WATTer Skills

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Water Efficiency and Water-Energy Nexus in Building Construction and Retrofit

IO2. Qualification Framework

Qualification framework for water efficiency technicians and experts

REPORT

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- Agência para a Energia – ADENE (Portugal)
- Fundación Laboral de la Construcción – FLC (Spain)
- Ente per la Formazione e l'addestramento professionale nell'edilizia – FORMEDIL (Italy)
- Centre for Renewable Energy Sources and Saving – CRES (Greece)

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Content

WATTer Skills definitions

Alphabetical order

- **Black water**. Black wastewater refers to domestic wastewater only in some extent (excludes greywater), including the sewage that produced from toilets or urinals.
- **Drinking water installations, efficient irrigation systems and sanitary network design**. Public water networks used for water transport and supply and building plumbing systems. Sanitary design should encompass strategies and systems for reducing water consumption, as well as recycling rainwater and grey water may be key elements to save water in buildings.
- **Energy and water efficient home appliances.** Equipment and devices with good energy efficiency performance, that can save water and energy in different aspects of the construction and use of the building, especially those that are related to hydraulic and thermal installations.
- **Greywater**. Greywater refers to domestic wastewater only in some extent (excludes black wastewater), also addressed as soap water, including that produced from e.g. baths, showers, faucets, dishwashers or laundry.
- **Heat, cooling and hot water installations and renewable energy systems**. The energy performance of installations is directly associated to water use in the case of hot water production and indirectly to heat control in summer. Air conditioning and heating installations often uses water as a heat transfer fluid, which requires no leaks.
- **Rainwater harvesting**. Rainwater harvesting refers to water that result from the rainfall occurring locally or in the surrounding area and that represent, in general, low pollutant content, and collected in dedicated systems.
- **Regenerated water.** Regenerated water refers to grey water that is treated for reuse purposes, in compliance with the quality standards established for the destination uses.
- **Site conditions**. Site conditions, e.g. climate, orientation, the influence of “heat island” effect, that can be used to enhance energy efficiency related to water efficiency (use and water consumption reduction).
- **Wastewater**. Domestic wastewater refers to the general house effluent coming from the toilets, kitchens, laundry and similar uses (includes backwater and greywater).
- **Water efficiency in green areas and site based passive measures**. Buildings with gardens and green areas, especially single dwellings, can have an intense water consumption and ecological footprint if the climate is not taken into consideration. For instance, it is very important that green areas are composed of native plants and a combination of other materials, such as wood, sand or rock, which minimize the water use. It also needs to be taken into account that trees, vertical gardens, and green roofs can also provide thermo-regulation for the building (envelope and interior).
- **Water efficiency**. Efficient use of the water which is supplied to a building (including alternative sources other than drinking water), considering water conservation measures and the continuous valorisation of the water as a natural resource, also integrating the water-energy nexus. Water efficiency measures in buildings may include water use audits, water-efficient products and smart technologies or recirculation systems (e.g., for hot water). Other measures could refer to greywater reuse, rainwater harvesting, landscape redesign and efficient irrigation systems.
- **Water-energy nexus**. Strong interrelation and interdependence between energy and water consumption. The inefficient management of water corresponds to energy waste and vice-versa, owing that water is critical for energy production while energy is critical for water production and use.

WATTer Skills acronyms

Alphabetical order

DHW	Domestic Hot Water
ECVET	European Credit system for Vocational Education and Training
EQF	European Qualification Framework
KSC	Knowledge – Skills - Competences
NQF	National Qualifications Framework
NQS	National Qualification System
SWH	Solar Water Heater
VET	Vocational Educational and Training
WEE	Water Efficiency Expert
WET	Water Efficiency Technician

1 Introduction

WATTer Skills (*Water Efficiency and Water-Energy Nexus in Building Construction and Retrofit*, http://watterskills.eu/) is a European project, funded within the ERASMUS+ programme, which aims to develop, implement and propose a common curriculum, qualification framework and certification scheme at the European level, for training and skills upgrading of construction and green professionals on water efficiency and water-energy nexus for building construction and retrofit.

Therefore, WATTer Skills will:

- Set the perimeter and the WATTer skills map at a European Union (EU) level;
- Develop a common qualification framework and certification schemes based on training and learning outcomes designed for water skills, in line with the European Qualifications Framework (EQF) provisions, able to be adopted and adapted (nationally) for training and qualification of the different types of professionals targeted;
- Develop the training courses curricula and contents for the two professional profiles identified: Water Efficiency Technician (WET) and Water Efficiency Expert (WEE);
- Develop and propose a common certification system based on the European Credit system for Vocational Education and Training (ECVET) training credits capable of being used in all EU countries, fostering mobility and recognition of professionals in the European market.

2 Objectives

The WATTer Skills aims at providing provide a tool that promotes transparent curricula and training for the development of sustainable and sound practices for water efficiency and its related professionals. The project will contribute to the recognition and transparency of qualifications at EU level and provide an innovative model for competencies for the water efficiency sector, from building construction to its final use. Thereby, the Vocational and Educational Training institutions will have the necessary tools to enhance the set skills as required in the various disciplines and workplaces to workers within the water efficiency field.

This document refers to the second step of the project - the Intellectual Output II (IO2), which objectives are to present the definition of the training and qualification/certification scheme requirements based on the learning outcomes defined in IO1, in line with the European Qualifications Framework (EQF) provisions, to adopt and adapt (nationally) for training and qualification of the different types of professionals targeted, including areas of knowledge, number of hours, trainer and trainee profiles, the required prequalifications, amongst other relevant criteria. The identified scheme requirements will form the background for the development of the appropriate training courses for the two 'new' proposed by WATTer Skills specialties, as well of the corresponding supporting materials and tools (subject to the Intellectual Output III – IO3).

3 WATTer Skills training and qualification framework and requirements

WATTer Skills, in straight line with the European Qualification Framework (EQF) guidelines, addresses the definition and description of qualifications based on learning outcomes. As opposed to the traditional educational training systems, more conceptual and theoretic, the expected knowledge, skills and competences (KSC scheme) need to encompass the required knowledge – more theoretical, the "knows how to be", the skills - more practical knowledge, the "knows how to do", and the soft skills – the specific social and vocational competences, needed for water efficiency building professionals. Both non-formal and informal learning validation will be considered, according with EQF, NQFs and ECVET technical specifications, to facilitate updating professional qualifications and to allow official recognition of such qualifications, thus supporting the already experienced water professionals from the building sector.

In the proposed framework, qualifications and level descriptors need to be transparent and carefully revised, for helping both learners and employers understand what is implied and can be expected from training and in the market. As result, the identification of short-, mid- and long-term learning objectives, the allowance of mobility, together with the adaptation and recognition of education and training systems, need also to be accounted during training. Likewise, the descriptors should be general and sufficiently elastic/flexible to be used by the different countries, and at the same time detailed, to consent the required horizontal (learning domains and subdomains) or vertical (from lower to higher qualification levels) arrangements.

Beyond this ultimate challenge of organising such a flexible framework, fitting the diverse needs of the different participating countries, WATTer Skills qualification schemes aim at the replication throughout the other European countries.

3.1 Qualification framework

With respect to the specific objective of creating the basis for the qualification framework setup, and each short- to long-term learning objective, the training and qualification schemes for the targeted professionals will need to include the identification of the KSC (knowledge, skills, and competences) approach (Table 3-1). Based on the EQF definitions (Cedefop, 2009[1], 2018[2]), the areas of knowledge, skills and competences may be identified as follows:

1. **Knowledge** - the necessary facts, concepts, theories and methodologies for the learning and understanding of the professional activities. In the context of the EQF, knowledge may be described as "theoretical and/or factual";
2. **Skills** - both general and specific tasks, routine and non-routine problems, simple to complex instructions, amongst other relevant criteria, i.e., the required skills for task accomplishment and comprehensive completion. In the context of EQF, skills may be described "as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments)";
3. **Competences** - evidenced ability to express and communicate with peers or people from different hierarchy levels within an organisation, together with planning and preparation abilities, amongst other relevant criteria, i.e., the relevant professional and social competences required for working individually or

[1] Cedefop. The sift to learning outcomes. Policies and practices in Europe. Cedefop Reference Series. ISBN 978-92-896-0576-2.

[2] Cedefop. Analysis and overview of NQF level descriptors in European countries, Cedefop Research Paper, ISBN: 978-92-896-2668-2.

in a team. In the context of the EQF, competences may be described as "the ability of the learner to apply knowledge and skills autonomously and with responsibility".

