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

IO3. Training Courses Curricula and contents (per Learning Unit)

Training Courses Curricula and Contents (per Learning Unit)

REPORT

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Partnership:

- Agência para a Energia – ADENE (Portugal)
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- Ente per la Formazione e l'addestramento professionale nell'edilizia – FORMEDIL (Italy)
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This IO3 report is accompanied by the supplementary documents: WET handbook (proposal of training contents) and WEE handbook (proposal of training contents).

Contents

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
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 Project aims at providing a tool that promotes transparent curricula and training for the development of sustainable and sound practices for water-energy 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 use. Thereby, the Vocational and Educational Training institutions will have the necessary tools to enhance the skills set as required in the various disciplines and workplaces to workers within the water efficiency field.

This document refers to the third step of the project - the Intellectual Output III (IO3), whose objectives are the development of training courses curricula and contents. More specifically, the Intellectual Output IO3 consists of the following main tasks:

- Formulation of the training course structure and curricula, according to the definition of the scheme requirements (illustration of knowledge-skills-competences, i.e. KSC, describing what the learner will know and be able to do, regardless of the system under which a particular qualification is awarded).
- Development, validation and implementation of the training contents, including the production of the tools and media resources needed for providing online training modules and dissemination of training contents.
- Development of classroom training manuals for trainers and trainees (2 handbooks and supported training materials).
- Trial and assessment of the training contents produced by experts and target groups in order to get them validated from different points of view, as well as to achieve a sound market recognition (7 pilot events).

In the present report, the structure of the training courses for the Water Efficiency Technician (WET) and the Water Efficiency Expert (WEE) as well as the corresponding curricula and the detailed topics / thematic of the training are presented, according to the learning outcomes and the KSC (knowledge – skills – competences) defined in the previous intellectual outputs.

3 Formulation of training courses curricula and contents

To better support the transfer and recognition of assessed learning outcomes, the suggested Training Curricula also follows the technical components of the European Credit System for Vocational Education and Training - ECVET. Within this framework, the definition of VET learning outcomes is organized as the required knowledge, skills and competences and it is structured into specific 'Knowledge–Skills-Competences' (KSC) units. Each of these Learning Units can be subject to evaluation and autonomous validation, which facilitates incorporation into existing national qualification frameworks within the partners' countries.

Furthermore, the ECVET approach promotes the assignment of credit points to the professional profile of water efficiency technicians (WETs) and water efficiency experts (WEEs), thus enhancing the compatibility between the different vocational education and training (VET) national systems. This will make it easier for professionals working in the water efficiency sector to obtain the validation and recognition of work-related skills and acquired knowledge independently of the learning context in which they have been developed.

It is important to point out that the curricula of the WATTer Skills professional profiles need to be developed based on the activities and job requirements analysis and related KSC system (IO1 and IO2 of the project), considering the relevant national qualification frameworks and repertories of each partner country (Portugal, Italy, Spain and Greece). In IO1, two categories of water efficiency professionals have been defined, with competences mainly related to water efficiency measures and not directly driven by energy efficiency targets.

3.1 Sequencing and distribution of professional training modules

3.1.1 Introduction

When designing a training course, the starting point - if, of course, the learning outcomes are already known and established - is the definition of the overall learning time needed to fulfil its learning objectives. In the overall learning time the direct contact (teaching) hours, the time allocated for hands-on practice, the hours spent on self-studying and those requested for the assessment of trainees are included.

For completeness purposes, and according to the prevailing terminology, it is clarified that:

- Contact hours refer to theoretical (non-practical) hours of learning conducted either in classroom or through e-learning with (supervised) tutoring. In the case of live tele-conferencing contact sessions, in case they are conducted in school setting and supervised, then they are considered as part of the contact hours.
- Self-study hours refer to the study of something by oneself without direct supervision or attendance in a class. In case of site visits, if not supervised, they are considered as self-study.
- Hands-on hours refer to practical sessions, which can also be supervised. In case of site visits, if supervised, they are considered as hands-on practice.
- Assessment hours refer to the time considered necessary for examining the trainees on the knowledge and skills acquired through the training process. They further include the time needed to prepare the assignment (e.g. if a student has to spend 6 hours reading a book in order to be able to work on an assignment, those 6 hours should be included). In the case of an exam, only the time allocated to the exam (for example 2 hours) should be indicated.

3.1.2 Water Efficiency Technician - WET

The suggested curriculum for the WET consists of a total of six (6) Modules, each one of which consisted in their turn by 2 to 6 learning Units (2 for Modules 3, 4 and 6, 3 for Module 5, 5 for Module 2, and 6 for Module 1), with

an overall learning time of **100 hours of learning**. As is presented in the below aggregate table, out of the total time of those 100 learning hours, the 40 of them will be spent for the so-called 'contact hours', i.e. the hours during which in-classroom or other type of training (e.g. e-learning) will be provided, 20 hours are foreseen for hands-on training (practicing), i.e. for the practical part of the training (e.g. in special shaped and equipped laboratories or on-site), and 5 for the assessment / examination purposes (Table 3-1).

Table 3-1 – Water efficiency technician – modules and training structure.

Hours	Contact	Hands-on	Self-study	Assessment	TOTAL
Module 1: Hydraulic installations and losses	12	6	11	1	30
Module 2: Domestic hot water (DHW) systems	8	4	7	1	20
Module 3: Grey water reuse	6	3	5	1	15
Module 4: Rainwater harvesting	6	3	5	1	15
Module 5: Outdoor installations	4	2	3	1	10
Module 6: Communication with customers / consumers	4	2	4	0	10
TOTAL:	**40**	**20**	**35**	**5**	**100**

3.1.3 Water Efficiency Expert - WEE

The suggested curriculum for the 'Water Efficiency Expert' (WEE) consists of a total of four (4) Modules, each of them consisted by 3 to 6 learning Units (6 for Module 1, 4 for Module 3, and 3 for Modules 2 and 4), with an overall learning time of **50 hours of learning**. As is shown in the following aggregate table, out of the total time of the 50 learning hours allocated, the 20 of them will be the so-called 'contact hours', i.e. the hours during which in-classroom (face-to-face) of training or any other way of 'supervised' training (e.g. e-learning) will be provided, while the assessment / examination of the participants in the course(s) will last for 3 hours.

Table 3-2 - Water efficiency expert – modules and training structure.

Hours	Contact	Hands-on	Self-study	Assessment	TOTAL
Module 1: Design of water efficient buildings	8	4	7	1	20
Module 2: Supervision during the construction, commissioning and operation of a project	4	2	3	1	10
Module 3: Water measurements and water-energy nexus	4	2	3	1	10
Module 4: Communication with customers	4	2	4	0	10
TOTAL:	**20**	**10**	**17**	**3**	**50**

3.2 ECVET equivalence

As regards the already mentioned "assignment of credit points (ECVET)", and following the ECVET Recommendation[1] to enable a common approach for the use of ECVET points for a given qualification in the EU, the allocation of ECVET points should be made as follows:

- Allocation of ECVET points to a qualification is based on using a convention according to which **60 points** are allocated to the learning outcomes expected to be achieved in **one year of formal full time VET**.
- It is up to the competent institutions in charge of designing qualifications to decide which specific programme will be chosen as a **point of reference** (e.g. the initial VET or the most common programme).
- The duration of the selected reference programme, together with the ECVET convention on ECVET points (60 points for 1 year), will give the number of ECVET points allocated to the qualification.

In this sense, and taking into account the widely accepted approach of **1 ECVET point (credit) = 25 hours of total learning**, which corresponds to an average of 1,500 hours for 1 year full VET (as applied, for example, in the Erasmus programme in the case of mobility of workers, being also consistent with the European Credit Transfer and Accumulation System - ECTS model), the "WATER EFFICICNECY TECHNICIAN" Curriculum can be considered as foreseeing the allocation of **4 ECVET credits**, while the "WATER EFFICIENCY EXPERT" Curriculum can be considered as foreseeing the allocation of **2 ECVET credit points**. However, this is only indicative, as firstly the training program to be used as a reference should be decided, while the distribution of learning hours may need to be revised according to the national needs as well as the organizational frameworks of mentors, trainers, teachers and counsellors involved in the sector.

[1] Recommendation of the European Parliament and of the Council of 18 June 2009 on the establishment of a European Credit System for Vocational Education and Training (ECVET) (2009/C 155/02)

4 Development of training and programmatic contents

Following the proposal of the skills maps and that of the learning outcomes elaborated in IO1 and IO2, IO3 includes the formulation of the training contents structure and curricula for the water efficiency profile (WET Course) and the water efficiency expert (WEE Course). A proposal of the handbooks produced by the partnership for the WET and WEE profiles, respectively, are presented in separate documents.

