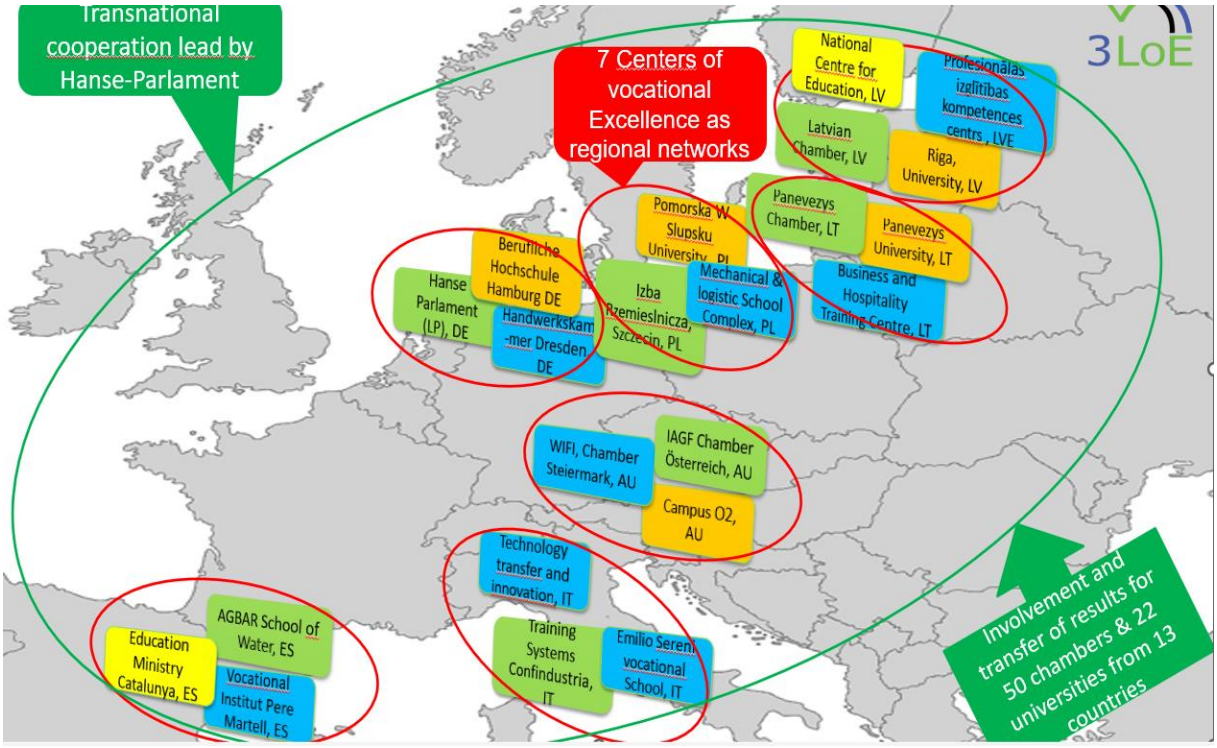
Result 3.5

Training programs for strong learners in initial vocational training

Curricula

Partner



Language

English

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Project Summary and Introduction

About the 3LOE project

Around 99% of all EU businesses are SMEs, creating up to 70% of all jobs. In general, SMEs have good growth prospects for the future and are particularly well equipped to solve environmental problems and to enhance the green economy. However, in most of the project countries, SMEs are confronted with a shortage of skilled workers and young entrepreneurs. This shortage of skilled workers is even more alarming taking into account that due to aging of current entrepreneurs, a large and growing number of companies will have to be handed over to the next generation. Furthermore, young specialists and entrepreneurs often lack the qualifications and skills needed in order to respond to contemporary developments in the fields of energy, climate and environmental protection. The following problems have been identified in SMEs working in the fields of green economy, energy and environmental protection:

- Blatant and growing shortage of skilled workers.
- Large qualification deficits, especially in the Green Economy.
- Loss of attractiveness and low qualification of school-based VET.
- Low rates of further training and insufficient orientation of offers to SME needs.
- Ageing of entrepreneurs and increasing shortage of young people (demographic change).
- Failure of business transfers and low rates of business start-ups.
- Low innovation rates and insufficient productivity.
- Not enough cooperation between universities and SMEs and a lack of teaching geared to SME needs.
- Comparably low internationalization of SMEs and vocational training providers.
- Lack of national level support for SMEs".

To meet these challenges, work-based learning and new paths in vocational training must be provided through cooperation between educational institutions, economic chambers and SMEs. University graduates are often well-qualified in theory, but lack practical knowledge, skills and abilities that are crucial for SMEs. For this reason, VET reforms must also involve higher education, and should implement dual bachelor's degree programs that combine a bachelor's degree with vocational training and on-sight work in companies.

In the 3LOE project, an innovative and complex project structure with 22 project partners from 7 countries as well as 60 associated partners from 13 countries was designed. In each country, centers of vocational excellence (COVEs) in Green Economy will be established, managed and their permanent continuation ensured. A transnational cooperation of the centers will be developed, extended to 60 education stakeholders from 13 countries and operated permanently in an institutionalized form. The centers will offer a wide range of dual education measures in vocational training, further education and higher education, that are being developed, tested and evaluated in the project. These educational measures on EQF levels 3-7 focus on Green Economy, Digitalization and Entrepreneurship. Furthermore, vocational and educational consulting and innovation support for SMEs will be developed and implemented. In total,

seven Train-the-Trainer programs will be developed and implemented permanently by the project partners. All results will be transferred to the 60 associated partners together with implementation advice.

The objectives and aimed outcomes of the 3LOE project can be summarized as following:

1. Foundation of a three-level Center in each project country

1.1 Building the "Green Economy" skills alliance for qualifications in SMEs with educational and economic actors from the 7 project countries; development of information and cooperation tools.

1.2 Expansion of the skills alliance to the 60 associated partners from 13 countries, comprising chambers of commerce, SME associations, as well as universities of applied sciences/colleges.

1.3 Development, testing and evaluation of a curriculum and teaching materials for Train the Trainer courses for personnel and center management (vocational school-teachers, trainers in SMEs and lecturers in further and higher education institutions).

1.4 Evaluation of the construction and operation of the seven centers of Excellence and of the transnational cooperation.

1.5 Development of business and financing plans and ensuring the long-term continuation of the seven centres and transnational cooperation.

1.6 Development, consulting and introduction of political strategy program.

2. Implementation and realization vocational training

2.1 Development and implementation of a tool for vocational and qualification counselling as well as a training for consultants and teachers to use the tool.

2.2 Implementation of the dual system, so that work-based learning is put into practice in the project countries.

Preparation and transfer of curricula and examination regulations for dual vocational training for different professions and implementations in Poland, Lithuania, Latvia and Spain.

Development, test and implementation Trainings for teachers to conduct dual vocational training as well as Training of trainers in SMEs.

2.3 Development political concept for the training and integration of young people with learning difficulties for young people with learning difficulties (EQF level 3).

Development, test and implementation of a dual vocational training "Specialist for Building Insulation”.

2.4 Development, testing and evaluation of education programme, teaching materials and examination regulations for the provision of sector-specific qualifications already during the initial vocational training for stronger learners. Implementation in the dual system, so that work-based learning is put into practice in the project countries.

2.5 Development and implementation five-year technician training „Ecologic Solutions in Logistics”.

3. Implementation and realization of further vocational training

3.1 Development and implementation of concepts and instruments for the management of continuing vocational training.

3.2 Development, test and implementation of a Train-the-Trainer program for teachers to conduct further training.

3.3 Development and implementation of a concept "SME-fair digitalization" as well as development, test and implementation of two train the trainer programs "Basic and advanced digital skills".

3.4 Transfer and implementation of four further trainings Energy Saving and Renewable Energies.

3.5 Preparation, transfer and implementation of six further trainings in the Green Economy.

3.6 Development, testing and evaluation of different training programs and teaching material for owners, managers and qualified workers of SMEs (EQF level 5 and 6). The trainings are specifically tailored to SME needs and different qualification levels and combine the transfer of technical, professional and management know-how.

- Training Enterprise and Entrepreneurship in Green Economy
- Training Energy Service Manager
- Trainings vocational Master Carpenter and Electric
- Training Construction Technician
- Training Service Technician
- Training Sustainability in foodservice industry

3.7 Development of regulations for new continuing education occupational profiles with a focus on the green economy.

3.8 Development of an integration programme for the unemployed (EQF level 4) in order to be able to place the unemployed in permanent jobs through further training seminars and a further training qualification.

4. Implementation and realization of higher education

4.1 Preparation and transfer of curricula, evaluation and examination regulations for two existing dual Bachelor degree programmes "Management of Renewable Building Energy Technology" and "Business Administration for SMEs".

4.2 Development and beginning of implementation of new dual Bachelor degree programs

- Business Administration & Sustainable Management of SMEs
- Entrepreneurship and Innovation in Green Economy
- Logistics - Green Supply Chains
- Service technician
- Tutorial "Sustainable management Climate neutrality for companies"

4.3 Development, test and implementation of four study modules (EQF level 6) on SME management in the Green Economy sector, which will be carried out in the dual study system and integrated into existing Bachelor degree programmes.

4.4 Development and implementation of concept for innovation promotion Solutions for manageable R&D tasks of SMEs and conducting manageable R&D projects for SMEs-

4.5 Development, testing and implementation of Training program for university lecturers and SME advisors.

5. Dissemination, transfer and use of the project results

5.1 Development of a concept and summary evaluation of the dissemination results of all partners

5.2Transfer of all educational measures to 60 educational institutions in 13 countries and needs-oriented implementation consultations as well as realization of a bundle of measures for further dissemination of the project results.

5.3 Further dissemination activities such as presentations online, at third-party events, press releases and conferences.