For the two EQF reference levels respective to the two professional profiles under development, the specific learning outcomes need to be described (Figure 3-1) and adapted to the existing qualification system (Cedefop, 2018). Particularly to the EQF4 and EQF6 levels, which correspond to the water efficiency technician (WET) and water efficiency expert (WEE) professionals, the set of descriptors indicating the learning outcomes relevant to these qualifications are:

Table 3-1 – Knowledge, skills and competences under each qualification framework level (Cedefop, 2018)

	EQF 4	EQF 6
Knowledge	Factual and theoretical knowledge in broad contexts within a field of work or study, including current applicable legislation, standards and norms	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles
Skills	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study
Competences	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.	Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups

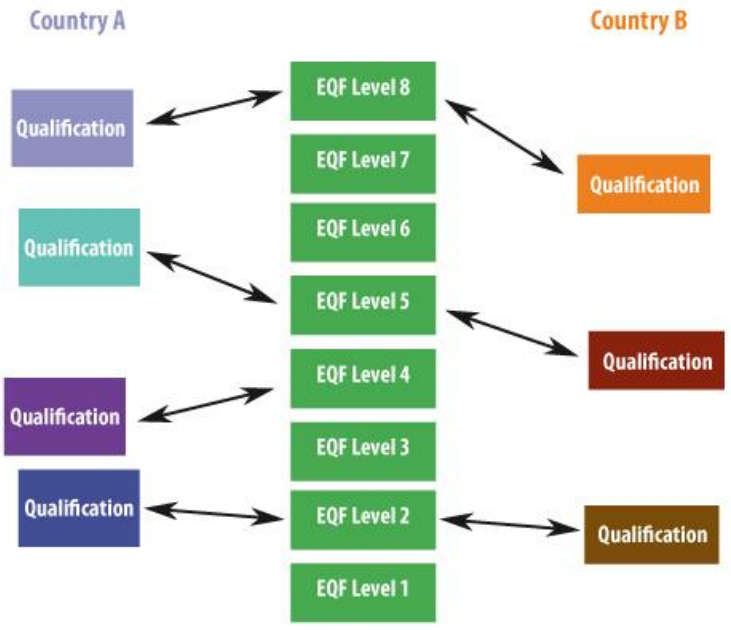

Figure 3-1 – European Qualification scheme (in: http://mavoieproeurope.onisep.fr/en/european-tools-for-mobility/the-eqf/)

3.2 Professional profiles

The WATTer Skills professional profiles need to be developed based on the activities and job requirements analysis and related KSC approach system, considering the relevant national qualification frameworks and repertories of each partner country (Portugal, Italy, Spain and Greece). This identification has been quite explored in the IO1 report, with two categories of water efficiency professionals defined[3]:

1. Water efficiency technician (WET) – The person certified to install, maintain, repair and replace water systems in buildings in compliance with water efficiency requirements, addressing water efficiency and water-energy nexus measures in buildings, considering site conditions, building type and the most adequate systems and layouts, including water and energy efficient home appliances, equipment and devices, water efficiency in green areas and outdoor environment, water network performance and retrofit, and installation systems for rainwater harvesting and greywater reuse in line with legislation or standards. The water efficiency technicians envisaged by this new qualification scheme are upskilled plumbers, equipment installers, water supply and drainage maintenance technicians and energy systems installers, for which the scheme resulting from the WATTer Skills project will provide upgrading training, qualification and certification on water efficiency technical skills, resulting in a new output profile and certification scheme of specialized "Water Efficiency Technicians", to be aligned with EQF and NQF (level 4) as well as on ECVET training credits within the common accreditation system to be developed, allowing for mobility within the EU territory;

2. Water efficiency expert (WEE) – The person certified to design, select, propose and inspect water systems in buildings considering water efficiency requirements, addressing the water efficiency and water-energy nexus measures in buildings, considering site conditions and building type and the most adequate systems and designs, including water and energy efficient home appliances, equipment and devices, planning for water efficiency in green areas and site based passive measures design, water network performance and retrofit, systems for rainwater harvesting and greywater reuse, in line with legislation or standards. The water efficiency expert envisaged by this new qualification includes upskilled water systems designers, engineers, architects, technical engineers, technical agents, energy and environmental performance auditors. The upgrading training course and corresponding validation will result in a new output profile of "Water Efficiency Experts" (corresponding to EQF 6), to be included in WATTer skills ECVET accreditation system proposal, allowing for mobility within the EU territory.

The development of each professional profile will need to assume a modular approach, where the activities and competences represent the "bricks" (modules) and can be progressively integrated within the professional development path for the individual, also considering his/her own experience. These may be related with transversal sectors, including the tertiary sector and public administration, residential, industrial, transport or civil, acknowledging the required skills and competences of the two water efficiency specialisations.

3.3 Areas of competence (WET and WEE)

The WATTer Skills professional profiles require, per each area of competence, the identification of the corresponding KSC scheme. The identification of the water-energy efficiency related skills and recognition of the learning outcomes for the two WATTer Skills specialisations (WET and WEE) was made considering two steps: the description of job positions with the related tasks with respect to water efficiency (construction system/stage, work functions related to water use in buildings and job position) and the description of the required competence units on water efficiency (building work areas related to water efficiency, profession involved and skills necessary to achieve water and energy - related to water use - savings). The skills map for

[3] it should be noted that the defined competences should be mainly related with water efficiency measures and not directly driven by energy efficiency targets

each qualification was then defined after careful analysis of the gathered information and identification of the main areas, with all tasks classified, with the objective of grouping the skills into "areas of competences", to be used for setting the qualification framework. The IO1 skills map identification was thus developed stepwise, according with the Figure 3-2. In addition, during the definition of the two profiles, boundary activities of the WET and WEE were identified, with the previously defined skills maps in IO1 redefined in terms of areas of competence, leading to a different set in the number of required competence areas and further learning units.

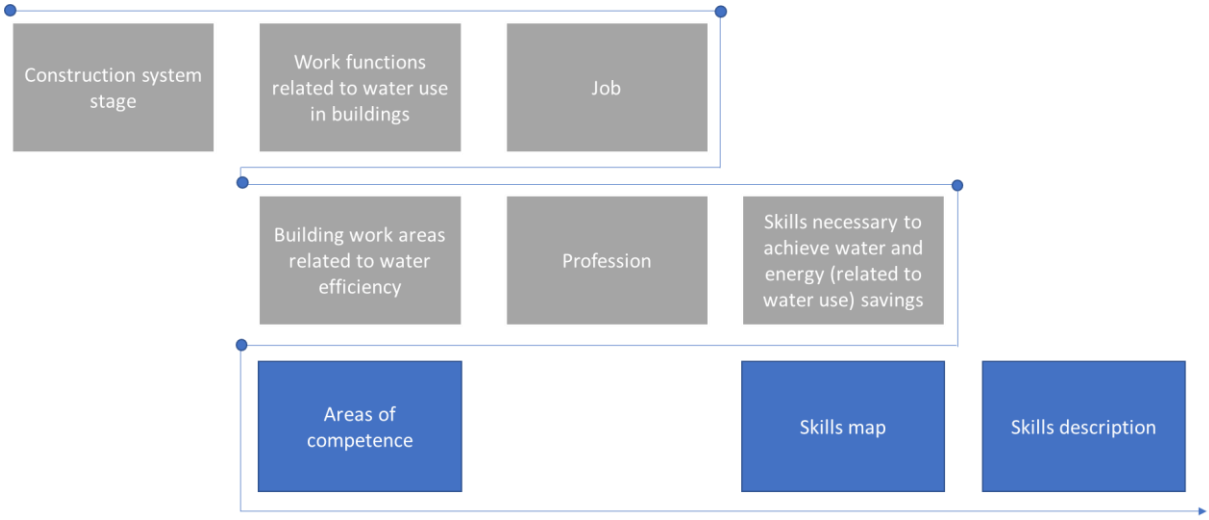

Figure 3-2 – Skill map identification process developed in IO1 report (WATTer Skills IO1).

The established skills for WATTer Skills correspond to six areas of competences with 20 skills in total for the WET, and four areas of competences with 14 skills in total for the WEE, grouped as follows:

1. WET areas of competence:
   - Hydraulic installations and water losses[4] (6 skills);
   - Domestic hot water systems (5 skills);
   - Grey water reuse (2 skills);
   - Rainwater harvesting (2 skills);
   - Outdoor installations (3 skills);
   - Communication with the customers/ consumers (2 skills);
2. WEE areas of competence:
   - Design of water efficient buildings (5 skills);
   - Supervision during the construction, commissioning and operation of a project [5] (3 skills);
   - Water measurement and water-energy nexus (3 skills);
   - Communication with customers/consumers [6] (3 skills).

The above-mentioned areas of competence will be then translated into learning outcomes described in terms of knowledge, skills and competences, in order to form the basis that will be used for the construction of the qualification frameworks and training programmes to be developed. Likewise, for each professional profile, each

[4] It includes the selection of materials and appliances topic

[5] Project supervision may require project design and installation experience.

[6] Includes the possibility of acting as an independent auditor to the above referenced areas of competence

learning outcome for each area of competence will be translated into competence units that, in turn, will be re-constructed and lead to the requested *knowledge, skills and competences* (KSC).

3.4 Training Program

Based on the professional profile in terms of the required activities and assuming the KSC approach, WATTer Skills training courses of around 200-300 hours (for all modules) may be foreseen for WET and WEE qualifications. The WATTer Skills competence program framework may be defined independently for the WET and WEE profiles, in terms of the professional competences, together with:

1. **Modules**, corresponding to the areas of competences defined for each water efficiency profile (the areas of competences defined in IO1);
2. **Learning units,** corresponding to the learning outcomes (the so called "skills", as identified in the IO1 skills maps), with reference to the duration defined for each training unit (number of hours);
3. **KSC**, for each learning unit, following a more detailed description of the necessary 1) standards, basics and fundaments, 2) tasks accomplishment and 3) soft skills, which are the required for the trainee to accomplish for successful completion of each training unit;
4. **Training and evaluation methods**, including the contents' description, expected delivery and assessment quality requirements for objective attesting of the trainees' accomplished competences (Figure 3-3).