4.1 WET Course

Module 1: Hydraulic installations and losses

LEARNING UNITS

Unit 1: Effective implementation of the thermo-hydraulic installations design

Unit 2: Correct selection and installation of piping materials and components

Unit 3: Correct selection and installation of water-energy efficient appliances and fixtures

Unit 4: Installation and management of smart-meters and other water consumption monitoring equipment

Unit 5: Hydraulic adjustment and balancing of thermo-hydraulic installations

Unit 6: Indoor leakage identification & control and periodic cleaning of hydraulic installations

Unit 1. Effective implementation of the thermo-hydraulic installations design

GENERAL DESCRIPTION

In the 1st Unit of Module 1 the principles for an effective implementation of the thermo-hydraulic installations design for adequate performance will be presented to the trainees in order to acquire the necessary knowledge of the operational characteristics of thermo-hydraulic system components, of the functioning of fittings and other parts of the thermo-hydraulic system, of the methods and/or techniques that may be applied to secure good performance of the thermo-hydraulic system, and of the regulations and standards (local, national, international) applicable to thermo-hydraulic systems, considering water-energy efficiency requirements. This way, the trainees will enhance their abilities to interpret the thermo-hydraulic system project (and related available manuals) and dimensioning characteristics, to establish the sequence of pipe installations and the corresponding components, to limit obstructions and improve the piping network layout, e.g. in respect to reduce pipes lengths, as well as to provide an estimation of the work to be carried out for the system implementation.

OUTLINE OF UNIT CONTENTS

Contents	Description
Basic calculations for verifying the water network requirements of the facility in study	• Determination of the demand for domestic hot water (DHW) • Estimation of losses of heating/cooling water distribution networks
Basic stages of an efficient hydraulic installation	• Determination of the water flow rate at each branch • Calculation of pressure losses • Selection of the appropriate piping

Legal requirements for achieving water-energy efficiency	• Requirements for water-energy efficient thermo-hydraulic systems • Existing regulations related to the efficient use of water in thermo-hydraulic systems

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 2. Correct selection and installation of piping materials and components

GENERAL DESCRIPTION

In the 2nd Unit of Module 1 the principles for the correct selection and installation of piping materials and components will be showcased to the trainees in order to improve their knowledge of selecting the appropriate pipe material, in compliance with the regulations and standards (local, national, international) applicable to thermo-hydraulic systems, of the potential for minimization of thermal losses through the piping system, and of selecting the adequate insulating materials that can be used for thermal insulation purposes. The participants to the training will thus enhance their abilities to accurately implement the thermo-hydraulic project proposed, to correctly apply the most effective and suitable equipment and materials for correct implementation of the system (including thermal insulation), to efficiently implement the thermal-hydraulic system installation, and to deliver to the client an effective thermo-hydraulic system (in line with the client needs and the necessary performance and environmental requests).

OUTLINE OF UNIT CONTENTS

Contents	Description
Selection of the appropriate materials for pipes and fittings	• Piping materials and their applications • Internal volume of various water distribution pipes and delivery time of hot water to a tap depending on the type of pipe
Selection of the appropriate pipe diameters	• Limitations in speed and water pressure drop per pipe length • Iterative procedure for the proper selection of pipes nominal diameter, according to pipes materials (through graphs and tables)
Selection of circulation pump	• Main features of a circulation pump selection. • How to perform the calculations (what to watch out for)
Selection of thermal insulation materials and dimensions	• How to estimate the effectiveness of the insulation (by the R value - thermal resistance).

	• Minimum insulation thickness (determined by the diameter of the pipe and the insulation material) • Installation of insulation materials according to their type.
Tests for verification of system functioning and for leaks	• Tests necessary for the verification of system functioning and how to do them. • Pressure test for leaks and how to carry out it.

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 3. Correct selection and installation of water-energy efficient appliances and fixtures

GENERAL DESCRIPTION

In the 3rd Unit of Module 1 the principles of the correct selection and installation processes of water-energy efficient appliances and fixtures will be presented to the participants in the training in order to enhance their knowledge of correctly interpreting the proposed project selecting the adequate appliances and fixtures, in compliance with regulations and standards (local, national, international), of correctly placing all components, appliances and fixtures, in accordance with the proposed project, as well as of performing all required tests to secure the correct functioning of the installed appliances and fixtures. This way, the trainees will enhance their abilities to recognize the benefits of efficient appliances and fixtures versus the conventional / traditional ones, 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), to accurately implement the appliances and fixtures, to correctly apply the most effective and suitable techniques and methods for the proper installation of the appliances and fixtures, and 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).

OUTLINE OF UNIT CONTENTS

Contents	Description
Available hydraulic equipment (fixtures and other final receptacles of water)	• Water-saving shower systems and devices / appliances • Water-saving faucets • Water saving toilets
Household electrical appliances	• Washing machines, dishwashers • Ecolabel, Energy labels, etc.

Heating terminal units	• Radiators • Fan coils • Under-floor heating and other integrated heating systems

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 4. Installation and management of smart-meters and other water consumption monitoring equipment

GENERAL DESCRIPTION

The 4th Unit of Module 1 deals with the principles of installation and management of smart-meters and water consumption monitoring equipment, in order for the trainees to acquire the necessary knowledge of correctly selecting the adequate smart-meter and water monitoring equipment, including the adequate fittings, in compliance with the regulations and standards (local, national, international) applicable to thermo-hydraulic systems, of the basic characteristics of the appropriate monitoring equipment and control devices, e.g. for minimisation of water losses, of the benefits from monitoring water consumption in buildings, including the prevention of water losses, and of the regulations and standards (local, national, international) applicable to the monitoring of water consumption. The trainees will thus enhance their abilities to select the suitable water consumption monitoring equipment and control devices, to properly and correctly install the water consumption monitoring equipment and control devices, and to manage the outputs of smart-meters and control devices (water monitoring equipment).

OUTLINE OF UNIT CONTENTS

Contents	Description
Water metering / smart-metering	• General principles, necessity and benefits • Current practices
Water flow metering devices	• Typical flow meters and how they work • Smart water meters as an integral part of an automated water supply system (AMI) • Correct positioning in the piping network of the proposed metering devices • Correct interpretation of the measured values

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 5. Hydraulic adjustment and balancing of thermo-hydraulic installations

GENERAL DESCRIPTION

In the 5th Unit of Module 1 the trainees will be taught the principles of hydraulic adjustment and balancing of thermo-hydraulic installations works trying to increase their knowledge on the principles of fluid dynamics in pipes, on the possible measures and/or corrective actions for assessing hydraulic imbalances in the thermal-hydraulic system (e.g. pressure drops), as well as on the critical settings that must be met when performing the hydraulic adjustment (specifically to water pressure). This way, the trainees will enhance their abilities to choose the appropriate tools to secure the proper adjustment of the thermo-hydraulic system, to perform the necessary tasks for the hydraulic adjustment and balancing of the thermo-hydraulic system, and to efficiently check-out the thermal-hydraulic system installation.

OUTLINE OF UNIT CONTENTS

Contents	Description
Basics of hydraulic adjustment and balancing	• Necessity of balancing hydraulic networks • Hydraulic adjustment and balancing methods / techniques
Dynamic balancing for dynamic networks	• Meaning of dynamic balancing of a hydraulic network • How the dynamic balancing of a hydraulic network is made
Control of the operation pressure	• Benefits of controlling the inflow water pressure • Controlling the operation pressure in hydraulic networks

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 6. Indoor leakage identification & control and periodic cleaning of hydraulic installations

GENERAL DESCRIPTION

In the 6th Unit of Module 1 of the WET course, the basics of indoor leakage identification & control and periodic cleaning of hydraulic installations will be showcased to the trainees in order to enhance their knowledge of the procedures for the identification of the leakages in the thermal-hydraulic system, and of the procedures for proper repair, replacement and maintenance of the thermal-hydraulic system. This way, the participants will enhance their abilities to identify and / or diagnose the possible leakage occurrence throughout the fixtures and/or other equipment of the hydraulic installation and to fix the problem(s), and to perform the regular maintenance and repair works of the hydraulic installations.