5.4 Book with all results of the project and distribution via book trade.

For each of the three levels of educational measures there will be:

- Target-group-specific educational programs.
- Curricula, teaching materials, etc. developed in a leading role by the educational institutions of the respective level, whereby the educational institutions of the other levels (in particular universities) participate in an advisory and supportive manner.
- Representatives of the participant target groups involved in the development work.

All educational measures will be tested with the respective target groups under different national conditions in the countries, evaluated and completed on the basis of the evaluation results with application notes.

About the training programs for strong learners in initial vocational training

The 3LOE project aims at promotion of work-based learning by introduction of dual vocational education and training, especially in countries with school-based vocational training. Dual training has proven to be particularly effective, however, attention should be paid to observe individual abilities and possibilities and better adapt to youth with different educational backgrounds, competencies, skills and learning progress, such as:

Level 1: Two-year training for youth with practical talents with a recognized degree (EQF Level 3)

Level 2: Three-year practical and theoretical training, completed with a recognized qualification as skilled worker/journeyman (EQF Level 4)

Level 3: Three- to three-and-a-half year's training for overachievers, including additional qualifications, completed with a recognized qualification above the examination level of skilled worker/journeyman (EQF Level 5)

Strong learners as well as trainees with proper training achievements in intermediate examinations can be granted a shortening of the regular vocational training time by up

to one year. Such shortening is to be limited to half a year, while the second half of the year should be invested in transferring skills in technology and management of the Green Economy. In a sense, this is comparable to an early training, delivered already during vocational training.

Regardless of ways of shortening the training period, additional qualifications can be imparted during the regular training period or, alternatively, upon completion of vocational training.

Imparting additional qualifications allows for

- attracting skilled workers who have already acquired in-depth knowledge and skills in environmental techniques during or immediately upon vocational training.
- prompting stronger learners (e.g. with Matura (Abitur) or school leaving certificate (intermediate level)) towards completing vocational training that will be equivalent to advanced training qualifications and will serve as a door-opener to perfect career opportunities.
- to increase the attractiveness of vocational training, to attract young people with stronger learning abilities to vocational training and thus to meet the high qualification requirements and to make an effective contribution to overcoming the high and growing shortage of skilled labor in the future.

Learning results are based at EQF Level 5. Additional competencies and skills imparted during vocational training (EQF Level 4) are largely inter-occupational. Only selective modules are job specific. The project will address in particular young people who are undergoing vocational training in relevant occupations, for example:

- specialists in wastewater technology
- specialists in recycling and waste management
- specialists in water supply technology
- plant mechanics for sanitary, heating and air conditioning technology
- gas and water fitters
- plumbers.

Following the example of VET, additional qualifications should be offered, if applicable, in a dual VET-system. To this end, in the project seven key modules will be used, with the following scope of training:

A Technologies in water supply

B Technologies in water saving

C Greywater and rainwater utilization technologies

D Decentralized wastewater treatment technologies

E Fundamentals of the circular economy

F Systemic solution-oriented consulting

G Customer service fitter

Participants may complete selective or all main modules, and for each completed main module an attendance certificate will be issued. Participants who complete all trainings

are entitled to an advanced training exam with the degree “Environmental Consultant in... (followed by the name of the qualified occupation)”.

As part of the project, curricula and teaching materials for six training courses were prepared and transferred to all COVEs, which were trialed and evaluated in various countries. This ensured that the different national conditions were already taken into account during the development and implementation of the activities, thus promoting their application in the different countries.

The six curricula with teaching materials were transferred electronically, made available on Google drive and published on the project website for permanent use by all interested parties.

The six training programs for high-performing learners in initial VET are listed below.

Work Package 3: First centre level "Vocational training" (EQF Level 3-4)

Activity 7: Additional Qualification Trainings

Training A – Water Supply Technologies

BEST PRACTICE CURRICULUM

Developed by:

KONTIKI in 2020 in the Project "Management and Technologies of Water, Waste Water, Waste and Circular Economy (WWW&CE)"

Prepared by:

Wirtschaftsförderungsinstitut (WIFI) Steiermark

August, 2021

Co-funded by the Erasmus+ Programme of the European Union

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Chapter 1: Executive Summary

The course "Water Supply Technologies" was developed in the project "Management and Technologies of Water, Waste Water, Waste and Circular Economy – WWW&CE", which was funded by the Erasmus+ Programme of the European Union. Eleven partners from seven EU Member States developed tools according to work-based learning principles that are piloted and evaluated. For more information: https://www.sa-ce.eu

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The course is part of a training package for "Environmental Consultants", dealing with six key areas of sustainable economy. The courses are designed to provide additional qualifications on the European Framework Qualification Level 3 to 4. Furthermore, the six courses are primarily designed for young people with strong learning skills for vocational training. Completing all six courses enables the participants to support others, especially small and medium sized companies, to steer towards a more environmentally conscious approach to their personal and business objectives in order to generate a more sustainable world.

The six courses in the "Environmental Consultant" programme are:

- A – Water Supply Technologies
- B – Water Saving Technologies
- C – Greywater and Rainwater Utilisation Technologies
- D – Decentralized Wastewater Treatment Technologies
- E – Fundamentals of Circular Economy
- F – Solution-oriented Consulting for Sustainable Development

Each course may be completed individually or as part of the "Environmental Consultant" training programme. For each participated and completed course, a participation degree is provided. The degree for this course, which is achieved with a successful completion of the course, is called "Consultant in Water Supply Technologies".

The main objective of the course "water supply technologies" is to introduce an environmentally conscious perspective of qualified professionals in the field of water supply technologies to

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attending course participants. Thereby, the participants are able to obtain qualifications in the field of sustainability in water supply technologies.

The course aims to provide participants with knowledge about water access, the necessity of sustainable water management and water saving to transform their own personal or business activities or consult others in these areas.

The course "Water Supply Technologies" comprises of following modules:

- Module I Climate Change vs. Climate Crisis
- Module II Water
- Module III Water Supply System
- Module IV Opportunities of saving water / drinking water

Chapter 1.1: Name of the Course

"Water Supply Technologies"

Chapter 1.2: Contact Details

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Körblergasse 111-113

A-8010 Graz

Tel.: +43 306 602 1234

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E-Mail: info@stmk.wifi.at

Web: https://www.stmk.wifi.at

To be adapted by each partner

Chapter 1.3: Type of Course

Training course for additional qualifications. Specifically, for qualification of young people with strong learning skills for vocational training.

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Chapter 1.4: Target Group

The target group of the whole "Environmental Consultant" training programme comprises of students in vocational training related to water management, water supply and sewage water management, skilled workers already working in these professional fields or other people interested in the topic of responsible water management.

Chapter 1.5: Competences Obtained

ENVIRONMENTAL MOTIVATION	Seeing the necessity of effective water management, knowing water supply technologies, the participant can act in spreading a water-saving life style. As a responsible user of water, the participant has knowledge and the intention to act in informing others of water-saving behaviour in business.
LEGAL KNOWLEDGE	Knowledge of EU Directives, international recommendations and conventions and domestic legislation on water management as well as in the necessity of water saving and sustainable development.
RESPONSIBILITY	Knowing her own and others' thoughts, personal and/or business behaviour and motivations, the participant can assess and compare these activities from the perspective of a responsible participation in sustainable water management.
CREATIVITY	Using technological knowledge, the participant can offer solution driven opportunities to new problems regarding water supply from a conscious and responsible water use perspective.
SENSITIVITY TO TECHNICAL PROBLEMS	With an approach towards responsible water management, the participant can interpret technical conditions, assess the enforcement of the aspects of purpose-oriented water use and water saving and support it with recommended technical solutions.
COOPERATION WITH OTHERS	Effective in exploring various problems, the participant can provide supportive cooperation with stakeholders and

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	professionals in designing and constructing water supply systems for small communities.
ATTITUDE TO SUSTAINABILITY	Sensitivity and information about a sustainable world, sustainable economy, deficiencies resulting from climate change, increase of population and the change of people's living habits and critical situations. Ability to consciously participate in actions for preserving life and resources for future generations.
PERCEPTION OF OPPORTUNITIES	Identification of connections for various existing or future technical conditions and responsible, economical water usage solutions suitable for the purpose.
RISK MANAGELENT	Reasonably taking challenges and risks, the participant can perceive emergencies in specific problem solving processes as well as manage those preventively and constructively.
APPROACH OF ENVIRONMENT CONSCIOUSNESS	The participant can perceive responsible water management and realistic water saving opportunities of human and technological processes related to the use of water.

Chapter 1.6: Course Duration

The course comprises of

- 74 contact hours,
- 46 hours of individual learning and
- 2 hours of assessment.

The total duration of this course amounts to 122 hours.

Based on the principles set out in the European credit system for vocational education and training (ECVET), the total of the following activities shall be taken into consideration in calculating the duration of the training:

- Contact hours (theoretical): expected number of hours of joint activity of teacher and student, including the lectures, processing teaching materials, seminars and workshops required to learn the theoretical parts.

- Self-study times (individual work): individual study some topic or technical literature by the participant of the training programme without supervision or participation in the training group.

- Assessment hours: time to prepare for exams including the time of the exams.

The training content is available via digital tools on a platform supporting distant learning for people living farther from the venues of the course or avoiding forms of group learning in order to prevent the spread of the COVID-19 epidemic.

Chapter 1.7: Required Prerequisites

The content of the course is designed as a training according to level four (4) of the European Qualifications Framework (EQF).

The participants entering the training programme shall meet at least one of the following requirements based on the content of the curriculum:

a) They attend a school or dual basic programme, they have appropriate educational results and they wish to obtain additional qualification in addition to their normal qualification.
b) They already have a completed vocational qualification and wish to obtain an additional qualification.