Modules (areas of competence)	Training units		KSC	Training and evaluation method			
	Learning Outcomes	Duration		Contents	Description	Delivery	Assessment
Area of competence A	LO A.1	Number of Hours	Knowledge A.1 Skills A.1 Competences A.1	..	..	(discussions, hands-on, lessons, role-play)	(examination, oral examination/exercises, project, written exercises/test)
	LO A...	Number of Hours	Knowledge A.. Skills A.. Competences A..	..	..	(discussions, hands-on, lessons, role-play)	(examination, oral examination/exercises, project, written exercises/test)
Area of competence B	LO B.1	Number of Hours	Knowledge B.1 Skills B.1 Competences B.1	..	..	(discussions, hands-on, lessons, role-play)	(examination, oral examination/exercises, project, written exercises/test)
	LO B...	Number of Hours	Knowledge B.. Skills B.. Competences A..	..	..	(discussions, hands-on, lessons, role-play)	(examination, oral examination/exercises, project, written exercises/test)

Figure 3-3- WATTer Skills qualification framework – Learning outcomes and training program curriculum

The areas of competences/modules need to be independent and, therefore, should be evaluated and validated autonomously. On the other hand, areas of competences may be specific to one profile or common to both qualifications.

Based on the developed competences framework, the training programs need to be clearly described with the identification of the training topics and duration of theory and practice sections, the learning methodology (e.g., on line, in classroom, tutoring) together with the verification assessment method (e.g., continuous evaluation, examinations). In addition, the resources and the necessary equipment for task completion and the outputs need to be defined.

3.5 Professional qualification requirements

Amongst the participating countries (Portugal, Spain, Italy and Greece), the national referencing process may be different and include many other qualifications apart from those identified by the two EQF levels, i.e. the 4th EQF level for the WET and the 6th EQF level for the WEE. Also, there should be no replacement of the existing qualification framework of each country, other than a proposal with the relevant descriptors that could be included in the reference system. The bridge between the national and the European qualifications may be conducted in accordance with the following scheme 1- identification of the entry level requirements, 2- complementary training attendance or competence validation and 3- qualification recognition by the national qualification entity (Figure 3-4):

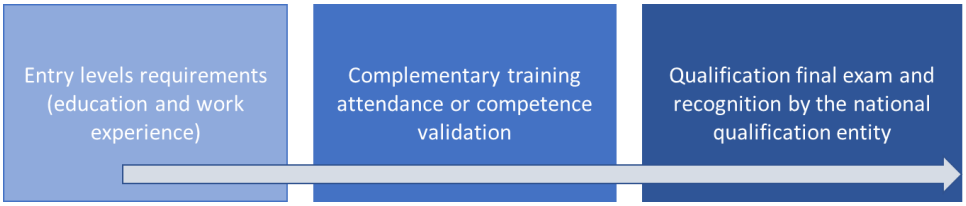

Figure 3-4 Qualification scheme process (adapted from ANQ report, 2011)

Portugal

With the purpose of setting the two new qualifications (WEE and WET) and attempt their inclusion in the Portuguese National Catalogue of Qualifications (CNQ), the training contents should be defined according to the professional profile setup by National Agency for Qualification and Vocational Education and Training (ANQEP report[7,8]). The National Qualifications Framework is a single reference framework for classifying all the qualifications produced by the education and training system in Portugal, irrespective of their levels or access routes. The qualifications with the technological/professional components include: the competence reference, the competence units, and the training reference, as well as the definition of short duration training units.

The identification process of the unit of competence needs to be based on the functional analysis and to be complemented with certification, amplitude and transferability, clarity and legibility and specificity. The design phases of a unit of competence include: title definition; description of the actions; description of knowledge, skills and attitudes; description of performance criteria; describe context conditions; identification of products / outputs (expected outcomes); revision of the actions/outcomes and performance criteria; assignment of a level to the unit of competence; confirmation of the title of the unit of competence and allocation of the ECVET points.

Apart from the units of competence, smallest units of qualification allowing recognition and certification at a national level exist, the short-term training units. The training standard should include the correspondence between the units of competence and the short-term training units. For definition of the short-term training units, the several elements need to be considered: learning objectives; contents; evaluation criteria; resources

[7] ANQEP – Agência Nacional para a Qualificação e Ensino Profissional. Methodological guidebook – concept of qualifications based on learning outcomes. ISBN: 978-972-8743-77-2.

[8] ANQEP - Agência Nacional para a Qualificação. Report on the Referencing of the National Qualifications Framework to the European Qualifications Framework.

and products/outputs. Units should be complemented with the definition of autonomy principles; pertinence and adequacy; transversal and transferable properties; exclusive and differentiation; specificity; complexity and depth; clarity and eligibility. The design phases of a short-term training unit include: title definition; formulation of the learning objectives; identification of the contents; determination of the workload; identification of resources; definition of evaluation criteria; identification of the products/outputs; confirmation of the title of the short-term training unit.

Spain

In Spain, the regulation of professional qualifications is articulated in the Organic Act 5/2002[9], with the creation of the *Sistema Nacional de Cualificaciones*, National System for Qualifications and Vocational Education and Training (SNCFP, in Spanish).

This Law states that "*the system, inspired by the principles of equal access to vocational training and participation of social agents with public authorities, must promote lifelong learning, integrating the different training offers and implementing the recognition and accreditation of professional qualifications at national level, as a mechanism for the homogenization, at European level, of levels of training and professional accreditation with a view to the free movement of workers and professionals in the scope of the market that the European Community entails*".

Two key concepts are identified:

- Professional qualification → it's a set of professional competences significant for employment, which can be acquired through vocational education and training (VET) modules or any other kind of learning structure as well as through work experience. It may be subject to evaluation and accreditation.
- Professional competence → the set of knowledge and capabilities which allow the performance of an occupation according to the requirements of production and employment.

This Law also indicates the role of two bodies involved in defining, drafting and updating qualifications:

- General Council for Vocational Training[10] (CGFP, in Spanish) → Advisory body and institutional participation of public administrations (general and regional) and social agents, and advice to the Government on vocational training.
- National Institute of Qualifications[11] (INCUAL, in Spanish[12]) → technical support body for the General Council responsible for defining, drawing up and keeping up to date the National Catalogue of Professional Qualifications (CNCP, in Spanish) and the corresponding Modular Catalogue of Vocational Education and Training (CMFP, in Spanish):
    - The National Catalogue lists the professional qualifications identified in the productive system according to competences appropriate for an occupational practice.
    - The Modular Catalogue is the set of learning modules related to the different competence units which form a professional qualification.

[9] Organic Act 5/2002, of 19th June, on Qualifications and Vocational Training.
[10] Created by Act 1/1986, of 7th January, modified by Acts 19/1997, of 9th June, and 14/2000, of 29th December.
[11] Created by Royal Decree 375/1999, of 5th March.
[12] National System for Qualifications and Vocational Education and Training. National Institute of Qualifications (INCUAL). General Vocational Education and Training Direction. Ministry of Education, Culture and Sports (currently, Ministry of Education and Vocational Training).

The structure of INCUAL includes the Professional Observatory, which provides information on the evolution of the demand and supply of professions, occupations and profiles in the labour market, and participates in the definition, preparation and maintenance of the updated Catalogue.

For the definition of qualifications, 26 working groups have been set up (one per professional family), made up of technical and technological experts selected on the basis of proposals from the organisations making up the General Council.

Steps to determine, develop and update the CNCP:

1. **Collection and treatment of information and creation of working group** → Gather and analyse information of professional sectors, employment and training institutions to set up the observation professional grid of every professional family. Also, creation of working groups according to professional profiles previously defined by the INCUAL.

2. **Qualification design**→ from the observation professional grid, the methodology of functional analysis is carried on defining the general competence, the competence units and the professional environment for the professional qualification.

3. **Definition of related training** → every unit of competence has a linked learning module which is defined in terms of capacities with all of the assessment criteria specifying learning contents and parameters of the learning environment. The qualification quality assurance is verified through an internal review.

4. **External review** → Once the qualification is designed by the working groups, it is submitted to the general and regional administrations, social agents and other organizations related to the qualifications, all of them represented in the General Council of Vocational Education and Training in order to improve its quality and to ensure that it fits to the productive services.

5. **Qualification approval** → it is the Government the one who definitely approves which qualification must be included in the Catalogue once the advisory process to the General Council for VET, to the Spanish State School Council[13] as well as the ministerial departments involved is finished.

6. **Updating** → The CNCP and the CMFP are updated through revisions no more than five years since the date the qualification is included in the CNCP.

Two ways to implement the procedure for the inclusion of a new qualification in the Catalogue:

1. The INCUAL, through the studies carried out by the Professional Observatory, may raise the need to develop a new qualification.

2. Any entity or organization that has any link or relationship with professional families can initiate the process. To do so, it must fill in Annex 1, a document addressed to INCUAL in which, in a reasoned manner, the request is justified by providing quantitative and qualitative data: number of people who could acquire said qualification, occupations of difficult coverage that could be covered more easily, demand for qualified workers in the field of the qualification, etc.