OUTLINE OF UNIT CONTENTS

Contents	Description
System diagnosis for leak assessment	• Lifetime of main components and identification of those that are more susceptible to leakage • Tests, measurements, and fault-finding techniques and tools
Periodic cleaning of hydraulic installations	• Methods for cleaning a central heating system • Inspection and cleaning of pipes/water lines • Cleaning of under-floor heating systems

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Module 2: Domestic hot water (DHW) systems

LEARNING UNITS

Unit 1: Correct and effective interpretation of DHW project designs and layouts

Unit 2: Correct selection of efficient technologies and/or equipment for DHW production

Unit 3: Basic concepts and pre-installation checks for DHW systems (focus on SWH)

Unit 4: Installing solar water heating (SWH) systems

Unit 5: Routine service, fault diagnosis and repair work of DHW systems (focus on SWH)

Unit 1. Correct and effective interpretation of project designs and layouts

GENERAL DESCRIPTION

In the 1st Unit of Module 2 the trainees will be taught on how to correctly and effectively interpret the project designs and layouts for domestic hot water (DHW) systems, enhancing their knowledge of the general principles and the basic operational characteristics of the DHW system components, and of the basic layouts of efficient hot water distribution installations. This way, the trainees will enhance their abilities to correctly differentiate the basic characteristics of a hot water system, as well as to interpret main parts of a project and correctly read schematic system layouts.

OUTLINE OF UNIT CONTENTS

Contents	Description
General principles and basic characteristics	• Reading of the proposed project's entire layout • List of checks that need to be made • Basic calculations needed for checking the dimensioning of a DHW supply system • Basic components of a DHW system and their positioning in the circuit
Basic layouts of efficient hot water installations	• Solar thermal system types for domestic hot water (DHW) • System main components • Schematic representations of solar thermal hot water systems layouts

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 2. Correct selection of efficient technologies and/or equipment for DHW production

GENERAL DESCRIPTION

In the 2nd Unit of Module 2 the main considerations for the correct selection of efficient technologies and/or equipment for DHW production will be provided to the trainees in order to improve their knowledge of the principles of correct selection and installation of efficient technologies and/or equipment for DHW production, and the determination of the energy savings resulting from the use of alternative/efficient water heaters. This way, the trainees will enhance their abilities to correctly differentiate the basic characteristics of a hot water generator, and to correctly select a storage and buffer tank.

OUTLINE OF UNIT CONTENTS

Contents	Description
Efficient technologies and/or equipment for DHW production	• Basic types, characteristics and dimensioning aspects of hot water generators • Basic types, characteristics & dimensioning aspects of storage tanks • Basic types, characteristics & dimensioning aspects of buffer tanks • Basic types, characteristics & dimensioning aspects of expansion tanks
Energy savings resulting from the use of alternative/efficient water heaters	• Solar thermal energy • Biomass source of energy • Ground source heat pump as an alternative energy source

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 3. Basic concepts and pre-installation checks for DHW systems (focus on SWH)

GENERAL DESCRIPTION

In the 3rd Unit of Module 2 the pre-installation checks that need to be made for the installation of DHW systems (with focus on SWH systems) will be showcased to the trainees in order to improve their knowledge of the criteria regarding the suitability of a site for the installation of DHW systems, of the way to carry out the necessary pre-installation checks, of the requirements of relevant regulations / standards relating to the installation activities for DHW systems, as well as of the applicable regulations to guarantee secure work environment, focusing on

SWH systems. This way, the trainees will enhance their abilities to recognize the basic concepts of pre-installation checks for the installation of DHW systems and will also develop the capacity to perform pre-installations checks.

OUTLINE OF UNIT CONTENTS

Contents	Description
Basic concepts	• Suitability of the proposed location • System type and components
Pre-installations checks	• Site survey before system installation and corresponding checks • Other related checks (authorizations, availability of access to work areas, suitability of the building structure / fabric, etc.)

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 4. Installing solar water heating (SWH) systems

GENERAL DESCRIPTION

In the 4th Unit of Module 2 the participants in the training will be able to improve their knowledge of correctly selecting the adequate SWH system components, including the adequate fittings, in compliance with the regulations and standards (local, national and/or international) applicable to solar thermal systems. This way, the trainees will enhance their abilities to install, pressurize and commission a small size, forced circulation solar thermal system.

OUTLINE OF UNIT CONTENTS

Contents	Description
Installing solar thermal collectors	• Study the safety regulations (including personal access and working at heights) • Evaluate the transport equipment and techniques • Setting up of the site (preparatory works) • Listing the main tools • Defining the exact work steps
Solar loop and piping using press-connect joints	• Selecting the joining technology for the piping circuit • Listing the main tools required • Defining the exact work steps

Installing solar pump station	• Listing the main tools required • Necessary preparations for the work • Defining the exact work steps
Pressurising solar thermal system loop	• Listing the main tools required • Defining the exact work steps

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 5. Routine service, fault diagnosis and repair work of DHW systems (focus on SWH systems)

GENERAL DESCRIPTION

In the 5th Unit of Module 2 the participants will improve their knowledge on how to undertake the routine service, the fault diagnosis and the repair work of water heater systems, including solar thermal based systems. This way, the trainees will enhance their abilities to carry out fault diagnosis of solar thermal systems, to plan routine maintenance work in solar thermal systems, to make a distinction between planned and unplanned maintenance, to describe the routine service and maintenance procedures, and to carry out repair work for solar thermal systems.

OUTLINE OF UNIT CONTENTS

Contents	Description
Requirements for the routine service and maintenance of basic domestic hot water systems	• Collecting technical details of the existing system • Obtaining information on previous maintenance work carried out on the system and on all component replacement that was performed • Applicable Health & Safety procedures during the execution of the work activities • Gathering the adequate equipment to allow for the performance of the tasks • Detailed planning of the maintenance work to be carried out and assembling of adequate tools to be used
Diagnose and fault rectification work on basic domestic hot water systems	• Obtaining the relevant information required to enable the fault diagnosis and rectification work

	• Deciding whether the work to be carried out is preventive, corrective maintenance, or component replacement • Creating a list of components that are most likely to fail • Setting the steps for the preliminary diagnosis of DHW systems • Reporting of all relevant data on the referred items in a logbook

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Module 3: Grey water reuse

LEARNING UNITS

Unit 1: Customised method and equipment selection for the reuse of collected grey water

Unit 2: Installation, commissioning and maintenance of grey water recycling systems

Unit 1. Customised method and equipment selection for the reuse of collected grey water

GENERAL DESCRIPTION

In the 1st Unit of Module 3 the principles of performing the customised selection of the method and components for the reuse of the collected grey water will be presented to the trainees in order to improve their knowledge of the operational characteristics of grey water system components, the functioning of fittings and other parts of the grey water system, as well as the methods and/or techniques that can be applied to ensure the proper functioning of the grey water system. This way, the trainees will enhance their abilities to apply the principles and different systems of grey water treatment, to apply techniques for collecting and using grey water, to recognize the components that make up a grey water treatment and storage system, to dimension a collection system including the storage tank according to the needs of the applicant, as well as to analyse installation and maintenance costs.

OUTLINE OF UNIT CONTENTS

Contents	Description
Grey waters and their main characteristics	• Types of grey waters • Current legislation and references to certification systems, particularly when compulsory

	• Definitions and eligible uses
Wastewater treatment and use	• Aspects that should be considered when designing a wastewater reuse system • Types of water collection and reuse systems • Grey water for irrigation • Household grey water
Grey water recycling	• Structure of the greywater recovery plant • Examples of complete greywater recycling systems
Collection of grey water	• Ultrafiltration systems (system components, treatment phases) • Installations with ozone disinfection (system components, treatment phases)
Storage of grey water	• Positioning of wastewater storage tanks • Materials used for the construction of the tanks
Distribution of grey water	• Equipment to be used according to the possible uses of the treated water
Treatment of grey water	• Grey water treatment with natural solutions • Grey water treatment with compact technical solutions
System components	• Hair traps and pre-filter, in-line filter, membrane filter • Air pump • Floating extraction point • System pump and pump control unit • Float switch • Pressure vessel • System Control Unit • System Module • Back-up air gap power supply type AA with solenoid control • Overcharge valve
System sizing	• Example of system sizing for a typical household application • Cost analysis of grey water recovery plants

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 2. Installation, commissioning and maintenance of grey water recycling systems

GENERAL DESCRIPTION

In the 2nd Unit of Module 3 the trainees will improve their knowledge of the principles of installation, commissioning and proper maintenance of grey water recycling systems, taking into account the water-energy efficiency requirements and the regulations and standards (local, national, international) applicable to grey water recycling systems. This way, the trainees will enhance their abilities to install the various grey water storage and recycling systems, to install the components of the storage system and carry out the excavations in compliance with health and safety regulations, as well as to carry out ordinary and extraordinary maintenance work.