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Chapter 2: Curriculum

Chapter 2.1: Content of the Curriculum

Number	Module Name	Content	Training Time	
			Contact Hours	Self-Study Time
I	**Climate Change vs. Climate Crisis**	The participant is informed on the data and trends of climate change. She learns about the measures required due to the adverse effects of climate change. The participant can identify opportunities for change to mitigate climate change and act on it.	**4**	**4**
II	**Water**		**26**	**16**
II.1	**Presence and quality of water**		12	4
	Water types: surface waters, groundwater, spring water	Knowledge of basic facts about water, its use and the principles of sustainable water use. The participant has knowledge about the Water Policy Directive of the European Parliament, the Water Management Action Plan of the Commission and the relevant national legislation. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy		
	Physical, chemical and biological characteristics of water			
	Special waters: karst water, thermal water, drinking water			
	Water quality, regulation of drinkable waters	The participant knows the physical, chemical and biological characteristics determining water quality, is informed about national standards on drinking water quality and the domestic procedure of accepting drinking water quality of waters available in the area.		
II.2	**Water use, water demand:**		8	8

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	Agricultural water use	The participant is informed about the problem of water overuse. She knows the role of agriculture, construction and the food industry as well as other industries with high water usage. She knows the importance of providing required information to make residential water use more efficient.		
	Industrial water use			
	Residential water use			
	Water demand and water footprint	The participant is able to support others in establishing economical water/drinking water use.	6	4
III	**Water Supply System**		**32**	**18**
III.1	**Water Acquisition**		12	6
	Surface waterworks, pump, shaft, barrage, filtering bulkhead	The participant is informed about the circulation of water. She knows the characteristics and availability of waters found in various places. She can place water resources reached by wells and drinking water from the tap in the system of water management.		
	Acquisition of underground water: shaft, well, deep-boring well	The participant knows international directives and national regulations on water acquisition and protection of water quality. She is informed about natural and biological water cleaning technologies.		
	Virgin water, treatment plant			
III.2	**Water distribution networks**		8	8
	Pumps, network, reservoirs, pipe fittings	The participant knows the technological equipment and stages of water and drinking water supply. She can identify the water saving risks in technological processes, can call attention to situations and behaviours violating the principle of water saving.		

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	Water reservoirs, elevated water tanks and deep reservoirs	The participant can identify water supply facilities in her area. She is aware of the function of given facilities.		
	Pressure increasing equipment			
III.3	**Water network of buildings**		12	4
	Connection to public utilities, connecting pipeline, external base pipeline	The participant knows the structure of the drinking water system of the town or village. She can identify the parts of the community water network and the private water network and the responsibilities related to the operation. She can support the neighbourhood in solving problems related to their water supply.		
	Base pipeline in the building, rising and branch pipeline.	The participant knows the position of the base, rising and branch pipelines of buildings in housing estates. She can detect failures of the elements of the pipe network and the necessity of modernisation in terms of water saving. She can help providing ideas for the technical designing the installation of pipelines providing the use of drinking water and rainwater in prefabricated houses and detached houses.		
	Water pipeline installations and equipment	The participant is informed about the function of equipment and devices providing for various residential water uses. She can help others learn about equipment facilitating economical water use not worsening the quality of water use.		
IV	**Opportunities to save water/drinking water**		**8**	**6**

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	Use of water and drinking water	One knows typical areas of residential water use. Such as the water-demand of having a bath or taking a shower as well as the opportunities of replacing drinking water used to flush toilets. The participant can examine the phenomenon of wasting water/drinking water in their own environment. They can make proposals for savings by replacing equipment or using alternative water sources, e.g. rainwater. http://www.passzivhaz-magazin.hu/vizsporolas/ The participant knows the curriculum of the course on saving water and how to apply the contents.		
	Secondary impact (eating habits, etc.)	The participant knows the amount of water required for the production of basic foodstuff. One can inform people living in the area about the water saving opportunities directly available by changing eating habits (water demand of 1 kg of wheat is 1,000 litre and that of 1 kg of beef is 13,000 litre). https//www.fna.hu/hir/kisvaltoztatas		
	Rainwater, greywater	The participant knows opportunities of using rainwater and how to apply them.		
	Base pipeline in the building, rising and branch pipeline.	The participant knows the position of the base, rising and branch pipelines of buildings in housing estates. She can detect failures of the elements of the pipe network and the necessity of modernisation in terms of water saving. She can help in providing ideas for the technical designing the installation of pipelines providing the use of drinking water and rainwater in prefabricated and detached houses.		
V	**Assessment**		**2**	
		Total	**72**	**44**

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Chapter 2.2: Content of the knowledge acquired by learning the modules

Learning achievements	Questions and exercises related to the recommended content	No of hours	
One knows the causes and impacts of climate change. The participant is able to inform others of the dangers of climate change and the decrease of water resources.	Topic No.1: Presenting the phenomena of climate change. Tasks: 1.1. Explain the essence of climate change. 1.2. Describe the changes caused by climate change and their impact on everyday life. 1.3. Present the impact of climate change on water resources via examples. Present problems in people's everyday life resulting from the decrease of water resources. 1.4. Prepare a presentation in which attention of others is called to the problem of climate change and the decrease of water resources.	**4**	**4**
The participant knows the principles of responsible water management and the European Water Management Action Plan.	Topic No. 2: Presence and Quality of Water 2.1. What is described in the action plan about surface water? What measures are feasible? 2.2. What characteristics of water is assessed as critical in the action plan and why? 2.3. What does the UN say in relation with individuals about drinking water? 2.4. Prepare a presentation about the water sources found in your living area and their physical, chemical and biological condition.	**12**	**4**
One is informed about the major problems of national water management and the issues directly affecting the population.	Topic No.3: Water use, water demand 3.1. Which sector/industry and the production of which foodstuff requires the most water? Explain your answer. 3.2. Is the major cause of water scarcity that there are many of us and we drink a lot of water? Or something else? 3.3. What do people use most drinking water for in their everyday life? 3.4. Calculate your own water footprint.	14	12
The participant knows the	Topic No.4: Water acquisition	12	6

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technological principles and practice of water acquisition and water purification	4.1. What is the national regulation applicable for waters from private owned wells? 4.2. What is the national regulation applicable for the extraction of thermal water and mineral water? 4.3. What is virgin water? 4.4. Describe a spring with drinkable (drinking water quality) water supplies in your country.		
One knows the system of water supply networks, the facilities and structures of water storage and pressure boosting.	Topic No. 5: Water distribution networks 5.1. What typical technical components does a water network of a settlement consist of? 5.2. What is the difference between a water storage tower and an electrical pressure booster equipment? 5.3. Who owns the pipeline? Who is responsible for repairs a) under public roads? b) in the staircase of prefab houses? c) in the bathroom? 5.4. Prepare a digital photo folder of water reservoirs and pressure boosters (e.g. water storage tower). It shall consist of at least 10 images.	8	8
The participant has technological knowledge of the water network of buildings. One can provide professional help in the installation a selection of water saving network fittings.	Topic No. 6: Water network of buildings 6.1. Can anyone connect rainwater to the water pipelines? 6.2. Can we flush our toilets with rainwater? 6.3. The boiler is far from the place of washing-up in the detached house. No problem because hot water gets there quickly. It is a problem because we need to waste a lot of colder water in the pipeline before the hot water gets there. What do you think we should do?	12	4
The participant knows and represents the	Topic No.7: Opportunities of saving water/drinking water 7.1. I take water from my own well. Should I take care of my water consumption?		

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importance of water saving in her environment.	7.2 Where can I get more information about saving water if I am interested?		
	Total	**114 +2 for assessment**	

Chapter 2.3: Teaching/Learning Equipment and Literature

Theoretical training: classroom equipped with school furniture, laptop computer, projector, internet access, presentation equipment.

Literature/Sources:

- Course books, e.g. Imre Horváth Vízellátás és csatornázás (Water Supply and Sewage Systems) Szent István University 2011, https://regi.tankonyvtar.hu/hu/tartalom/tamop412A/2010-0019_Vizellatas_es_csatornazas/index.html
- professional materials pl. https://kontikionlineschool.com
- documents related to responsible water management, information materials of local water suppliers,

Chapter 2.4: Further recommendations:

Learning methods: Lectures, discussions, teamwork, projects, presentation practice and virtual technological presentations, on-site inspections.

Requirements for the trainer's qualification: Instructors shall meet the applicable domestic legal regulations.

Chapter 2.5: Competence Level Testing

The assessment of the program and identification of competences (examination) consists of two parts.

1. Assessment of theoretical knowledge (multiple-choice test of 20 questions)

2. Presentation related to the topic of a module

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After the examination, the participants receive a competence certificate or certificate of participation depending on the result of the examination.

By completing the other 5 courses, the participants of this course can obtain the qualification of "Environmental Consultant".

Chapter 3: Teaching Materials

The present aid aims to provide support trainers involved in the implementation of the professional program of the course that assist the processing of the individual training modules in order to inform them about the role of the areas processed by them in the course. It shall help trainers find their ways in methodological issues of the course also facilitating the methodological freedom of trainers and the diversity of processing the training contents.

In the course of the contextual processing of the specific modules, special attention shall be paid to the fact that the contents to be processed shall be significantly different for the participants of the course from different countries because of the difference of the natural characteristics of the given countries. e.g. For participants from seaside countries, seawater shall have a significant role in the water base while rivers are the basic part of the water base in other countries.

Another similarly important aspect of processing the contents is that in addition to general knowledge and learning about technical development and innovation, the technical solutions and technologies already present in the daily practice of the given country shall be presented as well as contents and practical activities helping the utilisation of new theoretical knowledge in the local practice.

The shared content of the courses to be held in different countries and thus the uniform set of competences of individuals completing the courses to be organised in different countries and qualification obtained at the course that is accepted in any country is ensured.

The completion of course contents with contents considering local characteristics and processing these considering actual technical solutions shall ensure the direct usability of the course for participants.

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Chapter 3.1: Climate change vs. climate crisis

The participants are informed of the data, phenomena and trends of the climate change. They agree with the measures required due to the adverse effects of climate change, they can identify opportunities for change slowing down climate change in their own life and acting for it.