Once the document is received, the INCUAL team of experts of the referenced professional family assesses the suitability of initiating the procedure. Two options:

1. Develop a new qualification → step 2 and following of the above procedure.

[13] Created by the Organic Act 8/1985, of 3rd July, and regulating the Right to Education. It is the body of participation of the sectors most directly related to the world of education. Its scope of action extends to the entire State. It carries out a consultative work, advising and proposing to the Government in relation to the different aspects of the educational system.

2. Modify another existing qualification that may cover the need detected → procedure shown in the Royal Decree 817/2014[14], which establishes:

- Aspects that are considered specific in the updating of professional qualifications and units of competence.
- Those actions that are excluded as modifications.
- The persons who may approve these amendments.
- The effects they have on the CNCP.

Italy

In Italy the certification system is quite complex because it relates to different stakeholders, such as Sectoral social parts, Regions, Ministries, Uni rules for unregulated professions. Because of this diversification, the government, with the support of INPAP, has built "The Atlas of Work and Qualifications", which represents a detailed map of work and qualifications, described according to a common language shared between the institutions in the various areas of the lifelong learning system: Secondary level education, Vocational Education and Training, Higher Education and Regional Vocational Training. The Atlas and professions collect regulated professions (Directive 2005/36 / EC and subsequent additions), the Repertory of apprenticeship professions (consisting of all the profiles present in the National Collective Labor Agreements related to the professionalizing apprenticeship), and professional associations (Law n. 4/2013) which unite the professions not organized into orders or colleges.

In order to define the two new qualifications (WEE and WET) with a certification recognised at a national level and try to include them in the regional repertoires and in the national work Atlas, the training contents that may be proposed must be accepted by the respective Regions with regional determination and if the qualification must be obtained through an education and training course, the Regions must agree the same within the State and Regions agreement with the qualification of 3 or 4 at a national level. The national qualifications framework is a unique framework for the classification of all the qualifications produced by the education and training system in Italy but consists of a very complex process as it incorporates all the existing regional repertoires n.20, the professional profiles of the most representative collective labour agreements, the three-year and four-year qualification courses set up with an agreement between the regions. The qualifications that are proposed or the additional competences must be translated in knowledge and skills and competences and depending on the paths, the number of hours changes and is somehow a standard for the qualifications recognized at a national level and with a different weight at regional level.

In this case the transfer of the qualifications into the Italian system is uncertain, but it could bring to the attention of some Regions the request of adding skills regarding the technical operator of water efficiency and being a nationally recognized qualification in the education and training path the regions will have to represent it if implemented in the coordination table of the State and Regions. In case of regional qualification as level 3 for the workers, it will be possible to request only admission to the region. For level 6, on the other hand, there is no possibility, except to organize specific specialization modules to be provided in our training system without any recognition or graduates who wish to deepen the subject, being satisfied with a certificate of attendance. It should be emphasized that in Italy the two qualifications are not entirely pertinent to the construction sector but are shared in part with the installers and therefore with the metalworking sector.

Furthermore, it could be an agreement with universities to bring to the attention of the same the development of a master's degree. These are ambitious and willing proposals that require a constant form of involvement of the competent authorities. At present there is no guarantee that the two qualifications will receive an immediate and certain acceptance in the Italian system.

[14] Royal Decree of 26th of September, establishing the specific aspects of professional qualifications for the modification, approval procedure and effects of which article 7.3 of Organic Act 5/2002, of 19th June, on Qualifications and Vocational Training is applicable

Greece

Occupational profiles (OPs) are drawn up in cooperation with the social partners, via tripartite representation (workers and employers associations) and certified by EOPPEP (National Organization for the Certification of Qualifications & Vocational Guidance). OPs are intended to serve as the basis for the development of VET Curricula Framework and for the definition of Occupational Standards, being the benchmarks for the recognition and certification of Qualifications.

The existing national legislative framework for the certification of OP entails the provisions of the law 3879/2010 and mainly the provisions in the article 19, the 110998/2006 Common Ministerial Decree, the provisions in the article 18 of the law 4186/2013 and the provisions of article 19 of the law 4115/2013, namely referring to the amendment of the constitution of the Advisory Committees. More specifically, the 110998/2006 Common Ministerial Decree initiates the framework for both the development and certification of Occupational Profiles. In the article 3 it is foreseen that the OPs are complete and thorough descriptions of occupations, including the following sections:

(a) Title/definition of the job and/or specialty;

(b) Background history;

(c) Current legislative framework;

(d) Breakdown of the job and/or specialty into specifications;

(e) Knowledge, skills and competence (KSC) required

(f) Suggested potential pathways for acquiring necessary qualifications;

(g) Indicative tools of assessing knowledge, skills and competence associated with the job.

Subsequently, at the article 4.3 of the abovementioned decree it is foreseen that eligible to deliver an OP are entities (consortiums) in which participate essentially representatives of the employers' and employees' organizations, which negotiate and undersign the National General Collective Labour Agreement (EGSSE). Once the OP is delivered by the consortium, according to the aforementioned structure, then EOPPEP holds responsibility to constitute the "Advisory Committee", which will assess and if, necessary, make suggestions to the consortium to revise and/or further develop parts of the OP.

The Advisory Committee holds responsibility to: a) confirm the compliance of OP with the terms and provisions of the legislative framework, b) to assess the adequacy of all section of the OP to the conditions and specifications provided by legislation and c) to draft a Joint Report which reflects the Committees final proposal to EOPPEP board. At the time when the OP reaches the final stage, EOPPEP's governing board decides finally upon the certification of the Profile.

4 WATTer Skills learning outcomes map

Based on the skills description earlier identified in IO1 report, and in line with the EQF provisions, the WATTer Skills learning outcomes map needs to include, amongst other relevant criteria, the areas of knowledge, number of hours, trainers and (potential) trainee profiles, and the pre-qualifications required. The learning outcomes map is linked to the skills map, with the former going into a higher level of detail than the latter.

4.1 The learning outcomes map

The development of the learning outcomes map needs to be done stepwise, with the required skills/competences and the learning outcomes for each area of competence (Figure 4-1).

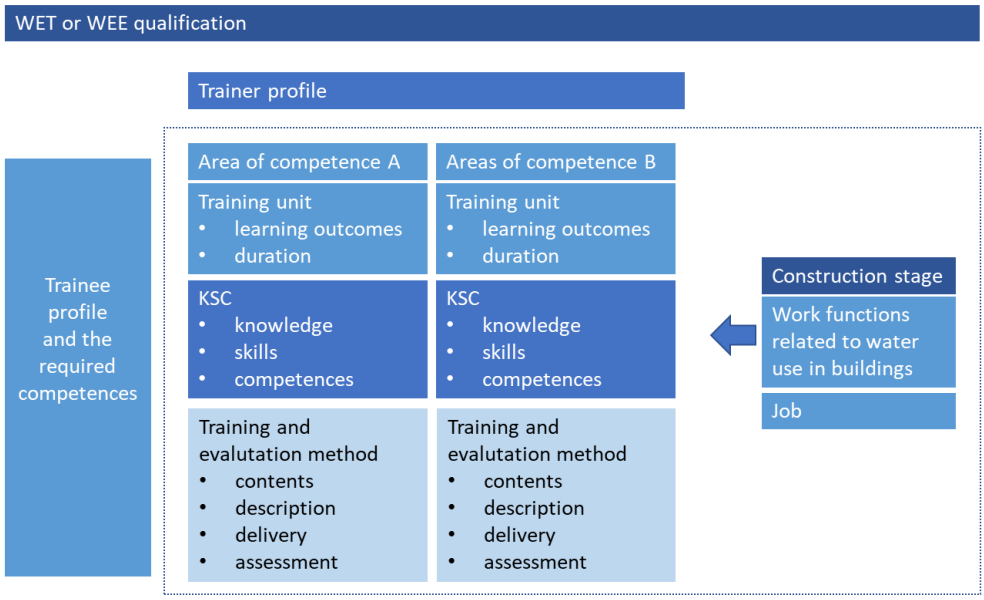

Figure 4-1 – Trainee profile and required competences; trainer profile and areas of competences framework

The learning outcomes map will include the knowledge applying, communication, judgmental and learning skills, identified to describe each competence and the learning outcome objectives. Next figure (Figure 4-2) presents the general idea of a description of the area of competence in terms of the learning objectives.

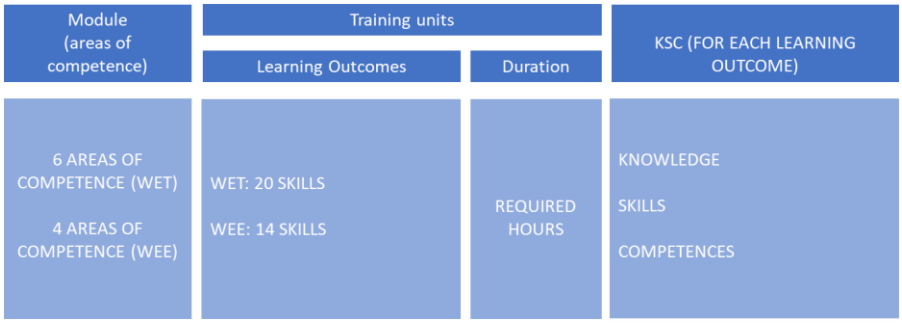

Figure 4-2 – Areas of competence translated as learning outcomes (the process - scheme).

