs and maintains systems in hydropower plants. They also perform inspections, analyze problems, and carry out repairs. In addition to that, they ensure that the turbines work effectively and in compliance with the safety regulations, and assist the hydropower engineers in the construction of turbines (ESCO).



In general, in 2020 the hydropower energy technology experienced a growth in relation to several consecutive years of decline. According to IRENA, approximately 2.2 million people worked directly or indirectly in the sector in 2020. A rough estimation is that with the 1.5°C of global warming by 2050, the jobs related to hydropower will reach the amount of 3.7 million (IRENA, 2021).

#### A) Vocational – Theoretical knowledge

A hydropower technician must have the following essential theoretical knowledge, skills and competences:

- Knows the definition of hydropower energy
- Explains how hydropower works
- Describes ways that hydropower can be utilized without harming fish and wildlife
- Knows the definition of marine energy
- Explains how marine energy works
- Has a basic understanding of environmental engineering including its basic theories and practices
- Knows the concept of energy transformation
- Knows the concept of energy efficiency
- Has a basic understanding of renewable energy technologies such as: wind, solar, water, biomass, and biofuel energy
- Has a basic understanding of how to implement these types of energy such as: wind turbines, hydroelectric dams, photovoltaics, and concentrated solar power
- Knows the basics of oceanography and describes oceanic phenomena such as: marine organisms, plate tectonics, and the geology of the ocean bottom
- Knows the basics of hydroelectricity
- Performs technical drawings using various symbols, perspectives, styles, and layouts
- Knows the concept of energy performance of buildings
- Has an understanding of electrical power safety regulations and procedures
- Has a basic knowledge of the development and maintenance of engineering processes
- Knows the principles and operations of electric generators such as: dynamos, alternators, rotors, stators, armatures, and fields
- Uses scientific research methodologies
- Has a basic understanding of control engineering
- Has a basic understanding of power engineering

#### B) Vocational – Practical knowledge

A hydropower technician must have the following practical knowledge, skills, and competences and perform the following tasks/duties:

- Manages engineering projects including: resources, budget, deadlines, and human resources
- Monitors electric generators
- Designs electric power systems
- Promotes innovative infrastructure design
- Maintains electrical equipment including: safety measures, guidelines, and legislation
- Adjusts engineering designs for products to meet requirements
- Applies health and safety standards
- Operates scientific measuring equipment
- Performs minor repairs to equipment



- Resolves equipment malfunctions
- Maintains records of maintenance interventions
- Promotes environmental awareness
- Researches ocean energy projects
- Wears protective gear such as: goggles, eye protection, hard hats, and safety gloves
- Assembles mechatronic units using mechanical, pneumatic, hydraulic, electrical, electronic, and information technology systems and components
- Monitors hydroelectric power plant equipment operation and performance
- Communicates status of hydroelectric operating equipment to supervisors
- Inspects water-powered electric generators to verify proper operation and to determine maintenance or repair needs
- Maintains logs, reports, work requests and other records of work performed in hydroelectric plants
- Operates high voltage switches and related devices in hydropower stations
- Inspects facility sites
- Maintains robotic equipment such as: storing robotic components in clean, dust-free, and non-humid spaces
- Installs and calibrates electrical and mechanical equipment, such as motors, engines, switchboards, relays, switch gears, meters, pumps, hydraulics and flood channels

### C) IT – Software literacy

A hydropower technician must have the following IT competence – software literacy:

- Uses Microsoft Office, Word, Excel, Visio, and PowerPoint
- Uses the computer-aided design software (CAD) and AutoCAD
- Knows ICT software specifications such as: computer programmes, and application software
- Knows the information structures including: semi-structured, unstructured, and structured data
- Knows 3D modelling
- Knows 3D printing process and technologies
- Knows cloud technologies
- Knows visual presentation techniques
- Knows and performs specific software systems (SAS)
- Uses mobile location-based services software (GPS)
- Has basic digital skills
- Uses industrial control software such as: SCADA
- Uses object component-oriented development software such as: C++, Python, and R

### **Conclusion**

Demand for renewable energy-related jobs will significantly increase in the next few years. Concepts such as environmental sustainability, awareness, energy efficiency, and of course, climate change will monopolize the global interest. Renewable energy employment opportunities will include manufacturers, constructors, professionals, and trade workers. In general, technical-oriented jobs will attract more people than the management-oriented ones. As it is evident from the skills and competences listed per job position above, the roles in the renewable energy sector are primarily focused in problem-solving and decision-making, while professionals “have to regularly work in multi-team projects, monitor equipment, conduct on-site testing, diagnose faults and issues and provide solutions to quantify risks” (Baruah et al., 2018).