OUTLINE OF UNIT CONTENTS

Contents	Description
Considerations for installing underground storage tanks	• Manufacturer's instructions • Ground strength and stability • Ground water levels • Proximity of trees • Proximity to utilities • Proximity to foundations • Shading and temperatures • Access routes
Methods of handling, laying and use of underground tanks	• Preliminary work • Preparation of excavation and bedding • Positioning of the tank and anchoring • Positioning of lifting tanks • Excavation and backfilling of soil • Restoration of excavation, pedestrianization and driveability
Positioning of communicating tanks	• Positioning the tanks • Connections
Requirements for pre-testing and commissioning	• Collection of pipework test requirements • Requirements and procedure for transverse connection tests • Start-up requirements • Requirements for registration of the start-up • System delivery requirements
System maintenance	• Routine/programmed maintenance • Extraordinary maintenance • Analysis of maintenance costs

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Module 4: Rainwater harvesting

LEARNING UNITS

Unit 1: Customized method and components selection for efficient rainwater storage and treatment

Unit 2: Installation, commissioning and proper maintenance of rainwater harvesting systems

Unit 1. Customized method and components selection for efficient rainwater storage and treatment

GENERAL DESCRIPTION

In the 1st Unit of Module 4 the trainees will improve their knowledge of the principles on how to make a personalised selection of the method and components for efficient rainwater storage and treatment, taking into account the rules and standards (local, national, international) applicable to rainwater harvesting systems. This way, the trainees will enhance their abilities to apply the principles and different rainwater treatment systems, to apply techniques for the collection and use of rainwater, to recognise the components that make up a rainwater treatment and storage system, and to dimension a collection system including a storage tank according to the place of installation and the needs of the client.

OUTLINE OF UNIT CONTENTS

Contents	Description
Basic concepts of rainwater collection and reuse systems	• Existing regulations and references to certification systems, particularly when compulsory • Eligible use and quality requirements • Types of rainwater collection and reuse systems
Principles of rainwater recycling	• Rainwater recovery for outdoor use • Rainwater recovery for external and domestic non-potable uses • Rainwater recovery for outdoor and domestic water and sanitation uses • Rainwater recovery for outdoor and domestic use, water and sanitation and drinking water
Rainwater collection	• Characteristics of the collection areas • Types of diverters • Filtering of the rainwater
Storage	• Positioning of rainwater storage tanks • Connection of a rainwater storage tank • Materials used for the construction of the tanks
Distribution	• Equipment to be used according to the possible uses of the stored water

Treatment	• Filtration process • Disinfection process
System components overview	• Inlet filter • Calmed inlet • Overflow siphon • Floating extraction point • Anti-surcharge valve • System pump and pump control unit • Float switch • Expansion vessel • Water level gauge • Solenoid controlled Type AA air gap back-up supply • System module • Desander
First Rain Basins	• Continuous First Rain System • Discontinuous First Rain System
System sizing	• Estimating the amount of water that can be obtained according to the available collection surfaces • Estimating the volume required to store the collected water

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 2. Installation, commissioning and proper maintenance of rainwater harvesting systems

GENERAL DESCRIPTION

In the 2nd Unit of Module 4 the techniques applied for the installation, commissioning and proper maintenance of rainwater harvesting systems will be showcased to trainees in order to improve their knowledge of the operation of accessories and other parts of the rainwater harvesting system, the methods and/or techniques that can be applied to ensure the proper operation of the rainwater harvesting system, as well as the rules and standards (local, national, international) applicable to rainwater harvesting systems. Thus, the trainees will enhance their abilities to install the various rainwater storage and recycling systems, to install the components of the storage system and carry out the excavations in compliance with health and safety regulations, to carry out ordinary and extraordinary maintenance work, and to analyse maintenance costs.

OUTLINE OF UNIT CONTENTS

Contents	Description
Considerations for installing underground storage tanks	• Manufacturer's instructions • Ground strength and stability • Ground water levels • Proximity of trees • Proximity to utilities • Proximity to foundations • Shading and temperatures • Access routes.
Methods of handling, laying and use of underground tanks	• Preliminary work • Preparation of excavation and bedding • Positioning the tank and anchoring • Positioning of lifting tanks • Hydraulic and electrical connections • Excavation and backfilling of soil • Restoration of excavation, pedestrianization and driveability
Above ground tank positioning	• Handling and transport • Preparation of the support slab
Positioning of communicating tanks	• Positioning the tanks • Connections
Pre-installation checks	• Control requirement - Elements to be controlled
Pre - testing and commissioning requirements	• Requirements for pre - testing and commissioning • Requirements and procedure for cross-connection test • Commissioning requirements • Commissioning record requirements • Pre-handover check requirements
System maintenance	• Routine/programmed maintenance • Extraordinary maintenance • Analysis of maintenance costs

Delivering and assessment

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Module 5: Outdoor installations

LEARNING UNITS

Unit 1: Correct interpretation of outdoor landscape design and application of techniques to minimise water from irrigation runoff or overspray

Unit 2: Correct selection, installation and maintenance of outdoor water use systems, including scheduling for optimal irrigation performance

Unit 3: Detection and repair of outdoor systems leaks

Unit 1. Correct interpretation of outdoor landscape design and application of techniques to minimise water from irrigation runoff or overspray

GENERAL DESCRIPTION

In the 1st Unit of Module 5 the basics for the correct interpretation of outdoor landscape design, including the techniques to minimise water from irrigation runoff or overspray, will be showcased to trainees in order to improve their knowledge of the operational characteristics of the irrigation system components, considering water-energy efficiency requirements, of the functioning of fittings and other parts of the irrigation system, of the methods and/or techniques that may be applied to secure a good performance for the irrigation system, considering water-energy efficiency requirements, and of the regulations and standards (local, national, international) applicable to irrigation systems. This way, the trainees will enhance their abilities to interpret basic drawings of outdoor and irrigation systems, to verify requirements for installation of outdoor and irrigation systems, to select the correct components and materials for an installation, as well as to reduce runoff and overspray.

OUTLINE OF UNIT CONTENTS

Contents	Description
Basics of outdoor and irrigation systems design	• Interpretation of the basic drawings and the technical elements of the proposed outdoor and irrigation systems design • Verification of the requirements of facilities under study regarding outdoor and irrigation systems • Verification of the compatibility of the proposed equipment, materials and components with the outdoor and irrigation systems design
Minimisation of water waste from irrigation runoff and/or overspray	• Methods for the reduction of runoff • Methods for the reduction of overspray

Delivering and assessment

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 2. Correct selection, installation and maintenance of outdoor water use systems, including scheduling for optimal irrigation performance

GENERAL DESCRIPTION

In the 2nd Unit of Module 5 the principles for the correct selection, installation and maintenance of outdoor water use systems, including the scheduling for optimal irrigation performance, will be presented to the participants in the training in order to improve their knowledge on correctly selecting the adequate pipe material, in compliance with regulations and standards (local, national, international) applicable to irrigation system, considering water-energy efficiency requirements, and 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. This way, the trainees will enhance their abilities to identify all components in an irrigation system, to perform maintenance tests and commissioning, and to optimize irrigation schedules.

OUTLINE OF UNIT CONTENTS

Contents	Description
Selection and installation of outdoor systems	• Correct selection of components and materials for outdoor systems • Safety requirements, legislation and standards • Selection of tools, equipment, materials and fittings for installation of outdoor systems
Testing and commissioning of outdoor water use systems	• System diagnosis and measurements • Tests for verification of system functioning • Pressure decay test • Commissioning of outdoor and irrigation systems
Scheduling for optimal irrigation performance	• Influential factors for water use in irrigation • Defining irrigation control scheduling

Delivering and assessment

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 3. Detection and repair of outdoor systems leaks

GENERAL DESCRIPTION

In the 3rd Unit of Module 5 the techniques used for the detection and repair of outdoor systems leaks will be showcased to the trainees in order to improve their knowledge of the available methods for the identification of the leakages in the irrigation system, and of the available methods for proper repair, replacement and maintenance of the irrigation system. This way, the trainees will enhance their abilities to use fault-finding methods to assess the existence of leaks in an irrigation system, to make the evaluation of the best methods for leak repair, and to perform proper maintenance in irrigation systems pipes to avoid leakages.

OUTLINE OF UNIT CONTENTS

Contents	Description
Leak assessment and diagnosis	• Fault-finding methods • Use phase analysis of outdoor system components
Leak repair	• Selection of the adequate tools for leak repair • Correct positioning and use of the tools for leak repair

Delivering and assessment

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Module 6: Communication with the customers / consumers

LEARNING UNITS

Unit 1: Providing clear information and guidance to customers on the selection of effective materials, equipment, appliances and fixtures

Unit 2: Providing guidance to consumers on the impact of consumer behaviour on water-energy savings

Unit 1. Providing clear information and guidance to customers on the selection of effective equipment, appliances and fixtures

GENERAL DESCRIPTION

In the 1st Unit of Module 6 the trainees will improve their knowledge on how to provide clear information and guidance to customers on the selection of effective equipment, appliances and fixtures. This way, the trainees will enhance their abilities to discuss with the customer/client and make recommendations (considering water-energy efficiency requirements), to evaluate the matching between the facility characteristics and client demands, to propose improvement options over the initial project and provide different alternatives, to inform about the advantages of water-energy efficient networks from the implementation of water-energy saving measures, and to provide information on water-energy retrofit options, including the cost-benefit analysis.