The training and evaluation method, including the contents, description, delivery and assessment are part of IO3. Nevertheless, as starting point, below are given the Learning Outcomes (LO) description and KSC scheme associated to each area of competence, for the water efficiency technician (WET) and the water efficiency expert (WEE).

Water Efficiency Technician – WET

Table 4-1 – Water efficiency technician (WET), hydraulic installations and losses (A.1) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
A. Hydraulic installations and losses	LO A.1: Effective implementation of the thermo-hydraulic installations design	2 hrs	**Knowledge:** • Knowledge of the operational characteristics of thermo-hydraulic systems components • Knowledge of the functioning of fittings and other parts of the thermo-hydraulic system • Knowledge of the methods and/or techniques that may be applied to secure good performance of the thermo-hydraulic system, • Knowledge of the regulations and standards (local, national, international) applicable to thermo-hydraulic systems, considering water-energy efficiency requirements **Skills:** • Ability to interpret the thermo-hydraulic system project (and related available manuals) and dimensioning characteristics, considering water-energy efficiency requirements • Ability to establish the sequence of pipe installations and the corresponding components • Ability to limit obstructions and improve the piping network layout, e.g., in respect to reduce pipes lengths • Ability to provide an estimation of the work to be carried out for the system implementation **Competences:** • Good technical skills (for effective comprehension of the project layout) • Good organisational and planning skills (for effective implementation of the thermo-hydraulic system, including pipe insulation) • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-2 Water efficiency technician (WET), hydraulic installations and losses (A.2) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
A. Hydraulic installations and losses	LO A.2: Correct selection and installation of piping materials and components	3 hrs	**Knowledge:** • Knowledge of selecting the appropriate pipe material, in compliance with the regulations and standards (local, national, international) applicable to thermo-hydraulic systems • Knowledge of the potential for minimization of thermal losses through the piping system • Knowledge of selecting the adequate insulating materials that can be used for thermal insulation purposes **Skills:** • Ability to accurately implement the thermo-hydraulic project proposed • Ability to correctly apply the most effective and suitable equipment and materials for correct implementation of the system, including thermal insulation • Ability to efficiently check-out the thermal-hydraulic system installation • Ability to deliver to the client an effective thermo-hydraulic system (in line with the client needs and the necessary performance and environmental requests) **Competences:** • Good technical skills (for selection and installation of the materials and components) • Good organisational and planning skills (for effective implementation of the thermo-hydraulic system, including pipe insulation) • Good communication, marketing and client support skills • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-3 Water efficiency technician (WET), hydraulic installations and losses (A.3) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
A. Hydraulic installations and losses	LO A.3: Correct selection and installation of water-energy efficient appliances and fixtures	2 hrs	**Knowledge:** • Knowledge of correctly interpreting the proposed project selecting the adequate appliances and fixtures, in compliance with regulations and standards (local, national, international) • Knowledge of correctly placing all components, appliances and fixtures, in accordance with the proposed project • Knowledge of performing all required tests to secure the correct functioning of the installed appliances and fixtures **Skills:** • Ability to recognize the benefits of efficient appliances and fixtures versus the conventional / traditional ones • Ability to identify the water savings that might result from the use of efficient water appliances and fixtures and to present to the client the water savings derived from the use of efficient appliances and fixtures (in respect to conventional ones) • Ability to accurately implement the appliances and fixtures • Ability to correctly apply the most effective and suitable techniques and methods for the proper installation of the appliances and fixtures • Ability to deliver to the client an effective set of appliances and fixtures (in line with the client needs and the necessary performance and environmental requests) **Competences:** • Good technical skills (for identifying the water savings that might result from the use of efficient water appliances and fixtures) • Good organizational and planning skills (for effective selection of equipment) • Good managerial skills (when carrying out the monitoring/ management of the energy/water saving equipment) • Good communication, marketing and client support skills • Good and effective communication skills with the client and co-workers • Good and effective communication skills with the client for awareness-raising over the importance of select and use of water-energy saving appliances and fixtures • Responsibility and autonomy

Table 4-4 Water efficiency technician (WET), hydraulic installations and losses (A.4) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
A. Hydraulic installations and losses	LO A.4: Installation and management of smart-meters and other water consumption monitoring equipment	1 hrs	**Knowledge:** • Knowledge to correctly select the adequate smart-meter and water monitoring equipment, including the adequate fittings, in compliance with regulations and standards (local, national, international) applicable to thermo-hydraulic system, considering water-energy efficiency requirements • Knowledge of the basic characteristics (features) of the appropriate monitoring equipment and control devices, e.g., for minimisation of water losses • Knowledge of the benefits from monitoring water consumption in buildings, including the prevention of water losses • Adequate knowledge of the regulations and standards (local, national, international) applicable to the monitoring of water consumption **Skills:** • Ability to select the suitable water consumption monitoring equipment and control devices • Ability to properly and correctly install the water consumption monitoring equipment and control devices • Ability to manage the outputs of smart-meters and control devices (water monitoring equipment) **Competences:** • Good technical skills (for careful installation of smart-meter or water monitoring equipment) • Good organizational and planning skills (for effective selection of monitoring equipment) • Good managerial skills (when carrying out the monitoring/ management of the water consumption monitoring equipment) • Good communication, marketing and client support skills • Good and effective communication skills with the client and co-workers • Good and effective communication skills with the client for awareness-raising over the importance of water-energy good monitoring and control, e.g., for minimisation of water losses • Responsibility and autonomy

Table 4-5 Water efficiency technician (WET), hydraulic installations and water losses (A.5) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
A. Hydraulic installations and losses	LO A.5: Hydraulic adjustment and balancing of thermo-hydraulic installations	2 hrs	**Knowledge:** • Knowledge of the principles of fluid dynamics in pipes • Knowledge of the possible measures and/or corrective actions for assessing hydraulic imbalances in the thermal-hydraulic system, e.g. pressure drop • Knowledge of the critical settings that must be met when performing the hydraulic adjustment (specifically to water pressure) **Skills:** • Ability to choose the appropriate tools to secure the proper adjustment of the thermo-hydraulic system • Ability to perform the necessary tasks for the hydraulic adjustment and balancing of the thermo-hydraulic system • Ability to efficiently check-out the thermal-hydraulic system installation **Competences:** • Good technical skills (for handling of the hydraulic adjustment and balancing of the thermo-hydraulic installations) • Good organisational and planning skills • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-6 Water efficiency technician (WET), hydraulic installations and losses (A.6) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
A. Hydraulic installations and losses	LO A.6: Indoor leakage identification & control and periodic cleaning of hydraulic installations	2 hrs	**Knowledge:** • Knowledge of the procedures for the identification of the leakages in the thermal-hydraulic system • Knowledge of the procedures for proper repair, replacement and maintenance of the thermal-hydraulic system **Skills:** • Ability to identify and / or diagnose the possible leakage occurrence throughout the fixtures and / or the equipment of the hydraulic installation • Ability to fix the identified problem(s) • Ability to perform the regular repair/maintenance of the hydraulic installations **Competences:** • Good technical skills (for handling of the hydraulic adjustment and balancing of the thermo-hydraulic installations) • Good organisational and planning skills • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-7 - Water efficiency technician (WET), domestic hot water (DHW) systems (B.1) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
B. Domestic hot water (DHW) systems	LO B.1: Correct and effective interpretation of DHW project designs and layouts	2 hrs	**Knowledge:** • Knowledge of the operational characteristics of the DHW system components • Knowledge of the functioning of fittings and other parts of the DHW system • Knowledge of the methods and/or techniques that may be applied to secure good performance of the DHW system • Knowledge of the regulations and standards (local, national, international) applicable to DHW system, considering water-energy efficiency requirements **Skills:** • Ability to correctly differentiate the basic characteristics of a hot water system • Ability to interpret main parts of a project and correctly read schematic system layouts **Competences:** • Good technical skills (for effective comprehension of the project layout) • Good organisational and planning skills (for effective implementation of the DWH system) • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-8 Water efficiency technician (WET), domestic hot water (DHW) systems (B.2) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
B. Domestic hot water (DHW) systems	LO B.2: Correct selection of efficient technologies and/or equipment for DHW production	2 hrs	**Knowledge:** • Knowledge of the concepts of energy efficiency and the corresponding savings • Knowledge of the relation between energy saving and the efficient use of water heaters • Knowledge of the relation between energy consumption of devices and the GHG emissions. **Skills:** • Ability to correctly differentiate the basic characteristics of a hot water generator • Ability to correctly select a storage and buffer tanks **Competences:** • Good technical skills (for effective selection and installation of efficient water heaters) • Good organisational and planning skills (for effective implementation of the DWH system) • Good skills regarding the identification of energy savings from the use of alternative/efficient water heaters • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-9 Water efficiency technician (WET), domestic hot water (DHW) systems (B.3) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
B. Domestic hot water (DHW) systems	LO B.3: Basic concepts and pre-installation checks for DHW systems (focus on SWH)	1 hr	**Knowledge:** • Knowledge of the criteria regarding the suitability of a site for the installation of water heaters systems, including renewable energy sources (RES) based systems • Knowledge of the techniques/methodology for the realization of pre-installation checks for water heaters systems, including renewable energy sources (RES) based systems • Knowledge of the requirements of relevant regulations/ standards relating to practical installation, testing and commissioning activities for DHW systems • Knowledge of applied legal framework principles to guarantee secure work environment associated with DHW systems, focusing on SWH systems **Skills:** • Ability to determine the necessary pre-installation checks for DHW systems, focusing on SWH systems **Competences:** • Good technical skills (for effective undertaking of the verification process) • Good organisational and planning skills (for effective preparation for the installation of water heaters systems, including RES based systems) • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-10 Water efficiency technician (WET), domestic hot water (DHW) systems (B.4) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
B. Domestic hot water (DHW) systems	LO B.4: Installing solar water heating (SWH) Systems	2 hrs	**Knowledge:** • Knowledge to correctly interpret the proposed project and select the adequate water heaters, including RES based systems, in compliance with regulations and standards (local, national, international) • Knowledge to correctly select the adequate components and equipment for implementation of the DHW systems • Knowledge to correctly place all components and equipment in the DHW systems in accordance with the proposed project • Knowledge to perform all required tests to secure that the system presents no leaks • Knowledge to correctly commission the installed DHW systems, focusing on SWH systems **Skills:** • Ability to accurately implement the planned DHW system's project • Ability to correctly apply the most effective and suitable equipment and materials for proper implementation of the system, including thermal insulation • Ability to deliver to the client an effective hot water distribution system (in line with the client needs and the necessary performance and environmental requests) **Competences:** • Good technical skills (for effective installation, testing and commissioning of RES systems) • Good organisational and planning skills Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-11 Water efficiency technician (WET), domestic hot water (DHW) systems (B.5) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
B. Domestic hot water (DHW) systems	LO B.5: Routine service, fault diagnosis and repair work of DHW systems (focus on SWH)	1 hr	**Knowledge:** • Knowledge of the required tools to undertake analysis / diagnosis for DHW systems • Knowledge of performing the analysis/diagnosis of the DHW system • Knowledge to list all main problems/faults been detected for the DHW system • Knowledge of how to interpret the obtained results and propose adequate work to follow for the DHW system, focusing on SWH systems **Skills:** • Ability to understand and correctly interpret the main contents of the available technical manuals used for installation, repair, replacement and maintenance works in DHW systems • Ability to identify and / or diagnose any faults in the DHW system • Ability to perform the routine maintenance of the DHW system, focusing on SWH systems **Competences:** • Good technical skills (for effective repair/maintenance of the water heater system, including RES based systems) • Good organisational and planning skills (for carrying out the inspection, service and maintenance of water heaters systems, including RES based systems) • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-12 Water efficiency technician (WET), grey water reuse (C.1) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
C. Grey water reuse	LO C.1: Customised method and equipment selection for the reuse of collected grey water	3 hrs	**Knowledge:** • Knowledge of the concepts of water efficiency and the corresponding savings • Knowledge of the relationship between water savings and the efficient use of grey water systems • Knowledge of current legislation and references to certification systems, particularly when compulsory **Skills:** • Ability to apply the principles and different systems of grey water treatment • Ability to apply techniques for collecting and using grey water • Ability to recognise the components that make up a grey water treatment and storage system • Ability to dimension a collection system including storage tank according to the needs of the applicant **Competences:** • Good technical skills (for effective comprehension of the project layout) • Good organisational and planning skills (for effective implementation of the grey water system) • Good skills regarding the identification of water savings from the use of alternative/efficient grey water systems • Good and effective communication skills with the client and