However, what was also prominent in the literature is that there are significant skills and competences shortages in the renewable energy sector. This can be explained by the fact that the number of engineers and technicians is insufficient and also there is no adequate education and training. Regarding education in the renewable energy sector, Ott et al. (2018) suggest that the shifting from “hard” discourses such as science and mathematics to more “soft” discourses such as sociology of science, psychology of the mind, and neuroscience of the brain could be more suitable. Respectively, Lund et al. (2012) propose that renewable energy education could also entail more generic skills such as research methods, teambuilding, and writing reports as well as project management, policy, and economics. Finally, Lucas et al. (2018) appreciate that maybe the curricula are not suitable or that preparing students in general for renewable energy-related jobs is quite a challenge for educators.

In order to address the skills and competences shortages in the renewable energy sector, the following recommendations would be considered:

- 1) Improve STEM (Science, Technology, Engineering, and Mathematics) skills through targeted courses by VET providers
- 2) Increase workplace learning opportunities, by providing short-term placements and apprentices which could be integrated into TVET programmes
- 3) Provide financial and technical support to TVET institutions to upgrade the quality of renewable energy trainings
- 4) Disseminate appropriate educational content and techniques to industry at EU level
- 5) Boost Orientation and Mobility (O&M) trainings

By following these recommendations, the European renewable energy industry will have access to a well-trained workforce with a variety of skills and competences while more jobs will be created, economic growth will be boosted, and renewable-energy professionals will play a crucial role in the renewable energy transition (Fitch-Roy et al. 2013).

### **NON-VOCATIONAL COMPETENCIES (UNIVERSAL)**

Non-vocational competencies is a very wide category of skills, knowledge and attitudes which transpire beyond vocational aspects. There is no universal framework in the European Union which clearly defines which particular competencies can be included here especially when considering relevant competencies for 3 vocational sectors - logistics, building, renewable energy. Various authors often use different names for this category. For the purpose of this summary we will understand this category as knowledge, skills and attitudes commonly seen as necessary or valuable for effective action in virtually any kind of work, learning or life activity – in particular when it comes to 3 vocational sectors (based on the concept of transversal skills, Cedefop 2022b).

Thus, the following part will present suggestions from various researchers on what key competencies should be considered in this category. Additional factor impacting the results will be the universality – relevance of a given competence for students and graduates of 3 vocational sectors.

The Council of the European Union adopted a Recommendation on key competencies for lifelong learning in May 2018. The Recommendation identifies eight key competencies essential to citizens for personal fulfillment, a healthy and sustainable lifestyle, employability,



active citizenship and social inclusion. The key competencies are a combination of knowledge, skills and attitudes:

- Knowledge is composed of the concepts, facts and figures, ideas and theories which are already established, and support the understanding of a certain area or subject.
- Skills are defined as the ability to carry out processes and use the existing knowledge to achieve results.
- Attitudes describe the disposition and mindset to act or react to ideas, persons or situations (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2019).

Though the concept of key competencies is important, it is crucial to notice that some of them are more general and not adjusted to the particular situation of vocational schools. Regardless, when creating a conceptual framework of the most relevant competencies for the target group of Go4VocationalSkills, it is worth considering competencies selected by The Council of the European Union:

- Literacy competence
- Multilingual competence
- Mathematical competence and competence in science, technology and engineering
- Digital competence
- Personal, social and learning to learn competence
- Citizenship competence
- Entrepreneurship competence
- Cultural awareness and expression competence (European Commission, 2018)

From the abovementioned competencies at least 3 require additional explanation. A study from 2020 conducted in EU-27, Iceland, Norway and the UK found that digital, multilingual and literacy skills can be important in the VET sector (Cedefop 2020). Those skills have been embedded and promoted in initial upper secondary VET in Europe. The competencies can be defined in the following way:

### **Digital competence**

According to the digital competence framework (DigComp) 2.1, digital competence consists of five key components with eight proficiency levels (ranging from basic generic skills to higher-order skills and specialist skills):

- a. information and data literacy: browsing, searching, filtering, evaluating and managing data, information, and digital content;
- b. communication and collaboration: interacting and sharing through digital technologies, engaging in citizenship through digital technologies, collaborating through digital technologies, netiquette, and managing digital identity;
- c. digital content creation: developing, integrating and re-elaborating digital content, copyright and licences, programming;
- d. safety: protecting devices, personal data and privacy, health and well-being as well as the environment;
- e. problem-solving: solving technical problems, identifying needs and technological responses, creatively using digital technologies, identifying digital competence gaps (Cedefop 2020).