OUTLINE OF UNIT CONTENTS

Contents	Description
Cost-effective integrated water-energy saving interventions for energy upgrading of buildings	• Legislation and regulations applicable to hydraulic installations and systems • Relevant energy certifications and reference documents • Current legislation and references to certification systems, particularly when compulsory
Benchmarking and identification of the saving potential	• Benchmarking and identification of the saving potential through onsite measurements and observations ➢ Preliminary study ➢ Building/household profile diagnosis ➢ Sampling and monitorization
Principles of explanation and consulting techniques	• Financial outcomes, technical performance and water saving dimensions • Documented proposal with technical specifications

Delivering and assessment

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 2. Providing guidance to consumers on the impact of consumer behaviour on water-energy savings

GENERAL DESCRIPTION

In the 2nd Unit of Module 6 the principles for providing guidance to consumers on the impact of consumer behaviour on water-energy savings will be taught to the trainees in order to improve their knowledge of the consumer behaviour relating to the purchasing of water-energy efficient and/or environmentally preferable

goods, and of the consumer behaviour relating to the use of water and energy consuming appliances and equipment. This way, the trainees will enhance their abilities to understand and discuss with consumers about their real water-energy consumption needs and guide their choices in regards to water-energy consuming equipment/appliances/fixtures towards more efficient and/or more preferable from the environmental point of view solutions (even been more expensive than the conventional ones), and to provide tips and guidelines for an efficient, economical and safe use of the thermo-hydraulic installations.

OUTLINE OF UNIT CONTENTS

Contents	Description
Understanding consumer behaviour relating to the purchasing of water-energy efficient and environmentally preferable goods	• Understanding consumer decision-making • Understanding ethical and environmentally preferable consumerism
Understanding consumer behaviour relating to the use of water and energy consuming appliances and equipment	• Water-energy consuming patterns and trends in European regions • Principles of circular economy and consumption reduction habits
Knowing the proper use practices that lead to efficient, economical and safe use of the installation	• Use recommendations for sanitary installations • Use recommendations for cooling and heating systems • Use recommendations for saving water in household appliances • Use recommendations for saving water in green areas

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

4.2 WEE Course

Module 1: Design of water efficient buildings

LEARNING UNITS

Unit 1: Evaluation of the needs and site conditions to design a water-energy efficient building system and to select its appropriate components

Unit 2: Selection of suitable components and materials and description of their correct positioning in the circuit

Unit 3: Control and monitoring equipment, positioning in the circuit and main operating parameters

Unit 4: Considerations regarding maintenance and troubleshooting works most likely to occur in a water-energy system

Unit 5: Designing of water-energy efficient systems for green areas and landscapes

Unit 1. Evaluation of the needs and site conditions to design a water-energy efficient building system and to select its appropriate components

GENERAL DESCRIPTION

In the 1st Unit of Module 1 the basics for the correct evaluation of the needs and site conditions to design a water-energy efficient hydraulic system and to select its appropriate components will be presented to the trainees in order to improve their knowledge of evaluating the site conditions necessary to the design (in terms of conception and sizing) of the water energy-efficient system and the building load, of the applied methods and rationale for designing water-energy efficient systems, of identifying and applying adequate sizing tools, of the life-cycle cost analysis approaches and the most adequate valorisation strategies considering the environment and surrounding conditions, of how to carry out a proper work and cost estimation, of the application of circular economy principles in construction, as well as of the applicable regulations and standards. The trainees will thus enhance their abilities to evaluate the climate and site conditions, as well as the building loads (thermal and water demand), also applying circular economy principles during construction, 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 (e.g. climate, orientation), to execute life-cycle cost analysis considering the possible lowering impacts of manufacturing process, transportation, construction, use, maintenance, reuse or disposal, to dimension/size of the sequence of pipe installations and the corresponding components, and to provide work and cost estimation for the system implementation.

OUTLINE OF UNIT CONTENTS

Contents	Description
Evaluation of the climate and site conditions	• Performing a typical site analysis • Understanding of the macroclimate and the general climatic characteristics • Application of circular economy principles in construction
Evaluation of building loads	• Thermal energy demand evaluation • Water demand evaluation for specific types of buildings

Available methods for designing and planning of water-energy efficient systems	• Methodology for calculating thermal needs • Methods and rationale for the design of a water efficient system • Workload and cost estimations • Life-cycle cost analysis approaches
Regulations and standards	• Regulations applicable to the water-energy systems • Standards applicable to water-energy efficient buildings

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 2. Selection of suitable components and materials and description of their correct positioning in the circuit

GENERAL DESCRIPTION

In the 2nd Unit of Module 1 the trainees will be taught the principles of providing a list of the suitable materials and components and a description of their correct positioning in the circuit in order to improve their knowledge of the adequate selection and positioning of the different elements in the water energy-efficient system, the functioning of fittings and other parts of the water-energy efficient system, the applied methods and rationale for the designing/planning of the water-energy efficient system, as well as of the regulations and standards (local, national, international) applicable to water-energy efficient systems. This way, the trainees will enhance their abilities to identify the correct material and components for the system, and interpret its related available manuals), considering water-energy efficiency requirements and the environment conditions (e.g. climate, orientation), to describe materials and components functioning position in the circuit, to limit obstructions and improve the piping network layout, e.g. in respect to reduce pipes lengths, to apply life-cycle considerations when selecting materials, and to provide an estimation of the work to be carried out for the installation of the suitable materials and components.

OUTLINE OF UNIT CONTENTS

Contents	Description
Components selection in a water-energy efficient system	• Plumbing fixtures • Distribution network • Domestic water supply equipment and components • Functioning of fittings and other parts of the system

	• Life-cycle considerations when selecting materials, equipment and construction techniques
Positioning of the different elements/components in a water-energy efficient system	• Defining the position of the different elements in a water-energy efficient system • Preparation of the necessary construction plans (drawings)
Methods and tools for the selection and positioning of the components in the network	• Methods applied in the selection and positioning in the drawings of the components • Available tools for the selection and positioning in the network of the components (e.g. BIM)

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 3. Control and monitoring equipment, positioning in the circuit and main operating parameters

GENERAL DESCRIPTION

In the 3rd Unit of Module 1 the ways of providing clear indications of control and monitoring equipment, its positioning in the circuit and its main operating parameters will be showcased to the participants in order to improve their knowledge of the adequate control and monitoring equipment for the water energy-efficient system, of its correct position in the circuit, of its functioning parameters, and of the regulations and standards (local, national, international) applicable to the control and monitoring equipment of the water energy-efficient system. This way, the trainees will enhance their abilities to identify the adequate control and monitoring equipment for the water-energy efficient system and interpret its related manuals, considering water-energy efficiency requirements and environmental conditions (e.g. climate, orientation), to correctly position in the circuit this equipment, and to describe control and monitoring equipment functioning.

OUTLINE OF UNIT CONTENTS

Contents	Description
Control and monitoring equipment applied to water energy-efficient systems	• Introduction to water flow metering • Types and functioning of water flow metering devices and their positioning in the circuit
Smart water meters as an integral part of an automated water supply system	• What is a smart meter and how it functions • Advanced measurement reading (AMR) and the advanced metering infrastructure (AMI) technology

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 4. **Considerations regarding maintenance and troubleshooting works most likely to occur in a water-energy system**

GENERAL DESCRIPTION

In the 4th Unit of Module 1 the ways to indicate (to the customer) the maintenance, repair and replacement works (including costs) most likely to occur in the water-energy efficient system will be provided to the trainees in order to improve their knowledge of the methods for the identification of the leakages in the water-energy system, about the entire maintenance procedure that the water-energy systems need to follow, and of the procedures for proper repair and replacement of the water-energy system components. The trainees will thus enhance their abilities to prepare a suitable maintenance plan for the water–energy efficient system each time under consideration, as well as to implement in practice the methods for proper maintenance, repair and replacement of the water-energy system components.

OUTLINE OF UNIT CONTENTS

Contents	Description
Maintenance works of water-energy systems	• Scheduled maintenance types, tasks, steps, tools and costs • Unscheduled maintenance types, tasks, steps, tools and costs
Preparing a maintenance plan of a water-energy system	• Key steps in preparing a typical maintenance plan • Items that need to be scheduled during the elaboration of a maintenance plan

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 5. Designing of water-energy efficient systems for green areas and landscapes

GENERAL DESCRIPTION

In the 5th Unit of Module 1 the principles for designing of water-energy efficient systems for green areas and landscapes will be showcased to the trainees in order to improve their knowledge of green areas and landscapes design and maintenance strategies, and of the most adequate green areas and landscapes considering efficiency criteria and the environment and surrounding conditions. This way, the trainees will enhance their abilities to correctly design and maintain building green areas and landscapes, and to apply water-energy efficiency techniques and/or methods in landscape design.