This is the introductory part of the course in terms of content:

The trainer has a twofold role in this part. On the one hand, attention shall be called on the negative tendencies of general natural processes, waters and availability of healthy drinking water. On the other hand, it is an aim to be achieved that participants of the course shall be capable of becoming representatives of necessary and possible measures to be taken for the availability of healthy drinking water for the following generation for the people living in countries poor in water, starting and facilitating local initiatives.

We recommend to process the problem of climatic change and climate crisis on the basis of the summary found on the website of the Earth Day Foundation (http://fna.hu/vilagfigyelo/eghajlatvaltozas) and the European Environment Agency and other documents, completed with the personal experiences of the participants.

In the contextual work, the document European Environment Agency Signals 2018 Water is Life, (https://www.eea.europa.eu/hu/publications/eea-jelzesek-2018-viz-elet), which presents the current situation, calls attention to the unfavourable trends and is thus contains suitable topics for discussion.

Certain parts of the report provide good basis for professional discussions but may also form the basis for processing individual issues individually or in small groups.

"European rivers, lakes and seas are threatened by pollution, overuse and climate change. How can we ensure the sustainable use of this critical resource?"

- Clear water = life, health, food, free time, energy ...
- Water usage in Europe - Expected great challenges of quantity and quality;
- Serious risks threatening underwater life;
- Vast amounts of plastic
- Climate change and water - Warming oceans, floods and droughts;
- The Dutch give place to the river

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- Water in the city
- Malta: shortage of water is part of life
- Management - Moving water

Presenting specific issues, the report summarises the most important topics related to water. By collecting the personal experiences of participants throughout the course, the necessary environment for professional cooperation and thinking between the participants of the course and the trainer may be established.

After identifying the problem, the possibilities of sustainable water management and development of country strategies is aimed at, but working on certain parts of the document the Blue print European Water Management Plan of action (http://publications.europa.eu/resource/cellar/4890db5a-ddc9-4181-9d39-8a277faef30b.0013.02/DOC 1) may ensure the identification of individual opportunities for action for individual participants of the course.

e.g. Water quality or water quantity? "To do more" for water „„; Water worldwide;

Working on these two documents completed with local professional materials is suitable for the participants to learn the causes and effects of climate change. She thinks it is important to inform others of the dangers of climate change and the decrease of water resources. Most of them may be made to become committed to completing their activities with responsible thinking and action about our waters.

The different knowledge of participants of the course are sufficiently completed with less known content and thus the shared basis of approach and knowledge required for the success of the course is created.

Chapter 3.2: Water

Chapter 3.2.1: Presence and quality of water

- Water types: surface waters, groundwater, spring water
- Physical, chemical and biological characteristics of water
- Special waters: karst water, thermal water, drinking water

Presence of water in nature

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Earth as a space of reaction: The Earth is a closed system in terms of chemistry in an exchange of materials with its environment.

The entire surface of the Earth:

- 70.8 % water,
- 29.2 % ground.

Water on Earth

- Many living creatures mostly consist of water, including humans. About 60 % of the human body is water.
- Water is a raw material, an accessory or a shipping medium for many industries.
- 97% of water is found in oceans.
- Major fresh water resources are the polar ice and glaciers. Groundwater and surface waters are the most important sources covering our water demand.
- The total fresh water consumption of the world is over 3,000 km3.
- Two characteristic conclusions can be made for natural water resources:
    - The best quality and largest reserves are found far from human civilisation and thus we can directly use far less than 1% of these.
    - The usable water reserves are constantly renewed due to the circulation of water, which is in close relationship with the heat balance of the surface of the Earth.

Water resources are distributed unequally on the Earth. Just like overall the Earth, there are significant differences in Hungary between individual geographic areas in terms of water resources and water quality. Different waters all results from precipitation. Part of the precipitation on the surface of the Earth moves on the surface and part of it escapes to the soil.

Precipitation on the surface moves in beds in the forms of rivers or results in different lakes. These spatially unequally distributed water resources are associated with the significant changes in time according to the changes of the amount of precipitation.

Global Circulation of Water

it is nothing else but a huge distillation process operated by solar energy with an annual circulation of about 423,000 km3. Oceans send approximately 37,000 km³ water to the land which is compensated by the land with a similar amount of water through the rivers.

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Water exchange between the deeper and surface layers of oceans is so intense that fresh water flowing into the sea may only have regional effect on the composition of the surface layers of oceans. These surface layers are the scenes of biological activity.

The circulation of water in nature (flow of material is given in the unit of 103 km3/a).

Water Resources of the Earth

Water sources	Quantity 1015m³	Mean residence time/a-1/ → [1/year]
Ocean	1.340	
- surface layers	57	80
- deep waters	1,283	1,600
Polar ice and glaciers	28	5.000
Groundwater	8	600
Lakes and rivers	0.2	7
Atmosphere	0,0015	0,0036
Total:	1,376	

Opportunities of obtaining water

The water serving for water supply purposes may originate from:

- underground
- surface and
- reused sources

Surface water leaking into the soil is called groundwater. The different organic and inorganic microorganisms taken from the ground are found in groundwater. Waters leaking to the greatest depth (deep groundwater, artesian water) do not contain these because the previous materials are filtered out while leaking downwards. Underground waters are therefore more favourable for water supply purposes. Karst water is an important group of underground waters, which is found in the cracks, and holes of limestone and dolomite.

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Water moving or standing on the surface lies according to the hydrological circulation, which is developing into a bigger and bigger unit, and then it will find its place in the sea. Typically, it takes different organic and inorganic materials from its surface. Accordingly, the pollutant, nutritional component and microorganism content of water must be analysed before any water use and it requires cleansing if necessary.

Surface water:

- river,
- lake (natural),
- artificial reservoir,
- sea water.

Hydrological factors directly affect surface waters, their characteristics directly influence: temperature self-cleansing capacity, diffusion processes, physical, chemical, biological cleanliness. Among surface waters, the artificial reservoirs e.g. riverbed reservoirs, barrage dam reservoirs, cofferdam reservoirs ensure most favourable water management. Thus, the supply problems due to water discharge and quality fluctuations may be significantly reduced if the place of the reservoir was well chosen and operation is careful.

The relation of surface water (groundwater) to hydrological factors (e.g. precipitation supply, evaporation) is close; therefore, its characteristics influence the water production (e.g. producible water quantity, the level of water surface) variously. Environmental impact on the physical and chemical characteristics is quite direct (pollution by towns or fertilisers) and thus makes use as drinking water more difficult.

Karst water and crevice water is less protected and its quantity and quality may be more variable. Water moving and accumulated inside the karst. It gets to the cracks and channels of the karst from the surface partly by gravitational percolation and partly via swallow holes.

In case of industrial use, the drinking water must be chemically softened and disinfected, because it is not sufficiently purified due to the lack of natural filter layer (gravel, sand). Domestic karts water is heavily used particularly in industrial areas (Miskolc, Várpalota, Pécs).

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Physical characteristics of water	
Appearance	Clear water is a transparent, odourless and tasteless liquid. It may be solid (ice), liquid or gas (steam) depending on temperature and pressure. It may contain liquid, gas and solid substances in solved (e.g. alcohol), emulsified or suspended forms. These solved substances enter the water from the air, the soil, the bottom of the bed or the surface of the catching area.
Density & Viscosity	The density of seawater is greater because of its salt content, thus swimmers can stay more easily on the surface. The salt content of seawater is almost constant, approximately 3.5% irrespectively of geographic position. The salt content means increasing density and pollution to the chemically clear water and this result in the decrease of freezing point and increase of boiling point. Freezing point and boiling point of water depends on the extent of pollution not only on pressure. The freezing point of seawater is -2.12 °C on average. Density of water changes according to the temperature of water. Liquid water reaches its greatest density at 3.98 °C.
Temperature	Temperature conditions of natural waters and water resources change according to their origin. o The temperature of surface waters is strongly varying depending on hydrological conditions. o External conditions have smaller effect on the temperature of waters below the surface of the ground, so called groundwater. o The temperature of water is more and more constant towards the deeper levels. o Depending on geothermal conditions in deeper layers, at the depth of a few 100 metres or perhaps around 1,000 m water resources may be found with very high temperatures up to 80 - 100 °C.

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	Water is an excellent heat controlling medium and accordingly capable of storing external heat. This is very important in civil engineering systems.
Odour & Taste	The odour and taste of water depends on the gases and salts solved in it. Odour and taste of water is also influenced by the masses of dead microorganisms and organic matter found in water.
Colour	The colour of natural clear water is colourless if the thickness of layer is little and pale bluish if the thickness of layer is large. The colourful, suspended, floating substances in the water cause the apparent colour of water. The solved substances and communal and industrial sewage in it determine the actual colour of water.
Absorption of light	Absorption of light - a very important function. Photosynthesis is an energy storing process where green plants containing chlorophyll use the energy of the sun to create organic substances (glucose) from inorganic substances and produces oxygen as well: Plants only use red, violet and blue light, due to the light absorption characteristics of chlorophyll. o certain bacteria and other living organisms die in solar radiation o natural colour of water becomes colourless due to photochemical effects → self-cleansing

We primarily deal with those physical characteristics, which are most important from the point of view of water supply and sewage. These physical characteristics (temperature, odour, taste, colour, cloudiness, floating substance content) highly influence the nature of water.

- Temperature is under the effect of solar energy and therefore may be strongly fluctuating.
- The viscosity of water depends on its temperature, which affects the production of water production plants.
- Temperature of water strongly affects the activity of microorganisms in surface waters. Change of temperature causes flowing phenomena in different water spaces and this change results in quantitative consequences and the change of the efficiency of certain equipment.

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- The presence of certain substances turns out by senses and may result in such changes of quality that may result in the partial or total uselessness of water.
- Colour affects the enjoyment and usability value of water. Natural, clear water is colourless or pale bluish in colour if it is thicker.
- The content of floating substances characterises the settling, non-settling and floating materials, which may have granular or flaky structure. Larger granules may be removed by settling and fine granules may be removed by biological clarification. Cloudiness of water is caused by the amount organic, inorganic, insoluble and colloid particles found in it.