### **Multilingual**

Multilingual competence defines the ability to use different languages appropriately and effectively for communication. It broadly shares the main skill dimensions of literacy: it is



based on the ability to understand, express and interpret concepts, thoughts, feelings, facts and opinions in both oral and written form (listening, speaking, reading and writing) in an appropriate range of societal and cultural contexts according to one's wants or needs. Language competencies integrate a historical dimension and intercultural competencies. It relies on the ability to mediate between different languages and media, as outlined in the Common European framework of reference for languages (CEFR). As appropriate, it can include maintaining and further developing mother tongue competencies, as well as the acquisition of a country's official language(s)' (European Commission, 2018).

### Literacy

As set out in the 2018 recommendation, literacy competence 'is the ability to identify, understand, express, create, and interpret concepts, feelings, facts and opinions in both oral and written forms, using visual, sound/audio and digital materials across disciplines and contexts. It implies the ability to communicate and connect effectively with others, in an appropriate and creative way' (European Commission, 2018).

When it comes to particular key skills related with vocational aspects and second level of education European Center for the Development of Vocational Training (CEDEFOP) (<https://www.cedefop.europa.eu/en>) offers one of the most relevant resources. Upcoming changes in EU labour market involving in particular logistics, construction and renewable energy must include the European green deal. Recently published study (Cedefop 2021) offers insights on key competencies which relevance will increase in relation with the implementation of the European green deal. The most relevant will be the openness to lifelong development since the authors of the study prognose large changes in employment trends until 2030. By that time there will be redirection of employment towards cleaner production, transportation and renewable energy as well as sewerage and waste management. The biggest automation of jobs is expected to take place for the lowest level of qualification jobs (up to 77%). This can impact directly graduates of secondary level schools which will then require to either upskill or change profession completely. The authors do not define directly openness to lifelong development, however we can find other sources describing **learning to learn competence** - is the ability to reflect upon oneself, effectively manage time and information, work with others in a constructive way, remain resilient and manage one's own learning and career. It includes the ability to cope with uncertainty and complexity, learn to learn, support one's physical and emotional wellbeing, to maintain physical and mental health, and to be able to lead a health-conscious, future-oriented life, empathize and manage conflict in an inclusive and supportive context (European Commission, 2018).

### Analytical competency - open-mindedness, critical thinking and creativity

The OECD Innovation Strategy 2015 articulates the importance of innovation as a driver of economic growth and social development that addresses urgent global challenges. As recent geopolitical factors as well as COVID has shown – innovation is even more crucial. Recent report published by OECD indicates increase in the need to innovate (OECD 2019). Authors focus on the importance of **analytical competency**, in particular: **open mindset, critical thinking and creativity** competencies in students and graduates in vocational fields. Their summary presents the idea that in order to create new value, students need to have open mindset towards new ideas, perspectives and experiences. Creating new value requires critical thinking and creativity in finding different approaches to solving problems. Relevance of those competencies in a workplace (growth mindset<sup>16</sup>, critical thinking and creativity) is emphasized by Beaupre, Wallace, Walters (2022).

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<sup>16</sup> Researchers are describing this concept in a very similar way to „open mindset“ in the previously quoted publication



There is no one widely accepted definition of mentioned competencies. Researchers create own operational definitions, customized survey questions aimed at measuring the core of the competencies. **Critical thinking** is often defined as the ability to identify the information and facts needed to draw a conclusion, to draw logical conclusions based on facts, statements, or arguments and to identify the strengths and weaknesses of those arguments (Dondi, et al. 2021). **Creativity** is an ability that makes it easier to solve many and different problems, both in personal and professional life. It is crucial when looking for problems, diagnosing and solving them - generating creative solutions. Creativity is a set of knowledge, skills and practical attitudes using creative thinking techniques to create original and socially useful solutions to problems, development of new concepts or new connections with existing ideas and concepts. **Open-mindedness** a desirable attitude of self-control in situations that might leave one prone to bias. a desirable attitude of self-control in situations that might leave one prone to bias. a desirable attitude of self-control in situations that might leave one prone to bias (Lenker 2022). It involves a willingness to consider a variety of perspectives, values, attitudes, opinions, and beliefs, especially when they contradict an individual's own. This ability allows critical and rational thinking that is essential in education for learning new things and is studied by philosophers for cultivating intellectual humility (Korkoyah 2022).