OUTLINE OF UNIT CONTENTS

Contents	Description
Green areas and landscapes design principles and considerations	• Landscape criteria • Irrigation systems • Other measures for outdoor water efficiency
Green areas and landscapes design steps	• Calculation of the landscaped area • Calculation of the landscape water requirement (LWR) • Design of a sustainable landscape based on a regionally appropriate amount of water • Calculation of the costs

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Module 2: Supervision during the construction, commissioning and operation of a project

LEARNING UNITS

Unit 1: Supervision process of the construction works for keeping up the contractual terms of performance

Unit 2: Necessary tests and procedures to secure inspection and commissioning

Unit 3: Supervision and monitoring of operation (Operational Supervision)

Unit 1. Supervision process of the construction works for keeping up the contractual terms of performance

GENERAL DESCRIPTION

In the 1st Unit of Module 2 the ways for monitoring whether the selected components and tools meet the project requirements and their compliance with building regulations will be provided to the trainees in order to improve their knowledge of the supervision processes that have to be carried out during the construction works for keeping up the contractual terms of performance, and of the exact roles and responsibilities of the Site Supervisor (SS), the Qualified Person (QP) and the Contract Administrator (CA). This way, the trainees will enhance their abilities to efficiently implement the supervision process of the foreseen works and undertake the roles of either the SS or the CA, as well as to estimate whether the selected components and tools that are used comply with the contractual terms of performance.

OUTLINE OF UNIT CONTENTS

Contents	Description
Supervision process	• Role of the Site Supervisor (SS) and of the Qualified Person (QP) • Role and responsibilities of the Contract Administrator (CA) • Compliance with the specification / quality of works • Other considerations (health & safety, legislation, statutory obligations, etc.) • Checklists
Keeping up the contractual terms of performance	• Assessing whether the selected components and tools used fit the project requirements • Assessing whether the selected components are correctly positioned in the circuit
Regulations and standards	• Standards and requirements for plumbing products and materials • Metallic and non-metallic and plastic materials used in pipework • Regulations on the project supervision and commissioning

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 2. Necessary tests and procedures to secure inspection and commissioning

GENERAL DESCRIPTION

In the 2nd Unit of Module 2 the ways of monitoring whether the selected components are correctly positioned in the circuit will be showcased to the participants in order to improve their knowledge of the supervision process during the phase of the (inspection and) commissioning of a water-energy project (system). This way, the trainees will enhance their abilities to perform the necessary tasks for the testing of the water-energy system in consideration, to identify and describe the appropriate tools to secure proper inspection and commissioning of the water-energy system, to efficiently check-out the water-energy system, and to provide an estimation of the work to be carried out for the system testing, inspection and commissioning.

OUTLINE OF UNIT CONTENTS

Contents	Description
Planning for commissioning	• Fundamental elements of commissioning in project • Commissioning Professional's role and responsibilities • Development of a project-specific Commissioning Plan • Key elements of a Communication Plan
Tests and procedures for testing and commissioning of water-energy systems	• Pre-commissioning (prerequisites, activities, completion requirements) • Commissioning (stages, activities) • Site acceptance testing (SAT)
Conclusive benefits on commissioning	• Quality control • Preparation (through training, documentation, and involvement in the commissioning process) of facilities engineering staff responsible for operating the systems
Applicable regulations and standards	• ASHRAE Guideline 0-2019 • Other relevant Codes and Standards

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 3. Supervision and monitoring of operation (Operational Supervision)

GENERAL DESCRIPTION

In the 3rd Unit of Module 2 the ways for monitoring whether the selected components and tools meet the project requirements and their compliance with building regulations will be provided to the trainees in order to improve their knowledge of the supervision that has to be implemented throughout the final phase of the operation of the project (system). This way, the trainees will enhance their abilities to incorporate the "Condition Monitoring" and the "Condition based Maintenance" procedures into the wider procedure of the operational supervision, as well as to understand and focus on the advantages presented by the above mentioned procedures for the entire lifecycle of the water-energy project.

OUTLINE OF UNIT CONTENTS

Contents	Description
The basics of operational supervision	• Customer prioritization • Addressing problems at their source • Investing in new technology • Processes simplification • Effective communication
Condition monitoring	• Definition of the "Condition monitoring" procedure • Condition monitoring techniques and technologies • Condition monitoring engineer's tasks
Condition Based Maintenance (CBM)	• Definition of the "Condition Based Performance" or Condition Based Maintenance (CBM) • Benefits for the feasibility of a system imposed to CBM

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Module 3: Water measurements and water-energy nexus

LEARNING UNITS

Unit 1: Collection, verification and analysis procedure definition for field data related to water-energy use

Unit 2: Determination of baselines for water-energy use or demand assessment

Unit 3: Identification and prioritization of water-energy saving measures

Unit 1. Collection, verification and analysis procedure definition for field data related to water-energy use

GENERAL DESCRIPTION

In the 1st Unit of Module 3 the principles of the procedures for the definition of the collection, verification and analysis of field data related to water-energy use will be taught to the participants in the training, in order to improve their knowledge on the available methods for the identification of the necessary data inputs for studying water-energy profiles with respect to different parameters, as well as of how to elaborate fact sheets for collection of real data and to identify water-energy performance indicators based on field data. This way, the trainees will enhance their abilities to identify the necessary data inputs for studying water-energy profiles, to elaborate fact sheets for the collection of real data, to make the verification of field data related to water-energy use, and to identify the water-energy performance indicators based on field data.

OUTLINE OF UNIT CONTENTS

Contents	Description
Collection of field data related to water-energy use	• Identification of the necessary data inputs for studying water-energy profiles • Elaboration of fact sheets for the collection of real data
Analysis of field data related to water-energy use	• Verification of field data related to water-energy use • Identification of water-energy performance indicators based on field data

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 2. Determination of baselines for water-energy use or demand assessment

GENERAL DESCRIPTION

In the 2nd Unit of Module 3 the way to determine water and energy baselines for water-energy use or demand assessment will be provided to trainees in order to improve their knowledge on the regulations and standards (local, national, international) applicable to each project, on how to identify the valid variables for baselining, and on the definition of procedures for comparison of field data. This way, the trainees will enhance their abilities to make the quantification of water and energy consumption profiles, the identification of the water-energy baseline based on field data, and the comparison of water and energy use requirements with the reference values of building regulations.

OUTLINE OF UNIT CONTENTS

Contents	Description
Assessment of water and energy consumption profiles	• Quantification and baseline profiles • International Performance Measurement and Verification Protocol
Using reference values of water-energy use from building regulations and standards	• Revision of the existing applicable regulations and standards (local, national, international) • Comparison of water and energy use requirements with the reference values of building regulations

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Unit 3. Identification and prioritization of water-energy saving measures

GENERAL DESCRIPTION

In the 3rd Unit of Module 3 the methods used for the identification and prioritization of water-energy saving measures will be showcased to the trainees in order to improve their knowledge of defining the procedures for assessment of field data derived from water-energy balances necessary in buildings, of good practices in water-energy monitoring/auditing, of how to develop baselines (the basis for estimating future water and energy consumption), and of the cost-benefit analysis and impacts of water-energy saving measures. Thus, the trainees will enhance their abilities to assess field data derived from water-energy balances for buildings, to recognise the basic characteristics and savings derived from the application of 'alternative' water-energy saving measures, to figure out the cost-benefits and other impacts of alternative water-energy saving measures, and the ways to monitor and verify the positive effect of alternative water-energy saving measures, as well as to prioritize water-energy saving measures.

OUTLINE OF UNIT CONTENTS

Contents	Description
Alternative water-energy saving measures identification and prioritization	• Basic characteristics and savings derived from the application of alternative water-energy saving measures • Basic principles of how to prioritize water-energy saving measures (space / system prioritization)

Good practices in water-energy efficient usage	• Analysis of daily profile • Breakdown of consumption per space and per system
Cost-benefits and impacts from applying water-energy saving measures	• Using the baseline to calculate savings • Typical water-energy efficiency measures that can be comprehensively analysed by the expert technician/auditor • Monitoring and verification of the impacts of water-energy saving measures

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☐ oral examination / exercises

☐ project

☐ written exercises / test

Module 4: Communication with customers

LEARNING UNITS

Unit 1: Auditing, diagnosis and definition of consumption baseline, benchmarking and identification of water-energy saving potentials

Unit 2: Identification of water-energy efficiency measures and equipment to attain water-energy saving potentials and formulation of a documented proposal to the customer

Unit 3: Promotion of best practices for the correct use and maintenance of water-energy efficiency systems

Unit 1. Auditing, diagnosis and definition of consumption baseline, benchmarking and identification of water-energy saving potentials

GENERAL DESCRIPTION

In the 1st Unit of Module 4 of the WEE course the principles of auditing, diagnosis and definition of consumption baselines, benchmarking and identification of water-energy saving potentials, and of the appropriate customer information on the findings will be provided to the trainees in order to improve their knowledge of the basics for the definition of a dedicated audit approach, including the key steps for planning an audit or visit to a household, the conduction of a diagnosis and the identification of the consumption baseline for assessing household water system performance. This way, the trainees will enhance their abilities to identify the main steps towards the execution of an audit plan or diagnosis to buildings, to select instrumentation for measuring and monitoring water and energy demand, and to implement an audit plan.