	Chemical characteristics of water
General	Formula of water molecule: H^2O. In reality, there is no chemically clear water in nature. Organic and inorganic substances greatly influence the quality of water. Major characteristics of chemical components: solute oxygen, oxygen saturation, oxygen consumption (chemical oxygen demand) COD, biochemical oxygen demand BOD, total solved salts, colloid ion, sulphide, sulphate ion, calcium ion, magnesium ion, hardness, ammonia, nitrite, nitrate ion, iron, manganese in, carbonic acid, pH, phosphor, phosphate, toxic substances.
Hardness	Hardness of natural water is caused by calcium and magnesium ions and plays a very important role in the practice of civil engineering. The following characteristics of lime scale cause the greatest problem: o its heat conduction is worse than that of steel therefore if it is deposited on the internal surface of a heater, it has heat insulating effect, o it facilitates the corrosion of metals particularly at higher pressure and temperature, o Its thermal expansion differs from that of steel therefore the limestone layer deposited on the steam boiler body my chip off unequally causing harmful heat tension in the steel structure of the steam boiler.

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	Soap has worse foam in hard water and its cleaning effect is weaker. Women liked to wash in clear precipitation water because the washing agent has good foam in soft rainwater. In domestic practice, hardness is measured in **German degrees: nk°.1 German degree** water has calcium and magnesium salt equivalent to 10 mg calcium oxide (CaO) solved in 1,000 ml of water. Drinking water quenches thirst because it contains the right amount and rate of salts with changing and constant hardness.
Toxic materials	Mostly enter water with sewage waters, e.g. lead, arsenic, zinc, etc. Toxic The quality and usability of water is greatly affected by the toxic components. Radioactive pollution is also harmful which may occur in waters by mining and power plants. It must be treated by cleansing.
Carbon dioxide/carbonic acid content	Carbon dioxide (CO2) may enter water due to the contact of water and air as well as the biological and chemical processes in the soil and water. The carbon dioxide (carbonic acid) content of water in nature is significant in civil engineering because carbonic acid is aggressive and attacks structures made with lime, concrete and metal.
Biological and bacteriological characteristics of water	Biological community of water: Living creatures in water form a living community, the members of which may be grouped according to their role played in the transfer of energy: o Producers produce (photosynthesis) organic substance (sugar) from inorganic substances, water, carbon dioxide with the help of chlorophyll and sunlight. Green plants belong here. o Consumers build the organic substances produced by the producers into their bodies. Plants without chlorophyll, fungi and animals belong here. o Reducers decrease dead producers and consumers and their excreta to inorganic substances. Thus, they make those substances available again for producers. Bacteria belong here.

Plants and animals in water

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Waters are inhabited by many kinds of plants and animals. Physical and chemical characteristics of water provide the conditions for life for living organisms. Huge numbers of living organisms are present and conduct metabolism and the products of metabolisms as well as the dead, reducing substances of organisms form the quality of water.

Bacteria, algae and viruses are plant organisms. Bacteria consist of microscopic size cells and are usually harmless to people. Algae (seaweed) are unicellular or multicellular and they are alone or in colonies. The produce oxygen in sunlight so their presence is beneficial. However their presence is harmful in several areas, e.g. it causes odour nuisance if settled on the walls of swimming pools or in filters. Viruses are parasites building in cells and causing different poisonings.

Animal organisms use the organic material of plants living in water and obtain energy by breaking them down. Most microscopic animals are predators. Unicellular organisms (Zooflagellates, Amoeba, Ciliates) and multicellular organisms (Sponges, Rotifers, Cnidarias, Arthropods and Mollusca) feed from water plans and these are consumed by animals from higher classes.

Working on all these topics with the participants of the course together or individually (in small groups) and the competence of the participants include knowledge of the physical, chemical and biological characteristics determining water quality.

Water quality, regulation of drinkable waters

- Water quality is the summary of physical, chemical and biological characteristics of water. These characteristics may be developed in the course of the circulation of water in nature, which creates the water quality in question. The other effect that plays a role is the social circulation of water, i.e. the result of human water use, which usually generates unfavourable changes in quality.
- The quality of water is in constant change in the course of natural circulation, which may be either favourable or unfavourable from the perspective of water use. Features, which are unfavourable in short terms, may become favourable in long terms in nature, which take place in self-cleansing or natural cleansing.
- In the course of social circulation, the quality of water is endangered even more due to increasing water pollution. Favourable change of quality can be achieved by self-cleansing, dilution or increased quality control technologies. This latter is increasing by recognising the damage of natural environment.

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- The quality of underground waters is variable and can be improved to drinking water quality by dimerization, demagnetization, deacidification, degasification, or disinfecting. Many of the cleansing technologies can be performed in one device simultaneously.
- The quality of deep groundwater (e.g. artesian water) is usually favourable and constant; it can be seen as protected. It is much more protected from the effect of human activity than groundwater close to the surface.
- Spring waters of mountain areas are usually of drinking water quality.

Purpose of bacteriological qualification

- in the course of qualification, it is specified if there are any bacteria in the water and what type they are,
- Quantitative tests specify the extent of bacteria living in water.

Coli bacteria may be released to natural water from the human digestive tract. Water is qualified in terms of health on the basis of coli-titter. Coli-titter is the smallest amount of water in m^3 from which the Coli bacterium can be started. The larger this amount of water, the cleaner the water.

Another way of bacteriological qualification is the specification of total seed count. Bacteriological infectors with different names belong to this group of concepts. The most frequent of these is the pseudomonas, which causes gastric ulcer.

Limits for the water quality

If the pollution of surface water or background water reaches a critical level and the self-cleansing effect of bank filtration cannot cope with the continuous cleansing, it will get exhausted. In such event the quality of bank filtrated water cannot meet the regulations and requires cleansing for certain components.

The significance of water quality greatly differs depending on the purpose of water use. The difference between water for human consumption and the water required to flush toilets can be easily understood. The quality parameters for the specific purposes of use and the limit values for water quality are included in domestic regulations based on Directives of the Council of the European Union. (Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption and Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment, etc.)

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As a result of processing the above contents the competence of the participants of the course shall be completed with knowledge about water and the use of water as well as the principles of sustainable water use. They have knowledge about the Water Policy Directive of the European Parliament, the water management action plan of the Commission and water quality as well as the relevant national legislation. Directive 2000/60/EC establishing a framework for Community action in the field of water policy, Blueprint – Brochure,

Additionally, the participants of the course have sufficient knowledge of the principles of responsible water management, the European water management action plan and the necessity and system of qualifying waters for different uses.

Chapter 3.2.1: Water use & Water demand

Categories:

- Agricultural water usage
- Industrial water usage
- Residential water usage

Water demand

Water demand expresses the different water uses related to human activity. There is water demand directly serving human existence represented in different forms (communal, public spaces, watering, fire extinguishing, etc.) in urban areas. The other one occurs in business activity where assets are produced.

Major groups of water demand:

- Settlements,
- industry, construction industry,
- transport, telecommunication,
- commerce,
- agriculture,
- other production industry.

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The total water demand to be provided is expressed in l/person/day. Several factors affect the water demand of settlements (climate, type of building constructions, sewage, urban structure, etc.) which may also change in time due to development. The mean daily water demand (Qn) is specified for the design of the water treatment plant by multiplying the mean specific water demand (qn) and the number of residents (N).

The highest daily water demand is the highest water demand occurring on any day of the year: multiplier referring to the nature of water use.

The highest hourly water demand (Qh m3/h) is an important index, the value of which may be calculated with a formula where βn = 1.1-4.0 shall be the factor expressing the daily change in water demand.

The water demand used for business activities changes in a wide range occurring in the form of cooling water, boiler feed water, technological water, rinsing, washing and solving water, water in product, classifying water and other water. Its value can also be determined specifically for a product unit.

In industrial use, water is typically used in different stages of the production process, several times in certain cases; moreover, it is often used again using recirculation. This recycling may be used together with cooling and water cleansing, significantly reducing costs of water use.

Most of agricultural water use is utilized for satisfying the water demand of plants produced and animals bred for human consumption. 92% of our water consumption is hidden in our food. The amount of water used for certain foods is the amount of hidden water, for example 1 cup of coffee is 140 litres, 1 kg wheat is 1,000 litre, 1 kg rice is 1,400 litre, 1 kg beef is 13.000 litre.

All these topics completed with the content presenting the specific situation of the given country may help participants of the course become informed of the problem of water overuse. She knows the role of agriculture, construction and food industry as well as other industries in water use. She knows the importance of providing information required to make residential water use more efficient and ready to take part in this work.

Water demand and water footprint

European Environment Agency Signals 2018 Water is Life. It can help others establish economical water/drinking water use (www.fna.hu/mittehetsz/vizlabnyom).

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Chapter 3.3: Water Supply System

Chapter 3.3.1: Water acquisition

Conduction through surface waterworks, pump, shaft, barrage, filtering bulkhead and so on.

Opportunities of obtaining water: In order to practice any water use, it is critical to have sufficient water resources accompanied with water acquisition opportunities and water producing facilities. The harmony between these may be ensured by careful technical design.

Water acquisition	
Surface water	○ stream ○ lake ○ artificial reservoir ○ natural reservoir (sea)
Underground water	○ bank filtrated water ○ groundwater ○ deep groundwater ○ spring ○ karst water

Efforts are taken to use available underground waters first for quality reasons. By the periodic increase of water demands, surface waters are used more and more. The quality of underground waters is usually or can be improved to drinking water quality e.g. by deferrization, demanganization, deacidification, degasification, or disinfecting.

Acquisition of surface water

Surface waters are usually suitable for the production of large amount of water but less clear. Production costs are lower but cleansing costs are higher compared to underground water sources. For example, the Hungarian waterworks take efforts to use underground waters primarily and surface waters secondarily considering the above circumstances too.