Research by the McKinsey Global Institute has looked at the kind of jobs that will be lost, as well as those that will be created, as automation, AI, and robotics take hold. And it has inferred the type of high-level skills that will become increasingly important as a result. The need for manual and physical skills, as well as basic cognitive ones, will decline, but demand for technological, social and emotional, and higher cognitive skills will grow (Dondi, et al. 2021). McKinsey identified 4 competency categories: **cognitive, digital, interpersonal, and self-leadership** containing skill groups with 56 distinct elements. The research has shown strong relation between employment and competencies within the self-leadership category, namely “adaptability,” “coping with uncertainty,” “synthesizing messages,” and “achievement orientation”.

### **Language competency**

Language competency is one of the most required skills around EU countries (based on www review of employment agencies in Poland, Spain, Bulgaria, Greece). What is more, various researchers show that foreign language competencies are crucial to obtaining satisfactory vocational employment (Suhaili & Mohama 2021). Definition of language competency differs between studies. Majority includes factors like: understanding, reading, speaking, writing (<https://europa.eu/europass>) - which have become a common requirement for describing one's language competency in a CV for all European job candidates.

### **Interpersonal competency**

Developing students' Interpersonal Skills is a core element of any well-designed technical and vocational education particularly in this present era. This is coupled with the fact that interpersonal skills are among the crucial skills preferred in the world of work setting for the betterment of both employer and employee (Deba et al. 2014). Therefore it is imperative to consider interpersonal skills when conducting comprehensive competency review of technical vocational students/graduates.

### **Organizational competency**

This is one of the most commonly referred competencies related to job acquisition. Multiple researchers offer insights into evidence on existing application and practice, and synthesizes



research and development in the area of organizationally derived management competencies, in particular organizational competency (Sparrow 1995). This competency is especially important when it comes to requirements of the labor market in 2030.

### **Loyalty**

Employees' behavior remains a cornerstone to successful marketing and management strategies. By studying this concept researchers analyze the effect that the service company employees' behavior has on customer perceptions and the relationship in influencing each other's choice. What is more evidence is provided that loyalty is crucial competency for saucerful employees (Baruch 2021).

### **Resilience (stress, time)**

Various researchers have confirmed correlations between resilience and job performance, but surprisingly little is known about the nature of this relationship. One of the most recent studies offers crucial insight into how resilience influences job performance. Authors found (using structural equation modeling) that resilience can be a very important factor when considering job efficiency (Kašpárková et al. 2018). Thus this competency should be considered when selecting universal skills, knowledge and attitudes in vocational students and graduates.

### **Conclusion**

There is no agreement between researchers nor widely accepted key universal competencies matrix related with selected vocational areas within the Go4VocationalSkills project (especially for students and graduates of secondary level vocational schools). Thus, the Partnership decided to choose the following competencies for the purpose of conducting the project. This decision was based on the above mentioned sources as well as extensive desk research conducted by all partners. What is more, this decision is supported by the feedback received form personal coaching sessions conducted with 178 participants of project Go4FutureSkills (POWR.04.03.00-00-0031/18). During those sessions, a specialist (with a PhD in pedagogical studies) analised and discussed answers provided by students of logistics to a competence test developed during the project (which included both vocational and universal skills). The final selection of competencies included as well results of the Delphi method (with 201 experts).

## **DEFINITIONS OF SELECTED UNIVERSAL COMPETENCIES**

### **Language – knowledge of foreign languages**

This competence describes the level of mastery of language subsystems (phonetic, grammatical, lexical, syntactic and spelling), skills necessary for social communication in a given language outside the mother tongue, and knowledge of the rules according to which messages are organized, structured and applied, so that they can fulfill communication functions adequately to context and type of interaction.

### **Analytical – problem-solving skills**

This competence describes the skills of logical thinking, using various sources of information, showing a critical attitude towards the quality and usefulness of information and data, drawing conclusions, as well as using data analysis methods for the accurate and proper performance

of professional tasks. It indicates the knowledge of basic statistics and the ability to interpret and use them when making decisions, the ability to look at perspective, which translates into





the ability to plan, assess the risk of actions taken, assess the expected effects / effects of decisions made. An important element is also the knowledge of the industry and the specifics of the company's operations, because the selected and processed information should provide knowledge supporting its activities, performing tasks in a given position.