OUTLINE OF UNIT CONTENTS

Contents	Description
Planning a water-energy audit to the building	• Preparation of the audit • Preliminary study • Evaluation of the consumption profile • Current legislation and references to certification systems, particularly when compulsory
Identification of tools to carry out water-energy auditing	• Definition of the sampling approach • Sampling and monitoring • Selection of tools necessary for carrying out the auditing and diagnosis of consumption • Identification of the appropriate equipment for monitoring the consumption of water and energy
Collecting, registering and interpreting the obtained results	• Influencing factors occurring in the different fixtures / equipment • Calculations

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☑ examination

☑ oral examination / exercises

☐ project

☐ written exercises / test

Unit 2. Identification of water-energy efficiency measures and equipment to attain water-energy saving potentials and formulation of a documented proposal to the customer

GENERAL DESCRIPTION

In the 2nd Unit of Module 4 the trainees will be taught how to identify water-energy efficiency measures and equipment to attain water-energy saving potential and how to formulate a documented proposal to the customer in order to improve their knowledge of how to identify the applicable water and energy efficiency measures, and of the advantages / disadvantages per efficiency measure, based on the customer/consumer behaviour and expectations, including financial, technical performance and water saving dimensions. Thus, trainees will enhance their abilities to make the recognition of the saving potential with basis on a diagnosis, to identify efficiency measures for improving the performance and resiliency of a building, as well as to formulate a documented proposal with the technical specifications to the customer / consumer.

OUTLINE OF UNIT CONTENTS

Contents	Description
Identifying water-energy efficiency measures	• Large intervention water-energy efficiency measures • Short intervention water-energy efficiency measures
Elaborating a documented proposal with technical specifications	• Financial outcomes, technical performance and water saving dimensions • Documented proposal with technical specifications

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on

☑ lessons

☐ role-play

The unit will be assessed through:

☐ examination

☑ oral examination / exercises

☐ project

☐ written exercises / test

Unit 3. Promotion of best practices for the correct use and maintenance of water-energy efficiency systems

GENERAL DESCRIPTION

In the 3rd Unit of Module 4 the basics concerning the promotion of best practices for the correct use and maintenance of water-energy efficiency systems will be taught to the trainees in order to improve their knowledge of the criteria to guarantee of system well-functioning, as well as the key steps to perform the necessary measurements and make the identification of the consumption baseline. This way, the trainees will enhance their abilities to identify the main care actions in the implementation of water-energy efficiency measures, as well as to communicate the criteria to guarantee regular functioning of the system.

OUTLINE OF UNIT CONTENTS

Contents	Description
Identifying precautions in the implementation of water-energy saving measures	• Identification of water-energy consumption baseline • Identification and implementation of water-energy efficiency measures
Guaranteeing the regular functioning of the equipment or the installation	• Verification of cold and hot water distribution systems • Energy efficiency label for appliances

DELIVERING AND ASSESSMENT

The unit will be delivered through:

☑ discussions

☑ hands-on
☑ lessons
☐ role-play

The unit will be assessed through:
☐ examination
☑ oral examination / exercises
☐ project
☐ written exercises / test

5 Pedagogical validation through pilot trials

Each country organised trials using the training contents produced, to understand the level of usefulness of the learning unit contents and the expected learning outcomes upon completion of the training course. The specific tasks carried out by each country included:

- Dissemination of the event and participants selection based on curricula
- Administrative management of the training
- Technological assistance for the pilot
- Monitoring of participants in each of the learning objects
- Preparation of the course for accreditation through ECVET (IO4).

Each country organized a trial using the training contents produced and the pilot organisation included three important steps:

1. Administrative management of the training
    - Splitting the contents to test by all partners;
    - Selection of the date and place of the pilot training course;
    - Elaboration of an agenda;
    - Invitation of selected experts (observers) to the event;
    - Dissemination of the event (without a detailed agenda), to check the participants general interest in the course;
    - Participants registration;
    - Signature collection.

2. Technological assistance of the pilot
    - Availability of the course materials in digital format only (due to the Covid-19 restrictions), including integration into e-learning platform;
    - Monitoring of the participants throughout the course.

3. Technical validation of the course
    - Assessment of the learning outcomes considering performance assessments (ex-ante and ex-post);
    - Discussion with the trainees and the experts/observers regarding the validation of the course, materials and overall key-messages.

The pilot events both addressed to the WETs and the WEEs were conducted in-person (three of them) and on a digital format (four of them), while the following elaborated Modules (7 in total) of the WET and the WEE profile have been tested:

WET profile

- Hydraulic installations and losses
- Domestic hot water systems
- Grey water reuse
- Rainwater harvesting
- Communication with customers/consumers

WEE profile

- Design of water efficient buildings

- Communication with customers

More specifically, the pilot courses have been implemented, per partner:

ADENE:

✓ Pilot validation of Module 2 (Domestic Hot Water) of the **WET Profile** course. The pilot courses were implemented on a digital form, in the form of 2 online digital sessions of 4 hours duration each. In total 20 attendants (and 3 observers) followed the pilot course.

✓ Pilot validation of Module 4 (Communication with customers/consumers) of the **WEE Profile** course. The pilot course was implemented in-person, in the form of a 1-day online digital session. In total 31 attendants (and 7 observers) followed the pilot course.

FORMEDIL:

✓ Pilot validation of Modules 3 (Grey water reuse) and 4 (Rainwater harvesting) of the **WET Profile** course. The validation was performed through the implementation of two separate pilot courses addressing Module 3 and Module 4 respectively, and of 16 hours duration each. The pilot courses were implemented face to face with the participation of 13 attendants, each.

FLC:

✓ Pilot validation of Module 6 (Communication with customers / consumers) of the **WET Profile course**. The pilot course was implemented face to face with the participation of 7 attendants.

CRES:

✓ Pilot validation of the following 5 Modules of the **WET Profile course:** Module 1 (Hydraulic installations and losses), Module 2 (Domestic Hot Water Systems), Module 3 (Grey water reuse), Module 4 (Rainwater harvesting) and Module 6 (Communication with customers/consumers). The pilot course was implemented on a digital form, in the form of one online digital session of 6.5 hours duration. In total 9 attendants participated to the pilot course. It should be noted that, although the initial idea was to go for the testing of Module 1, following closely the initial communication made with the representatives of the Greek Association of Plumbers (OBYE), it was more than clear that there was already a big interest expressed since the first announcement of the pilot implementation to the plumbers/technicians, and especially to those living out of Attiki and for whom the (actually not preferred) option of the digital seminar seemed really a unique chance to participate to a very interesting course without having to move from another city to another. Thus, and as luckily it proved to be the case during the course, the plumbers expressed much more interest in the modules that treated innovative issues like the rainwater harvesting and the grey water exploitation, as well as the DHW technologies and future perspectives. Of course, the length of the whole course might not have been the ideal one, but it was sufficient for a quite enlightening introduction to the basic principles of all addressed modules.

✓ Pilot validation of the Modules of the **WEE Profile course** through the extended presentation of all the contents and the learning outcomes of the elaborated “Training Handbook for the WEE course”. The pilot course was implemented on a digital form, i.e. as one online digital session of 3.5 hours duration. In total 10 experts participated to the pilot course. It must be mentioned that CRES decided to proceed with a more complete overview and extensive presentation of the learning outcomes and the most basic contents of the handbook, instead of a single Module 1, with no new "technology entries" for the experts, because the target was for them to be able to acquire a more global view of all the Modules as parts of a complete approach of the water efficiency issue. In this case as well, the experts attending the course declared their enthusiasm and expressed their clear intention to get in hands the elaborated handbook as they thought it is actually treating the energy/water efficiency issue in a very global way, yet addressing issues that are still unknown and untreated especially in the public sector.