There are areas in Hungary where surface water constitutes a significant part of the total water amount provided by the water supplier. One example of this is Debrecen where significant amount of water is taken from the Eastern Main Channel (Keleti Főcsatorna) and after cleansing it is mixed to the water of deep wells. This mixed water enters the consumer network then.

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Vacuum water extraction is used if there is sufficient depth of water and large waterflow is available. Water flows from the nozzle through the discharge pipe to the pump, which sends it to the cleansing plant. The rack rake in the nozzle prevents pollution e.g. flotsam or ice from entering.

Shaft water extraction is usually used in case of strongly changing water levels or small depth of surface water. Water flows through the rack rake through the extraction space to a large shaft from where vertical pumps lift the water. Depending on demand, this technical solution may be designed practically for any capacity. The water space is in the bottom, the pipe and pump area is in the middle and the motor and the control space is located on the top of this.

In case of natural (e.g. sea) but mostly in case of artificial reservoirs, barrage dam water extraction may be applied. The controlled water extraction and auxiliary equipment is built in the barrage dam holding the water. It is an important condition that the reservoir shall have an automatic barrage spillway and the water required in the dead space shall always be provided.

If water needs to be extracted from not very deep lakes, then the filtering dam water extraction provides good protection against alleviation, ice and other harmful effects.

Acquisition of underground waters

Bank filtrated waters are produced when water leaking from the riverbed to the bank is found in larger amounts under the surface. Significant amounts are generated mostly in gravel and anomalistic rough grain alluvium. Bank filtrated water is usually extracted by wells. Most applicable well types are dug wells, twin wells, horizontal wells, and gallery. Bank filtrated water is produced as a result of a slow leakage and cleansing process however it may occur that in spite of this there may be substances in the water requiring certain subsequent cleansing. In such cases, the cleansing process is performed according to the suitable technology.

Water infiltrating from precipitation occurs in varying depth and amounts due to underground soil layers and geological characteristics. Pollutants in the water are filtrated in the soil due to infiltration so in some cases good quality water can be acquired. The deeper the water, the better the quality. If the riverbank band is not drained, water moves in two directions. In case of artificial draining, the major direction of flow is towards the draining equipment. Bank filtration is a slow filtration process, which means that the infiltrating surface water is cleansed by physical, chemical and biological processes.

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Bank filtration can only clean not very strongly contaminated virgin water, river water or infiltrating background water. The advantage of bank filtration is that it is a genuinely natural type of process and cleaning is provided by nature, the cleaning process takes place under the laws of nature and is free of costs.

In larger rivers, if there is sufficient a discharge pipe in the direction of flow may extract depth of water, water. The fundamental structure to extract underground water is a well or gallery completed with their combination, i.e. the horizontal well and the gallery shaft. The shaft can be considered as a specially built well.

Structures for the water extraction

- deep drilled wells
- shallow water extraction structures
    - dug wells
    - drop-shaft wells
    - driven wells
    - shallow drilled and twin wells
    - galleries
    - horizontal wells
    - shaft
    - spring water collection

Through topics worked on individually or in small groups, presentations and discussions on them, the knowledge of the course participants about the circulation of water, the characteristics and conditions of the availability of waters found in different places should become extended.

Virgin water & treatment plant

Water produced by wells is called virgin water. The extracted liquid is not usable without some cleansing in most cases.

Transportation of virgin water to the treatment plant - water can be led from the place of extraction to the treatment plant in several ways:

- By gravity if the treatment plant is below the level of extraction.

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- In case of a syphon system, the syphon pipe transfers water to the collection shaft. It is forwarded from the shaft by a pump.
- A pressure pipe is required if the water treatment plant is at a higher level than the place of water extraction.

Chapter 3.3.2: Water distribution networks

Appliances: Pumps, networks, reservoirs, pipe fittings,

Water is transferred to the consumers in the pipeline network. This system consists of a water extraction point and the connected water treatment plant. The two facilities are connected by a large diameter main pipeline. The piping network branching from the main pipeline in various diameters complete the system.

Several aspects may be enforced in the course of design and accordingly the pipe network may be constructed in several ways. Most frequently used network types:

- In branching systems the pipes branching from the main pipeline receive water from one direction only, they reach the consumer in the shortest possible way and they are dead-ended. The advantage of this type is that the length of pipes is the shortest and its disadvantage is that in case of broken pipeline, the supply is interrupted and in case of lack of consumption the dead water suffers deteriorating quality and there are great changes of pressure depending on consumption.
- In interconnected systems there is no section-ending pipe, water may be received from both directions in each section, therefore there is no interruption of service, fluctuation of pressure or dead water. More pipes are needed than in the previous type but the advantages make up for this.
- In looping systems the main pipeline turns back to itself (loop) to which the also looping branches are connected. In this system, the previous advantages are even more increased.
- In combined systems, especially in big cities where there are several water treatment plants and reservoirs, the combination of looping and interconnected systems are formed with all the advantages of these.
- Several advantages can be used in designing the network in horizontal lines because by changing the route of the pipes of different diameter and in vertical routes by adapting well

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to the relief a balanced solution may be found with good quality indexes and ensuring economic operation.

- In horizontal routes the main pipeline connecting the water treatment plant with the reservoir, i.e. the largest diameter pipe of the system may also be a supply pipe if the water treatment plant receives water from the reservoirs.

Pipeline sections with different, usually smaller diameters and capacities branch off from the main pipeline, depending on the water demand resulting from the population density. All consumers must be reached through some pipeline.

The main pipe has the largest diameter (300-500 mm) to which the smaller and smaller pipes are connected with decreasing diameters. The last pipe connected to the land of the consumer may have 80-100 mm diameter suitable for 5-10 l/sec water supply.

In case of vertical routes the pipeline may be used both is slope and elevation because the pipe transmits water by pressure flow with full section. Relief conditions can be adapted to well by correct route design.

In the course of designing the pressure conditions, care shall be taken to take the pressure-bearing capacity of the pipes into account and on the other hand that every point of the system shall be under pressure at all times. Water reservoirs, elevated water tanks, deep reservoirs as well as pressure increasing equipment is used to overcome difficulties.

The high reservoir has several functions. Thus, its placement to the axis of gravity has a balancing effect and it has a storage and pressure control function too.

In places where there is hilly land between the water treatment plant and the consumer, the flow-through water reservoir is suitable when the total amount of water flows through the reservoir and water gets to the consumers due to the prover of gravity. The operation of the return pressure reservoir depends on the relation of the pump and the consumer.

If pumping is stronger than consumption, the difference will enter the reservoir and if consumption is higher water will be used from the reservoir. The gravity reservoir is usually located on the centre of the area to be supplied on flat land where the pressure conditions are almost identical and the axle of gravity controls the network. If however it is used in a hilly area, it will work like a flow-through system.

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The vertical placement of the reservoir is influenced by several circumstances. The flow-through reservoir must be placed higher if it is placed farther from the supply area. The situation is similar in case of return pressure reservoirs. If axle of gravity reservoir is used, then effort must be taken to have equal pressure in the system in all directions from the reservoir because if the reservoir is removed from the axle, higher position is required in the new place.

The water treatment plant supplies the lower zone with the lower high reservoir and then an intermediate pumping station pumps the water to the higher high reservoir, which supplies the higher zone. The capacity of the reservoir is also the task of the designer where the question of economically satisfying the water demand at all times also plays a role. The reservoir always serves to equalise the difference between consumption and pumping in water supply systems and this is usually performed during 24 hours operation.

According to the Hungarian guiding principles, the built-in high reservoir provides 25-30% of the daily water demand and the water tower provides 10-20%. This ratio is important for safety due to malfunction.

Function of pressure increasing equipment

In places where there is no water network service or the system cannot completely satisfy consumer needs at all times, pressure-increasing equipment can ensure that consumers always have sufficient amount of water at the required pressure density. Pressure increasing equipment help keep pressure nearly at the same level in the consumer network and - reduce potential service problems arising from the excess water demand of consumer peaks with some water storage.

Measures for saving the water supply:

- the water pressure in the consumer network must reach the necessary minimum value
- the water pressure must not be higher than the highest value according to the technical requirements
- the pressure fluctuation must be as little as possible
- in case of certain buildings, at the draining equipment in the most unfavourable position there must be the required amount of water available at the appropriate pressure.

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Technical equipment to increase water pressure

The required pressure may be achieved in the water network by pumping. High reservoirs are suitable to control pressure because the operating water levels in the reservoir cause much less pressure fluctuation than the pumping solution without reservoir.

The turn on/off pressure value of the pumps of the compressed-air reservoir pressure increasing equipment determines the fluctuation of pressure in the network.

If the pumps are operated by continuous velocity control, much lower pressure fluctuation may be expected.

There are two different functions of the pressure increasing equipment, i.e. equalising the peak consumer demands and providing and controlling pressure can be solved by two group of machines, the reservoir and the pumps.

Increasing pressure by atmospheric high reservoir tank

The water pressure required in the consumer network is ensured by the pressure of the water column generated by the high positioned open atmospheric tank but still closed construction for hygienic reasons.

In order to ensure the required outflow pressure at the highest level, the lower static water level of the tank must be at least 8 metres above the highest water tap. In case of such pressure increasing equipment the highest water pressure is found at the taps on the lowest level.

The course does not aim to present the technological tools and stages of water supply and drinking water supply so after the brief introduction of the network, collecting the experiences of water users may help participants of the course become able to identify the water saving risks in the technological process. This way the participants become able to call attention to situations and behaviours violating the principle of water saving.

The participants can identify water supply facilities in their area to increase awareness of the function of the given facilities.

https://www.pannon-viz.hu/cikk/viztorony_sorozat_a_negyedik.html,

https://www.mozaweb.hu/Search/global?search=viztorony&lexikontypeid=7

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Chapter 3.3.3: Water network of buildings

Connection to public utility network

Connection to the public utility network may only be performed with the prior permit of the competent water supplier after arrangement of utilities. Arrangement of utilities shall also be performed with collaborating service providers in order to become familiar with the position of other utilities (sewage, gas, distant heating, telecommunication and electric cable).