### **Interpersonal – communication, teamwork**

It describes the ability to communicate information (orally and in writing) clearly and transparently, listening to others and understanding their needs. It describes the ability to flexibly adapt the form of communication to different recipients. It indicates the ability to create an atmosphere of openness, striving for agreement by working out solutions that are satisfactory for each of the parties involved. On its basis, we can conclude about the ability to establish positive relationships with others and awareness of your own role and the impact of the actions taken on the overall results of the team. It manifests itself in undertaking activities that improve and facilitate the achievement of common goals by sharing knowledge, experience and information. Its elements are: providing support, openness to ideas, opinions and feelings of other people, the ability to put the group's decisions above one's own interests.

### **Interpersonal – work in diverse teams (e.g. multicultural, multigenerational)**

This competence indicates the ability to identify cultural determinants and the impact they have on perception, evaluation and mode of action. It is understood as the ability to change perspectives, shape interactions and carry out professional tasks in diverse teams (e.g. culturally, generational), in a way that allows avoiding misunderstandings and conflicts. It manifests itself in accepting and respecting the diversity of different people, the ability to flexibly adjust one's own way of acting to achieve the set goals. It is characterized by openness to difference, cognitive curiosity, flexibility, a high degree of tolerance and a willingness to learn new things and a willingness to take up challenges in a heterogeneous team.

### **Organisation and self-organisation – time management, self-reliance**

This competence describes organizational efficiency as well as independence and effectiveness of actions. It allows you to apply for the ability to effectively use your own and your team's working time. It is the ability to organize work, create plans and schedules, provide resources needed to complete a task, and set deadlines and priorities. Its manifestation is the ability

to modify action plans when the situation requires it. It is also the ability to perform tasks effectively without direct supervision and assistance. It also manifests itself in the accurate identification of problems and proposing effective solutions, as well as predicting the effects and the ability to adequately assess the occurrence of risk factors. This skill is supported by the effective search for the necessary information and its reliable analysis, increasing the likelihood of making the right decision.

### **Creativity – generating new ideas, creative style of work**

It describes the ability to generate new ideas and a creative style of work. This competence manifests itself in the form of observed behavior, which consists in producing new, original and valuable (useful) solutions. The main goal of creative thinking is to go beyond the usual mental framework, stimulate curiosity, detach from conventional methods of action and formalized procedures, pay attention to what is non-standard, accidental, and take into account various solutions and alternatives. It is expressed in: noticing areas requiring changes, independent thinking, openness and diversity of perspectives, going beyond the usual patterns, generating solutions.



### **Learning – openness to lifelong development**

It is the ability to organize one's own learning through effective time and information management. This competence includes being aware of one's own learning process and needs, identifying available opportunities and the ability to overcome obstacles in order to be successful in learning. It means acquiring, processing and assimilating new knowledge and skills. It enables the use of previous experiences to apply knowledge and skills in a variety of contexts. The key factors in developing this competence are motivation and self-confidence.

### **Personal – loyalty, involvement, responsibility**

This competence describes the ability to consistently pursue the intended goal and carry out activities despite obstacles and difficulties. It manifests itself in conscientious and accurate fulfillment of duties. It is also taking responsibility for the results and results of your work, the ability to admit your mistakes, receive feedback and readiness to correct your behavior and methods of action. This competence manifests itself in the readiness to acquire knowledge, qualifications and skills, honesty and loyalty to colleagues and the employer, respecting applicable laws and rules.

### **Personal – capacity of resilience (e.g. for stress, time pressure)**

This competence describes the ability to act in a self-controlled and effective manner under stress, time pressure and the need to perform several tasks simultaneously. It is the ability to control your emotions and reactions and not transfer stress to other team members. It is associated with the ability to self-reflection and the ability to draw conclusions from difficult situations and to learn from mistakes.

## **SELECTED LEVEL DIVISION OF COMPETENCIES**

**Defining levels of particular competency** can be a very difficult task. There is no common framework functioning within the EU which could offer an easy solution. EQF Advisory Group (AG), established in 2008 has created The European Qualifications Framework. In addition, the EU has created ESCO (European Skills, Competencies, Qualifications and Occupations) which is the European multilingual classification of Skills, Competencies and Occupations. Both of those organisations can offer some support for vocational competencies and suggested levels but they do not provide detailed descriptions of particular competencies. Desk research has shown that various researches present separate levels of competency proficiency – especially when it comes to non-vocational competencies. One of which is the **competency standards created in the UK by The Royal Institute of Chartered Surveyors**, it includes 3 levels:

Level 1 – knowledge and understanding

Level 2 – application of knowledge and understanding

Level 3 – reasoned advice and depth of technical knowledge.