Table 4-13 Water efficiency technician (WET), grey water reuse (C.2) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
C. Grey water reuse	LO C.2: Installation, commissioning and maintenance of grey water recycling systems	3 hrs	**Knowledge:** • Knowledge of the operational characteristics of grey water system components, considering water-energy efficiency requirements • Knowledge of the functioning of fittings and other parts of the grey water system • Knowledge of the methods and/or techniques that can be applied to ensure the proper functioning of the grey system, taking into account the water-energy efficiency requirements and the regulations and standards applicable to grey water recycling systems **Skills:** • Ability to install the various grey water storage and recycling systems, • Ability to install the components of the storage system and carry out the excavations in compliance with health and safety regulations • Ability to carry out ordinary and extraordinary maintenance work • Ability to analyse installation and maintenance costs **Competences:** • Good technical skills (for effective selection and installation of the most appropriate equipment for the grey water system) • Good organisational and planning skills (for effective implementation of the grey water system) • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-14 Water efficiency technician (WET), rainwater harvesting (D.1) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
D. Rainwater harvesting	LO D.1: Customized method and components selection for efficient rainwater storage and treatment	3 hrs	**Knowledge:** • Knowledge of the concepts of water efficiency and the corresponding savings • Knowledge of the relationship between water savings and the efficient use of grey water systems • Knowledge of current legislation and references to certification systems, particularly when compulsory **Skills:** • Ability to apply the principles and different rainwater treatment systems • Ability to apply techniques for collection and use of rainwater • Ability to recognise the components that make up a rainwater treatment and storage system • Ability to dimension a collection system including a storage tank according to the place of installation and the needs of the client **Competences:** • Good technical skills (for effective comprehension of the project layout) • Good organisational and planning skills (for effective implementation of the rainwater harvesting system) • Good skills regarding the identification of water savings from the use of alternative/efficient grey water systems • Good and effective communication skills with the client and

Table 4-15 Water efficiency technician (WET), rainwater harvesting (D.2) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
D. Rainwater harvesting	LO D.2: Installation, commissioning and maintenance of rainwater collection systems	3 hrs	**Knowledge:** • Knowledge of the techniques applied for the installation, commissioning and proper rainwater harvesting, taking into account the water-energy efficiency requirements • Knowledge of the operation of accessories and other parts of the rainwater harvesting system • Knowledge of the methods and/or techniques that can be applied ensure the proper operation of the rainwater harvesting system • Knowledge of the regulations and standards (local, national, international) applicable to rainwater harvesting systems **Skills:** • Ability to install the various rainwater storage and recycling systems • Ability to install the components of the storage system and carry out the excavations in compliance with health and safety regulations • Ability to carry out ordinary/extraordinary maintenance work • Ability to calculate the annual rainwater supply • Ability to analyse installation and maintenance costs **Competences:** • Good technical skills (for effective selection and installation of the most appropriate equipment for the rainwater harvesting) • Good organisational and planning skills • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-16 Water efficiency technician (WET), outdoor installations (E.1) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
E. Outdoor installations	LO E.1: Correct interpretation of outdoor landscape design and application of techniques to minimise water from irrigation runoff or overspray	1 hr	**Knowledge:** • Knowledge of the operational characteristics of the irrigation system components, considering water-energy efficiency requirements • Knowledge of the functioning of fittings and other parts of the irrigation system • Knowledge of the methods and/or techniques that may be applied to secure good performance of the irrigation system, considering water-energy efficiency requirements • Knowledge of the regulations and standards (local, national, international) applicable to irrigation systems **Skills:** • Ability to interpret the irrigation system project and dimensioning characteristics, considering water-energy efficiency requirements • Ability to establish the sequence of pipe installations, to limit obstructions and improve the piping network layout • Ability to provide an estimation of the work to be carried out for the system implementation **Competences:** • Good technical skills (for effective comprehension of the project layout) • Good organisational and planning skills (for effective implementation of the irrigation system) • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-4 Water efficiency technician (WET), outdoor installations (E.2) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
E. Outdoor installations	LO E.2: Correct selection, installation and maintenance of outdoor water use systems, including scheduling for optimal irrigation performance	2 hrs	**Knowledge:** • Knowledge of correctly selecting the adequate pipe material, in compliance with regulations and standards (local, national, international) applicable to irrigation system, considering water-energy efficiency requirements • Knowledge of correctly selecting the adequate equipment, soil materials and fittings that can be used for irrigation purposes, of the potential for minimization of evaporation losses **Skills:** • Ability to accurately implement the proposed irrigation project • Ability to correctly apply the most effective and suitable equipment and materials (including soil materials) for correct implementation of the system • Ability to efficiently check-out the irrigation system installation • Ability to deliver to the client an effective irrigation system (in line with the client needs and the necessary performance and environmental requests) **Competences:** • Good technical skills (for effective selection and installation of the most appropriate technologies/equipment for the irrigation system) • Good organisational and planning skills (for effective implementation of the irrigation system) • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-5 Water efficiency technician (WET), outdoor installations (E.3) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
E. Outdoor installations	LO E.3: Detection and repair of outdoor systems leaks	1 hr	**Knowledge:** • Knowledge of the available methods for the identification of the leakages in the irrigation system • Knowledge of the available methods for proper repair, replacement and maintenance of the irrigation system **Skills:** • Ability to evaluate the elements of the project for irrigation demand (e.g., adequacy between project and facility proposed components) • Ability to assess the water benefit / gain from the use of efficient irrigation systems • Ability to provide the clients with documented advice as a tool /guidance for them to decide on the most appropriate (for each case) technologies and/or equipment • Ability to identify and / or diagnose the possible leakage occurrence throughout the fixtures and / or the equipment of the irrigation installation and to fix the problem(s) • Ability to perform the regular repair/maintenance of the irrigation installations **Competences:** • Good technical skills (for checking out of installations for leakages and respective maintenance) • Good organisational and planning skills (for effective inspection and maintenance of the irrigation system) • Good and effective communication skills with the client (to communicate the benefits of a well-maintained irrigation system) and with co-workers • Responsibility and autonomy