Drinking water network or connection to public utilities may only be developed with pipelines with certificate of compliance and allowed by a standard or any other accepted technical regulation. Only the service provider may connect the connection pipe to the public utility network. Internal water networks based on private well must be constructed so that later it can be connected to the public utility if it is constructed.

If there are pipe networks within the facility both based on private well as well as on the public utility system, those must be operated so that the two must be completely independent from each other.They must not be combined at all.

Water of non-drinking water quality may also be used for industrial technological purposes. A separate pipe network must be constructed for these, which must not be combined with the drinking water network connected to the public utility network. Such industrial technological use may be the cooling water of cooling circuits or water used for cleaning floors in the food industry. The quality of fire extinguishing water may be equivalent with the quality of industrial water.

If the water supply is provided by collecting and storing rainwater in addition to tap water, it is important to consider its use as a private well.

Connection pipe

Connection pipe is the pipe section until 10 cm beyond the water meter in the water meter shaft inside the border of the plot. If there is no water meter shaft because the building on or very close to the border of the plot, the connection pipe shall end 10 cm beyond the main meter placed in the building. In lack of water meter, the connection pipeline ends at the border of the plot.

In the course of constructing the pipe network and selecting the equipment, efforts must be made to implement a water- and energy saving safe system, which satisfies regulations of life, health,

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environment and labour safety. Therefore, the corrosion, noise and heat protection as well as the necessary electric shock protection of the piping and the equipment must be solved.

Heat protection comprises the protection against cold as well as hot and in certain cases, the heat insulation required for reducing the heat loss. An unavoidable case of heat protection is installation of the connection pipe under the frost line. 1.5m below the surface is considered safe below frost line. Connecting around the depth of 1.0 metre has the risk of freezing especially in case of less frequently used buildings, where there is dead water in the pipe system in great cold.

The connecting pipe shall be perpendicular to the public utility network and also perpendicular to the real estate supplied if it is possible. At least 1 m distance shall be kept between the water and the sewage pipe when connecting into the building or the water pipe shall be installed above the sewage pipe. If there is no 1 m distance the pipe shall be installed in a protective pipe.

External basic pipe

The part of the connecting pipe inside the border of the plot between the water meter shaft and the building is called external basic pipe. This pipe section is placed below surface level in the ground below frost line. At the deep point (points) of the water network of the facility, practically in the water meter shaft air intakes shall be installed at the high points of discharge points. No building or building structure shall be constructed on the connecting or the external basic pipe.

Knowledge about the structure of urban drinking water networks provide the opportunity for the participant of the course to be able to identify the parts of the community water network and the private water network and the responsibilities related to the operation of these. The participant obtains knowledge to people living in her neighbourhood in solving problems related to their water supply.
https://www.mozaweb.com/hu/Search/global?search=k%C3%B6zm%C5%B1vek&lexikontypeid=7

Pipes in the building

The part of the basic pipe inside the building, constructed in the basement if possible should be installed in front of the wall and below the ceiling or in supervised channel or plastered in other ways. Every section of the water pipe network inside or outside the building must be dischargeable. Water pipes may only be designed in rooms with internal temperatures not decreasing below +2 °C in winter.

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No water pipes shall be installed:

- in the external walls of buildings, walls and ducts of chimneys and air outlets
- in the ceiling, floor of rooms for long-term use, partition walls of independent units (e.g. flats)
- in channels shared with technological pipes causing corrosion or forwarding toxic substances
- in rooms for electrical equipment or in the wall, floor or ceiling of these, (e.g. transformer or mains switch room, elevator or escalator shaft or machine rooms)
- in rooms accommodating significant valuables or pieces of art or in the wall, floor or ceiling of these (e.g. museum)

Pipes	
Riser pipes	○ Riser pipes generally supply rooms and water taps of the equivalent functions above each other. ○ So called pipe string shutoff valves must be installed providing the possibility of discharging. This may take place with shutoffs including a discharge fitting or with a run tee fitting and a separate discharge fitting.
Branch pipes	○ The riser and the water tap are connected by a branch pipe ○ If the tap cannot be installed directly on the branch line but it must be installed on some equipment, like in case of a washbasin, then the two must be connected through a connection pipe.

Important circumstances of pipefitting

An important requirement of pipe fitting inside buildings is to prevent harmful disturbing noises during operation later. A significant point of noise protection is providing vibration-free operation in the future by appropriately fixing the pipes, placing pumps and other equipment on bases and connecting these to the pipe network carefully, etc.

Pipes must be properly insulated in order to avoid condensation of vapour, warming up or cooling down. In case of unprotected pipelines, one may expect condensation of vapour on the external surface in the following cases:

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Knowing the position of basic, riser and branch pipes of buildings in housing estates is useful for consultation with others in relation with water supply in your own environment. This may provide the ability to detect failures of the elements of the pipe network and the necessity of modernisation in terms of water saving. The participant can help providing ideas for the technical designing the installation of pipelines providing the use of drinking water and rainwater in prefabricated houses and detached houses.

Water pipeline installations and equipment:

- water meters
- shutoff taps, valves, slide-valves, taps of sanitary equipment
- pressure reducers and pressure controllers
- safety bleeders, backwater valves, water filters
- equipment for domestic hot water production, e.g. heat exchangers, storage units, water boilers,
- Circulation pumps, etc.

The fittings and equipment of the water pipe network shall be installed so that no forces or tensions are loaded on the pipe network later during operation and no source of noise is generated due to this. The water networks shall not be directly connected to civil engineering, industrial technology equipment in which there is or may be overpressure. Such equipment and systems are the following: boiler feeder pumps, steam ejectors, steam boilers, boiler pots, etc. Such equipment may only be fed with water from the public utility network from an interim tank.

Feeding pipes of low pressure steam, hot water and central heating boilers without permits may be connected to the water supply network only with a back-pressure valve installed and with releasable connection for the time of filling. It must be known however, that tap water is not the best choice for such purposes, i.e. for example for water supply of heating systems.

The participant is informed about the function of equipment and devices providing for various residential water uses. One can help others learn about equipment facilitating economical water use not worsening the quality of water use.

In the course of processing technical materials, such a location shall be chosen where some of the equipment may be seen and held in hand. In the course of working with this field it is worth relying on a practicing plumber by the participants of the course. Almost everyone has some technological

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knowledge of the water network of buildings and studying this in a system helps participants of the course to become able to provide professional help in the installation and selection of water saving network and fittings.

Chapter 3.4: Opportunities of saving water and drinking water

The Use of drinking or other water is part of this chapter. The professional entirety of the course includes the question of responsible water consumption and saving water & drinking water. There is also a course dealing with the importance and possibilities of water saving in details within the training program.

The primary task of the trainer is to raise interest, encourage action in order to make more and more participants feel that calling attention of responsible water use is their role and they should survey their own water management from this point of view.

The topic is suitable for the participants to collect their own good and less good examples in the field and this could provide an opportunity to discuss arguments for and against it.

The participant knows typical areas of residential water use and the water demand of having a bath or taking a shower as well as the opportunities of replacing drinking water used to flush toilets. One can examine the phenomenon of wasting water/drinking water in their own environment. The participants can make proposals for saving by replacement of equipment or using alternative water sources, e.g. rainwater. http://www.passzivhaz-magazin.hu/vizsporolas/

Furthermore, it is important that the participants are aware of the curriculum of the course on saving water and the way to apply for the course.

Secondary impacts

Also, secondary impacts (eating habits, etc.) should be considered in context of water saving. The participant knows the amount of water required for the production of basic foodstuff. She can inform people living in the area about the water saving opportunities directly available by changing eating habits (water demand of 1 kg of wheat is 1,000 litre and that of 1 kg of beef is 13,000 litre). https//www.fna.hu/hir/kisvaltoztatas

Rainwater and greywater

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The participants are aware of the curriculum of the course on opportunities of using rainwater and the way to apply for the course.

To conclude, the participants know and represent the importance of water saving in their environment.

Chapter 4: Assessment

During the participation in the course, supportive and positive feedback is important for participants since they took part in the cooperation by their own decision and based on their own interest. It may be important for the participants to learn about each other's opinion in connection with their operation.

The trainer plays an important role in recognising if any participant is pushed to the periphery and helping them integrate into the group. Feedback given to the participants may be suitable to develop their competences in appreciating others and giving feedback in this.

During assessment, efforts shall be taken to encourage the participants by the feedback on the value of their participation that they should develop themselves in additional courses and become more informed about certain issues.

The positive feedback given by the trainer may be enforced when the certificates of participation are handed over in a bit more formal situation, involving an external partner who is considered as a reference person for the participants.

Budapest, 31st August 2020

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Work Package 3: First centre level "Vocational training" (EQF Level 3-4)

Activity 7: Additional Qualification Trainings

Training B – Water Saving Technologies

BEST PRACTICE CURRICULUM

Developed by:

KONTIKI in 2020 in the Project "Management and Technologies of Water, Waste Water, Waste and Circular Economy (WWW&CE)"

Prepared by:

Wirtschaftsförderungsinstitut (WIFI) Steiermark

August, 2021

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Chapter 1: Executive Summary

The course "Water Saving Technologies" was developed in the project "Management and Technologies of Water, Waste Water, Waste and Circular Economy – WWW&CE", which was funded by the Erasmus+ Programme of the European Union. Eleven partners from seven EU Member States developed tools according to work-based learning principles that are piloted and evaluated. For more information: https://www.sa-ce.eu

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The course is part of a training package for "Environmental Consultants", dealing with six key areas of sustainable economy. The courses are designed to provide additional qualifications on the European Framework Qualification Level 3 to 4. Furthermore, the six courses are primarily designed for young people with strong learning skills for vocational training. Completing all six courses enables the participants to support others, especially small and medium sized companies, to steer towards a more environmentally conscious approach to their personal and business objectives in order to generate a more sustainable world.