For example, in remote sensing and photogrammetry, the following level descriptions are listed:

- Level 1: Demonstrate knowledge and understanding of the principles of remote sensing and photogrammetry (both aerial and terrestrial).
- Level 2: Apply the professional's knowledge and be aware of scales, camera and satellite principles and different data capture techniques. Understand and undertake



procedures for routine data capture, and analyse and/or adjust/transform data. Use standard industry software.

- Level 3: Provide evidence of fit-for-purpose advice on client requirements. Identify and assess client specifications. Use advanced industry software and advise on data transfer and/or format (Trinder 2008).

Similar framework has been created in the project **Go4FutureSkills** (POWR.04.03.00-00-0031/18), where the leader – Dobre Kadry has defined **4 levels of each key competence**:

- Level 1: Competencies necessary to perform simple and routine tasks which are the basis for further and more specialised activities.
- Level 2: Competencies necessary to perform tasks in typical situations.
- Level 3: Competencies necessary to perform complex tasks, both in typical and problematic conditions.
- Level 4: Competencies necessary to perform many complex tasks of various nature.

This scale incorporates the previously mentioned research, at the same time it extends and

For example two different levels of the leadership competency<sup>17</sup> have been described in the following way:

- Level 1: The employee gains the trust of others through participation in the implementation of tasks. Team members know that when they ask for his/her help, they will get it. The employee contributes to the team's work primarily through the correct performance of his/her tasks. Consistently, step by step, he/she builds his/her authority by acquiring new skills and systematically acquiring specialist knowledge. The employee shows a positive attitude and faith in overcoming difficulties and achieving set goals, thanks to which he/she positively influences the attitudes of team members. He/she openly shows satisfaction when the team is successful. Avoids communicating criticism. In a conflict situation, he/she does not get involved on either side.
- Level 4: The employee builds his/her authority primarily on the basis of a specific vision of the work of the team he/she manages. He/she clearly defines the principles of cooperation and her/his expectations. The employee inspires trust thanks to his/her attitude - determination and consistency in action, peace and building friendly relationships. As a supervisor, he/she focuses primarily on achieving goals, while at the same time taking care of a good working atmosphere. The employee takes control of the group's work - sets goals, distributes tasks adequately to the skills of employees, and monitors the level of their performance. Regularly gives positive and critical feedback based on facts. In the event of objections, he/she wants to know the reasons for the situation and, together with the employee, agree on the standards for the implementation of tasks for the future. The employee builds a sense of belonging to a team among employees – he/she reminds them of common goals, encourages them to cooperate and help others, and to share knowledge. The employee is open to suggestions of solutions and improvements presented by subordinates, which fosters their sense of shared responsibility. He/she shows employees an interest in their problems and provides them with real support. Attaches great importance to integrating the team - organizes meetings to increase motivation, exchange

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<sup>17</sup> Defined as: the ability to build authority and trust that allows you to lead the team to achieve its goals. It is the ability to stimulate people to action and focus their activities on tasks. It manifests itself in the ability to assign tasks adequately to the competencies of employees, appreciate the work of each team member, motivating the feedback among team members and resolving conflicts in a manner satisfactory to each of the parties.



experiences and jointly solve and analyze problem situations. Can choose the management style to the type of tasks and the specificity of team members. The employee efficiently makes decisions by taking into account various solutions and selecting the most advantageous ones, which contributes to the good results of the team. In conflict situations, he/she takes the role of a mediator - listens to each of the parties, gives them the opportunity to present their arguments in calm conditions, encourages them to listen to each other and search for solutions together.

Considering all desk research conducted by partners, as well as results of Go4FutureSkills project, the Partnership has decided to select the following levels of competency proficiency:

Level 1	Competencies necessary to perform simple and routine tasks which are the basis for further and more specialised activities.
Level 2	Competencies necessary to perform tasks in typical situations.
Level 3	Competencies necessary to perform complex tasks, both in typical and problematic conditions.
Level 4	Competencies necessary to perform many complex tasks of various nature.

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