6 Technical validation by national advisory boards and stakeholder groups

The National Advisory Groups (NAG) are consultative bodies in each partner country composed of stakeholders relevant to the project's goals. Through consultation with these Advisory Groups and with other relevant entities (sectorial stakeholders groups), it was intended to gather useful contributions and assessments to monitor the development of the project, to validate the qualifications and accreditation proposals and assure its future implementation in the partner countries. Involvement of relevant stakeholders is key, as they will help with the promotion of the WATTer Skills project, collaborate on the project activities, follow the project results and support in the dissemination and exploitation of the results, easing its endorsement by other stakeholders of the water efficiency and building sectors.

Through the project, each partner launched consultation processes involving their NAG aiming at evaluating and validating the main project outcomes, to be continued after projects conclusion towards its implementation. Depending on each partner's specificities, context and according to their technical assessment, they may conduct interviews, questionnaires or both.

With the purpose of developing the two qualification in WATTer Skills, partners needed to carry on the endorsement of the technical experts, namely the involvement of both the national advisory and the stakeholder groups, to understand the positive and negative aspects of the following:

- WATTer Skills objectives and outputs;
- The market requirements for the professions under development;
- IO contents and objectives;
- Pilot event training format, contents and interest.

The involvement of the NAG members and the stakeholder groups was done through semi-structured interviews (from 30 minutes to 1 hour), organised meetings (half-a-day or a complete day), by sending emails with IO revisions and send out of questionnaires (1 questionnaire for IO1 and 1 questionnaire for IO2).

Methodologies

Semi-structured interviews
• Duration: 30 minutes to 1 hour
• Medium used: Face to face interviews, Skype and phone calls.

Advantages:
• Very engaging for the NAGs, thus encouraging future collaboration.
• Allows the interviewer to focus the attention on certain areas rather than others depending on the NAGs' expertise.
• The information obtained is rich in suggestions and comments

Disadvantages:
• Less thorough than a "point by point" questionnaire.

Meetings

- Duration: estimated between half-a-day and a complete day
- Medium used: Face-to-face.

Advantages:

- Very engaging for the NAG's, thus encouraging future collaboration.
- Both good for the partnership and the NAG members, as a single meeting allows the whole information regarding the project main outputs and possible outcomes.
- The information obtained is rich in suggestions and comments.

Disadvantages:

- Less rich in comments and suggestions and doesn't encourage expert insight.
- Less engaging for the respondent that an interview.

Questionnaires

- Duration: estimated between 20 to 30 minutes
- Medium used: Google Forms

Advantages:

- They allow for a "point by point" evaluation that ensures all content has been assessed.
- Yields quantitative results which are easier to compare between partners (if significant).

Disadvantages:

- Less rich in comments and suggestions and doesn't encourage expert insight.
- Less engaging for the respondent that an interview.

Regarding the IO1 and IO2 questionnaires (Figure 6-1), questions included the level of importance (relevance, coherence and applicability) for each of skills maps, analysed for on a scale from 1-5 (from strongly disagree to strongly agree):

- Relevancy | Relevant for water and energy savings,
- Coherence | Relevant for a water efficiency technician qualification,
- Applicability | Expected impact on employability.

And the level of importance for each of the learning outcomes:

- Includes the most important knowledge, skills and competences,
- Ignores the most important knowledge, skills and competences,
- It should not be part of this profile.

To facilitate the process of undergoing the questionnaire answers, all partners translated the forms into their own languages and disseminated them individually.

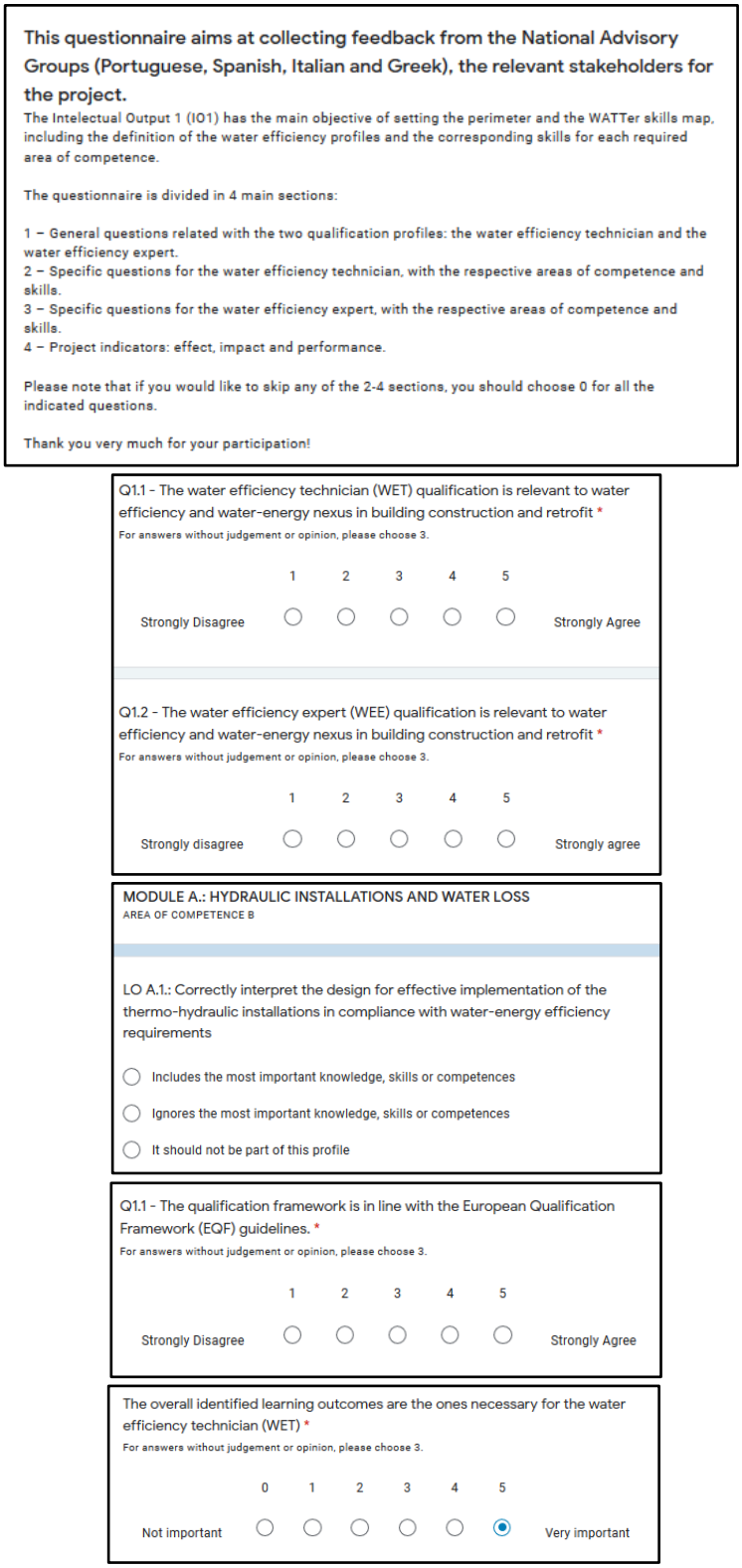

Figure 6-1: Screen shots of the google form questionnaires made for the IO1 and IO2

The participation of the NAG and stakeholder group in the revision of the IO3 and IO4 was conducted mostly through emails and during the pilot training trials, through the assessment of the experts/observers in the events (7 pilot events and the final conference closing event). The final conference and future implementation of the projects results with the support of NAGs and stakeholder groups contributed to the validation and consolidation of the IO3 and IO4 contents.

The NAGs that participated in the project were, per country:

- Portugal
    - Portuguese Environment Agency - APA
    - Portuguese Water and Waste Services Regulation Authority - ERSAR
    - Portuguese technical-scientific association – ANQIP
- Spain
    - Spanish National Construction Confederation – CNC
    - Spanish Federation of Construction and Services – CCOO
    - Spanish Federation of Industry, Construction and Agro - FICA-UGT
- Italy
    - University Federico Secondo of Naples: Department of Industrial Engineering
    - University of Rome La Sapienza: Department of Environmental Health Engineering
    - Business association of manufacturers of energy efficiency service facilities - ASSISTAL
- Greece
    - Federation of Installers and Plumbers of Greece – OBYE
    - Small Enterprises Institute of GSEVEE
    - National Institute of Labour and Human Resources from Greece – NILHR
    - Manpower Employment Organization – OAED

7 Final considerations

In this third report of the WATTer Skills project, at first the formulation of the training courses, then the development, validation and implementation of the training contents, the development of classroom materials for trainers and trainees, and the accomplishment of trial and assessment of the training contents produced were presented. The report is accompanied by the training materials for the water efficiency technician - WET course training handbook and the training materials for the water efficiency expert - WEE course training handbook, with the learning units of all modules developed. This report is also supported by the seven pilots used to validate and implement the training course materials during the project, three of them conducted in-person and four of them conducted integrated in an e-learning platform and presented in a digital format.

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