Table 4-19 Water efficiency technician (WET), communication with the customers / consumers (G.1) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
F. Communication with the customers / consumers	LO F.1: Providing clear information and guidance to customers on the selection of effective equipment, appliances and fixtures	2 hrs	**Knowledge:** • Knowledge of the regulations and standards (local, national, international) applicable to all types of hydraulic systems, considering water-energy efficiency requirements, for guidance and supporting the customer/client • Knowledge to correctly propose the adequate materials, equipment, appliances and fixtures, in compliance with regulations and standards (local, national, international), considering water-energy efficiency requirements (in line with the client needs and the necessary performance and environmental requests) • Knowledge of the operational characteristics of the thermo-hydraulic system components, considering water-energy efficiency requirements, for guidance and supporting the customer/client • Knowledge of the procedures to make a diagnosis over the facility and assessment of consumer behaviour, to make recommendations to the customer/client, considering water-energy efficiency requirements (in line with the client needs and the necessary performance and environmental requests) • Knowledge of the cost-benefit of the different alternatives that can be proposed • Knowledge of current legislation and references to certification systems, particularly when compulsory **Skills:** • Ability to discuss with the customer and make recommendations, considering water-energy efficiency requirements (in line with the client needs and the necessary performance and environmental requests) • Ability to evaluate the matching between the facility characteristics and client demands, considering water-energy efficiency requirements • Ability to propose improvement options over the initial project and provide different alternatives, including cost-benefit analyses • Ability to inform about the advantages of water-energy efficient networks, including material/equipment/ appliances and fixtures, with the implementation of water-energy saving measures • Ability to provide information on water-energy retrofit options, including the cost-benefit analysis **Competences:** • Good and effective communication and proactiveness in the providing of feedback and presentation of cost-effective alternatives, considering water-energy efficiency requirements (in line with the client needs and the necessary performance and environmental requests) • Good communication, marketing and client support skills • Good and effective communication skills with the client for awareness-raising over the importance of investing in water-energy networks, including material/equipment/ appliances and fixtures • Responsibility, autonomy and flexibility for matching the

Table 4-20 Water efficiency technician (WET), communication with the customers / consumers (G.2) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
F. Communication with the customers / consumers	LO F.2: Providing guidance to consumers on the impact of consumer behaviour on water-energy savings	2 hrs	**Knowledge:** • Knowledge of the consumer behaviour relating to the purchasing of water-energy efficient and/or environmentally preferable goods • Knowledge of the consumer behaviour relating to the use of water and energy consuming appliances and equipment **Skills:** • Ability to understand and discuss with consumers about their real water-energy consumption needs • Ability to guide their consumers choices in regard to water-energy consuming equipment/appliances/ fixtures towards more efficient and/or preferable solutions from the environmental point of view (even if the cost is higher compared to the conventional ones) • Ability to provide tips and guidelines for an efficient, economical and safe use of the thermo-hydraulic installations **Competences:** • Good and effective communication during the reporting or planning of the identified occurrences and flow-up activities • Good communication, marketing and client support skills • Good and effective communication skills with the client for awareness-raising over the importance of investing in water-energy networks, including material/equipment/ appliances and fixtures • Responsibility, autonomy and flexibility for matching the client needs and the necessary performance and environmental requests

Water Efficiency Expert – WEE

Table 4-21 Water efficiency expert (WEE), design of water efficient buildings (A.1) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
A. Design of water efficient buildings	LO A.1: Evaluation of the needs and site conditions to design a water-energy efficient building system and to select its appropriate components	2 hrs	**Knowledge:** • Knowledge of how to evaluate the climate and site conditions necessary to the design (in terms of conception and sizing) of the water energy-efficient system (hydraulic, DHW, grey water, rainwater harvesting, irrigation systems) and the building load, based on the provided information • Knowledge of the applied methods and rationale for the designing/planning of water-energy efficient systems • Knowledge of how to identify and apply adequate sizing tools • Knowledge of life-cycle cost analysis approaches and of the most adequate valorisation strategies considering the environment and surrounding conditions • Knowledge of how to carry out a proper work and cost estimation • Knowledge of the application of circular economy principles in construction, and of the applicable regulations and standards (local, national, international) **Skills:** • Ability to evaluate the climate and site conditions, as well as the building loads (thermal and water demand) (also applying circular economy principles during construction) • Ability to implement methods for the design of the water energy-efficient system and interpret its related available manuals, considering the water-energy efficiency requirements and the environment conditions • Ability to execute life-cycle cost analysis considering the possible lowering impacts of manufacturing process, transportation, construction, use, maintenance, reuse or disposal, • Ability to dimension/size of the sequence of pipe installations and the corresponding components • Ability to provide work and cost estimation for the system implementation **Competences:** • Good technical and designing skills (for effective description of the project layout) • Good organisational and planning skills • Good and effective communication skills with the client and the workers • Responsibility and autonomy

Table 4-22 Water efficiency expert (WEE), design of water efficient buildings (A.2) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
A. Design of water efficient buildings	LO A.2: Selection of suitable components and materials, and description of their correct positioning in the circuit	2 hrs	**Knowledge:** • Knowledge of the technical characteristics / specifications and the correct positioning of the different elements in the water-energy efficient system • Knowledge of the functioning of fittings and other parts of the water-energy efficient system • Knowledge of the applied methods and rationale for the designing/planning of the water-energy efficient system • Knowledge of the regulations and standards (local, national, international) applicable to the water-energy efficient system (thermohydraulic, DHW, grey water, rainwater harvesting and irrigation systems) **Skills:** • Ability to identify the correct materials and components for the system, and interpret their related available manuals, considering water-energy efficiency requirements and the environmental conditions • Ability to describe materials and components functioning and place them correctly in the circuit • Ability to limit obstructions and improve the piping network layout, in respect of reducing pipes lengths • Ability to apply life-cycle considerations when selecting materials • Ability to provide an estimation of the work to be carried out for the installation of the suitable materials and components **Competences:** • Good technical skills (for effective description of the project layout) • Good organisational and planning skills • Good and effective communication skills with the client and workers • Responsibility and autonomy

Table 4-23 Water efficiency expert (WEE), design of water efficient buildings (A.3) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
A. Design of water efficient buildings	LO A.3: Control and monitoring equipment, positioning in the circuit and main operating parameters	1 hr	**Knowledge:** • Knowledge of the adequate control and monitoring equipment for the water-energy efficient systems (thermohydraulic, DHW, grey water, rainwater harvesting and irrigation systems) • Knowledge of the correct position in the circuit of the adequate control and monitoring equipment for the water-energy efficient systems • Knowledge of the functioning parameters of the adequate control and monitoring equipment for the water-energy efficient systems • Knowledge of the regulations and standards (local, national, international) applicable to the control and monitoring equipment of the water-energy efficient systems **Skills:** • Ability to identify the adequate control and monitoring equipment for the water-energy efficient system and interpret its related manuals, considering the water-energy efficiency requirements and environmental conditions (e.g. climate, orientation) • Ability to correctly position in the circuit of the adequate control and monitoring equipment • Ability to describe control and monitoring equipment functioning and position in the circuit of the water-energy efficient system • Ability to provide an estimation of the work to be carried out for the installation of the appropriate control and monitoring equipment **Competences:** • Good technical skills (for effective description of the adequate control and monitoring equipment) • Good organisational and planning skills • Good and effective communication skills with the client and workers • Responsibility and autonomy

Table 4-24 Water efficiency expert (WEE), design of water efficient buildings (A.4) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
A. Design of water efficient buildings	LO A.4: Considerations regarding maintenance and troubleshooting works most likely to occur in a water-energy system	1 hr	**Knowledge:** • Knowledge of the entire maintenance procedures (step-by-step) that the water-energy systems need to undergo • Knowledge of the different kinds (categories and subcategories) of a typical maintenance procedure • Knowledge of how to prepare and present a detailed maintenance plan of a water-energy system **Skills:** • Ability prepare a suitable maintenance plan for the water–energy efficient system each time under consideration • Ability to implement in practice the methods for proper maintenance, repair and replacement of the water-energy system components • Ability to provide an estimation of the work to be carried out for the system maintenance and troubleshooting throughout the building life-cycle **Competences:** • Good technical skills • Good organisational and planning skills • Good and effective communication skills with the client and workers • Responsibility and autonomy

Table 4-25 Water efficiency expert (WEE), design of water efficient buildings (A.5) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
A. Design of water efficient buildings	LO A.5: Designing of efficient systems for green areas and landscapes	2 hrs	**Knowledge:** • Knowledge of the general principles and considerations that need to be made for the development of the appropriate green areas and landscapes design and maintenance strategies • Knowledge of the most adequate green areas and landscapes considering efficiency criteria (e.g., autochtonous/native and low-water use plants) and the environment (e.g., irrigation programmes) and surrounding conditions (e.g., lower runoff) • Knowledge of the detailed green areas and landscapes design steps **Skills:** • Ability to correctly design and maintain building green areas and landscapes • Ability to apply water-energy efficiency techniques and/or methods in landscape design **Competences:** • Good technical skills • Good organisational and planning skills • Good and effective communication skills with the client and workers • Responsibility and autonomy

Table 4-26 Water efficiency expert (WEE), supervision during the construction, commissioning and operation of a project (B.1) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
B. Supervision during the construction, commissioning and operation of a project	LO B.1: Supervision process of the construction works for keeping up the contractual terms of performance	2 hrs	**Knowledge:** • Knowledge of the roles of the Site Supervisor (SS) and of the Qualified Person (QP) • Knowledge of the roles and responsibilities of the Contract Administrator (CA) • Knowledge of the various steps and phases of the supervision process • Knowledge of the regulations and standards applicable to a water-energy related project, before and after commissioning **Skills:** • Ability to efficiently implement the supervision of the works and undertake the roles of either the SS or the CA • Ability to monitor whether the selected components and tools meet the project requirements and do comply with building regulations **Competences:** • Good and effective communication • Ability to evaluate the matching between the facility characteristics and the project requirements • Responsibility, autonomy and flexibility for matching the client needs and the necessary performance and environmental requests

Table 4-27 Water efficiency expert (WEE), supervision during the construction, commissioning and operation of a project (B.2) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
B. Supervision during the construction, commissioning and operation of a project	LO B.2: Necessary tests and procedures to secure inspection and commissioning	1.5 hrs	**Knowledge:** • Knowledge of the tests and procedures to secure inspection and commissioning of a water-energy related system • Knowledge of the regulations and standards (local, national, international) applicable in the inspection and commissioning of water-energy related systems **Skills:** • Ability to perform the necessary tasks for the testing of the water-energy system in consideration • Ability to identify and describe the appropriate tools to secure proper inspection and commissioning of the water-energy system • Ability to efficiently check-out the water-energy system • Ability to provide an estimation of the work to be carried out for the system testing, inspection and commissioning **Competences:** • Good and effective communication • Ability to evaluate the matching between the facility characteristics and the project requirements • Responsibility, autonomy and flexibility for matching the client needs and the necessary performance and environmental requests

Table 4-28 Water efficiency expert (WEE), supervision during the construction, commissioning and operation of a project (B.3) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
B. Supervision during the construction, commissioning and operation of a project	LO B.3: Supervision and monitoring of operation (Operational Supervision)	0.5 hrs	**Knowledge:** • Knowledge of the "Condition Monitoring" principles • Knowledge of the "Condition Based Maintenance" principles **Skills:** • Ability to incorporate the "Condition Monitoring" and the "Condition Based Maintenance" procedures into the wider procedure of the operational supervision • Ability to focus on the advantages presented by the above-mentioned procedures for the entire lifecycle of the water-energy project **Competences:** • Good and effective communication • Ability to evaluate the matching between the facility characteristics and the project requirements • Responsibility, autonomy and flexibility for matching the client needs and the necessary performance and environmental requests

Table 4-29 Water efficiency expert (WEE), water measurements and water-energy nexus (C.1) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
C. Water measurements and Water-Energy Nexus	LO C.1: Collection, verification and analysis procedure definition for field data related to water-energy use	1 hr	**Knowledge:** • Knowledge of the principles of the procedures for definition of the collection, verification and analysis of field data related to water-energy use • Knowledge of the methods for the identification of the necessary data inputs for studying water-energy profiles with respect to different parameters **Skills:** • Ability to identify the necessary data inputs for studying water-energy profiles • Ability to elaborate fact sheets for the collection of real data • Ability to make the verification of field data related to water-energy use • Ability to identify the water-energy performance indicators based on field data **Competences:** • Good technical skills • Good organisational and planning skills • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-30 Water efficiency expert (WEE), water measurements and water-energy nexus (C.2) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
C. Water measurements and Water-Energy Nexus	LO C.2: Determination of baselines for water-energy use or demand assessment	1 hr	**Knowledge:** • Knowledge of the methods for determining a consumption baseline for water-energy use or demand assessment • Knowledge to identify the valid variables for baselining • Knowledge to define the procedures for comparison of field data **Skills:** • Ability to quantify the water and energy consumption profiles • Ability to identify the water-energy baseline based on field data • Ability to make the comparison of water and energy use requirements with the reference values of building regulations **Competences:** • Good technical skills • Good organisational and planning skills • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-31 Water efficiency expert (WEE), water measurements and water-energy nexus (C.3) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
C. Water measurements and Water-Energy Nexus	LO C.3: Identification and prioritization of water-energy saving measures	2 hrs	**Knowledge:** • Knowledge of the procedures for the assessment of field data derived from water-energy balances necessary in buildings • Knowledge of good practices in water-energy monitoring/ auditing • Knowledge of how to develop baselines and use them to assess the real water and energy savings obtained with the project • Knowledge of the cost-benefit analysis and impacts of water-energy saving measures. **Skills:** • Ability to assess field data derived from water-energy balances for buildings • Ability to recognise the basic characteristics and savings derived from the application of 'alternative' water-energy saving measures • Ability to figure out the cost-benefits and other impacts of alternative water-energy saving measures • Ability to figure out the ways to monitor and verify the positive effect of alternative water-energy saving measures • Ability to prioritize water-energy saving measures **Competences:** • Good technical skills • Good organisational and planning skills • Good and effective communication skills with the client and co-workers • Responsibility and autonomy

Table 4-32 Water efficiency expert (WEE), communication with clients/customers (D.1) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
D. Communication with clients/customers	LO D.1: Auditing, diagnosis and definition of consumption baseline, benchmarking and identification of water-energy saving potentials	2 hrs	**Knowledge:** • Knowledge of the key steps for planning an audit or visit to a household • Knowledge of how to conduct the diagnosis of a water-energy system • Knowledge of how to identify the consumption baseline for assessing household water system performance • Knowledge of current legislation and references to certification systems, particularly when compulsory **Skills:** • Ability to identify the main steps towards the execution of an audit plan or diagnosis to buildings / households • Ability to select instrumentation for measuring and monitoring water and energy demand • Ability to implement an audit plan **Competences:** • Good and effective communication and proactiveness in providing feedback on and presenting of cost-effective alternatives, considering water-energy efficiency requirements • Good communication, marketing and client support skills • Good and effective communication skills with the client for awareness-raising over the importance of investing in water-energy systems • Responsibility, autonomy and flexibility for matching the

Table 4-33 Water efficiency expert (WEE), communication with clients/customers (D.2) KSC

Module (areas of competence)	Training units		KSC
	Learning Outcomes	Duration	
D. Communication with clients/ customers	LO D.2: Identification of water-energy efficiency measures and equipment to attain water-energy saving potentials and formulation of a documented proposal to the customer/consumer	1 hr	**Knowledge:** • Knowledge of water and energy saving measures to be implemented prior to the construction (project stage) or during the building / household usage • Knowledge of the above-mentioned saving measures' results in financial and comfort dimensions **Skills:** • Ability to make the recognition of the saving potential with basis on a diagnosis • Ability to identify efficiency measures to improve performance and resiliency of a building/household • Ability to formulate a documented proposal with the technical specifications to the customer / consumer **Competences:** • Good and effective communication and proactivness in providing feedback on and presenting of cost-effective alternatives, considering water-energy efficiency requirements • Good communication, marketing and client support skills • Good and effective communication skills with the client for awereness-raising over the importance of investing in water-energy systems • Responsibility, autonomy and flexibility for matching the client needs and the necessary performance and environmental request

Table 4-34 Water efficiency expert (WEE), communication with clients/customers (D.3) KSC

Module (areas of competence)	Training units		KSCs
	Learning Outcomes	Duration	
D. Communication with clients/customers	LO D.3: Promotion of best practices for the correct use and maintenance of water-energy efficiency systems	1 hr	**Knowledge:** • Knowledge of the necessary actions that need to be undertaken in the verification process and with the implementation of water-energy efficiency measures • Knowledge of the verification criteria to guarantee of system well-functioning • Knowledge of the key steps to perform the necessary measurements and make the identification of the consumption baseline **Skills:** • Ability to identify the main actions in the implementation of water-energy efficiency measures • Ability to communicate criteria to guarantee regular functioning of the system **Competences:** • Good and effective communication and proactiveness in providing feedback on and presenting of cost-effective alternatives, considering water-energy efficiency requirements • Good communication, marketing and client support skills • Good and effective communication skills with the client for awareness-raising over the importance of investing in water-energy systems • Responsibility, autonomy and flexibility for matching the client needs and the necessary performance and environmental request

4.2 Training courses background

The identified KSC scheme requirements will form the background for the development of appropriate training courses as well as materials and tools, considering the previously WET and WEE profiles.

The graduate profile of the water efficiency technician (WET, EQF4) may be the undergraduate professional with the technical-scientific background required for the work functions related with sanitation and plumbing installation; heating, cooling and hot water installations and renewable energy systems; and outdoor (garden, green roofs, vertical gardens and living walls), considering water efficiency techniques and water saving objectives.

The graduate profile of the water efficiency expert (WEE, EQF6) may be the bachelor professional with the technical-scientific background required for the work functions related with simple building project design: sanitation and plumbing facilities; heating, cooling and hot water installations and renewable energy systems; outdoor (garden, green roofs, vertical gardens and living walls); building thermal envelope, considering water efficiency techniques and water saving objectives. Whenever appropriate, installations and verification experience for the WEE profile may be required.

5 Final considerations

In this second report of the WATTer Skills project, the training and qualification/certification scheme requirements were identified, in the context of the EQF provisions and each country qualification circumstances. The learning outcomes (KSCs) have been aligned with the IO1 in order to form the background for the development of the appropriate and detailed training courses to the WET and WEE profiles, including supporting materials and tools (subject to the Intellectual Output III – IO3).

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