The six courses in the "Environmental Consultant" programme are:

- A – Water Supply Technologies
- B – Water Saving Technologies
- C – Greywater and Rainwater Utilisation Technologies
- D – Decentralized Wastewater Treatment Technologies
- E – Fundamentals of Circular Economy
- F – Solution-oriented Consulting for Sustainable Development

Each course may be completed individually or as part of the "Environmental Consultant" training programme. For each participated and completed course, a participation degree is provided. The degree for this course, which is achieved with a successful completion of the course, is called "Consultant in Water Saving Technologies".

The main objective of the course "Water Saving Technologies" is to introduce and form an environmentally conscious perspective of qualified professionals in the field of water saving technologies to attending course participants. Thereby, the participants are able to obtain qualifications in the field of sustainability in water saving technologies.

The course aims to provide participants with knowledge about water access, the necessity of sustainable water management and water saving to transform their own personal or business activities and to consult others in these areas.

The course "Water Saving Technologies" comprises of following modules:

- Module I Climate Change vs. Climate Crisis
- Module II Role and Availability of Water in the World
- Module III Opportunities of Saving Water
- Module IV Use of Rainwater
- Module V Greywater
- Module VI Secondary Impact resulting in Water Saving

Chapter 1.1: Name of the Course

"Water Saving Technologies"

Chapter 1.2: Contact Details

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To be adapted by each partner

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Chapter 1.3: Type of Course

Training course for additional qualifications. Specifically, for qualification of young people with strong learning skills for vocational training.

Chapter 1.4: Target Group

The target group of the whole "Environmental Consultant" training programme comprises of students in vocational training related to water management, water supply and sewage water management, skilled workers already working in these professional fields or other people interested in the topic of responsible water management.

Chapter 1.5: Competences Obtained

ENVIRONMENTAL MOTIVATION	Seeing the necessity of effective water management, knowing water supply technologies, the participant can act in spreading a water-saving life style. As a responsible user of water, the participant has knowledge and the intention to act in informing others of water-saving behaviour in business.
LEGAL KNOWLEDGE	Knowledge of EU Directives, international recommendations and conventions and domestic legislation on water management as well as in the necessity of water saving and sustainable development.
RESPONSIBILITY	Knowing her own and others' thoughts, personal and/or business behaviour and motivations, the participant can assess and compare these activities from the perspective of a responsible participation in sustainable water management.
CREATIVITY	Using technological knowledge, the participant can offer solution driven opportunities to new problems regarding water supply from a conscious and responsible water use perspective.

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SENSITIVITY TO TECHNICAL PROBLEMS	With an approach towards responsible water management, the participant can interpret technical conditions, assess the enforcement of the aspects of purpose-oriented water use and water saving and support it with recommended technical solutions.
COOPERATION WITH OTHERS	Effective in exploring various problems, the participant can provide supportive cooperation with stakeholders and professionals in designing and constructing water supply systems for small communities.
ATTITUDE TO SUSTAINABILITY	Sensitivity and information about a sustainable world, sustainable economy, deficiencies resulting from climate change, increase of population and the change of people's living habits and critical situations. Ability to consciously participate in actions for preserving life and resources for future generations.
PERCEPTION OF OPPORTUNITIES	Identification of connections for various existing or future technical conditions and responsible, economical water usage solutions suitable for the purpose.
RISK MANAGELENT	Reasonably taking challenges and risks, the participant can perceive emergencies in specific problem solving processes as well as manage those preventively and constructively.
APPROACH OF ENVIRONMENT CONSCIOUSNESS	The participant can perceive responsible water management and realistic water saving opportunities of human and technological processes related to the use of water.

Chapter 1.6: Course Duration

The course comprises of

- 98 contact hours,
- 56 hours of individual learning and

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- 2 hours of assessment.

The total duration of this course amounts to 156 hours.

Based on the principles set out in the European credit system for vocational education and training (ECVET), the total of the following activities shall be taken into consideration in calculating the duration of the training:

- contact hours (theoretical): expected number of hours of joint activity of teacher and student, including the lectures, processing teaching materials, seminars and workshops required to learn the theoretical parts.

- self-study times (individual work): individual study some topic or technical literature by the participant of the training programme without supervision or participation in the training group.

- assessment hours: time to prepare for exams including the time of the exams.

The training content is available via digital tools on a platform supporting distant learning for people living farther from the venues of the course or avoiding forms of group learning in order to prevent the spread of the COVID-19 epidemic.

Chapter 1.7: Required Prerequisites

The content of the course is designed as a training according to level 4 of the European Qualifications Framework (EQF).

The participants entering the training programme shall meet at least one of the following requirements based on the content of the curriculum:

a) They attend a school or dual basic programme, they have appropriate educational results and they wish to obtain additional qualification in addition to their normal qualification.
b) They already have a completed vocational qualification and wish to obtain an additional qualification.

Requirements of the qualification of trainers:

Trainers shall meet the applicable domestic legal regulations.

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Chapter 2: Curriculum

Chapter 2.1: Content of the Curriculum

Number	Module Name	Content	Training Time	
			Contact Hours	Self-Study Time
I	**Climate Change vs. Climate Crisis**	The participant is informed on the data and trends of climate change. She learns about the measures required due to the adverse effects of climate change. The participant can identify opportunities for change to mitigate climate change and act on it.	**8**	**4**
II	**Role and Availability of Water in the World**		**26**	**16**
II.1	**Presence and scarcity of water**		**12**	**4**
II.1.1	Areas rich in Water	Knowledge of basic facts about water, its use and the principles of sustainable water use. The participant has knowledge about the Water Policy Directive of the European Parliament, the water management action plan of the Commission and the relevant national legislation. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy		
II.1.2	Areas poor in water			
II.1.3	Effect of water scarcity			
II.1.4	Water Management Strategies, EU	The participant is informed about the provisions of the Water Policy Framework Directive of the European Union. She knows		

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	regulations, National Strategies	the national action plans and regulations related to the provisions of the Framework Directive.		
II.2	**Water use, water demand:**		**8**	**8**
II.2.1	agricultural water use	The participant is informed about the problem of water overuse. She knows the role of agriculture, construction and the food industry as well as other industries with high water usage. She knows the importance of providing required information to make residential water use more efficient. https://ec.europa.eu/environment/generationawake/index_en.htm		
II.2.2	industrial water use			
II.2.3	communal water use			
II.2.4	Illegal water use and overuse			
II.2.5	Water demand and water footprint	The participant is able to establish technological conditions of economical water/drinking water use.	6	4
III	**Opportunities of saving Water**		**36**	**18**
III.1	**Saving Water in the Economy**		12	6
III.1.1	Water use and efficiency in agriculture	The participant is informed of the water demand of agriculture (24% of total water use in the EU, one third of which returns to nature.) She supports development of efficient water use for people farming around the house.		
III.1.2	Industrial water/ drinking water use	The participant is informed about the water demand of industry, supports SMEs to change to technical solutions of economic water use. She calls attention to opportunities of using rainwater, industrial water and cleaned water in business.		
III.1.3	Reuse of Water			
III.1.4	Leak of water networks	The participant is informed about the problem of leaking and "lost" water. (Modern		

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		residential water networks consist of endless pipe and pump systems. Pipes break regularly and water leaks. Up to 60% of delivered water may "get lost" due to leakage from the distribution network. Up to 340 litres of water, i.e. roughly the consumption of a whole household may leak through a 3mm hole on a pipe every day.) The participant joins the detection and prevention of leakages in the water network of her neighbourhood.		
III.2	**Saving water by residents**		24	12
III.2.1	Importance of saving water by residents	While proper quality drinking water is an unavailable luxury for close to one third of the population of the world, it is a natural part of everyday life for European citizens. Due to the prodigal water use however, the global clear fresh water resources are continuously decreasing, thus everybody is responsible for securing water resources.		
III.2.2	Attitude issues in saving water by residents.	The participant is informed about residential water using habits and the extend thereof. She can provide authentic information to people. She can support them in developing more water saving habits and technical solutions replacing the use of drinking water.		
III.2.3	More economic devices and products.	The participant is informed about water saving devices, their procuring and installing opportunities. She knows the Ecolabel system. She can support people living in her neighbourhood in selecting and purchasing water saving devices.		
III.2.4	Opportunities of reducing daily water consumption.	The participant knows typical areas of residential water use. She knows the water demand of having a bath or taking a shower. The participant is informed of the importance		

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		of economical water use in saving drinking water. (Shower - economical showers 8-9 litres/minute, tooth brushing: not closing the tap while brushing teeth 6 litres/minute, toilet flush from modern tank, 9 litres/flush, water saving washing machine, etc.)		
III.2.5	Residential rainwater use opportunities	The participant can identify local opportunities of residential rainwater use, e.g. to replace drinking water used for flushing toilets. She can examine the phenomenon of wasting water/drinking water in her own environment. She can make proposals for saving by replacement of equipment or using alternative water sources, e.g. rainwater.		
IV	**Use of Rainwater**		**12**	**8**
IV.1	Who owns rainwater? Law and practice	The participant is informed about the domestic and local regulations on collecting and using rainwater on one' own land or roof. She can support the start of legally using rainwater for replacing drinking water.		
IV.2	Detached houses, water supply systems for small communities.	The participant knows the technical characteristics of water supply systems for small communities and detached houses. She can support the integration of rainwater in private water supply systems.		
IV.3	Rainwater from prefab houses and public spaces			
V	**Greywater**		**8**	**6**
V.1	Legal environment of using greywater	The participant is informed about the European legislative process on the quality of greywater. She knows the secondary use opportunity of drinking water.		
V.2	Technology of using greywater	The participant can help implement technologies for reusing used drinking water.		

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VI.	**Secondary impact resulting in water saving (eating habits, etc.)**	The virtual water content of a product is the amount of water required to produce the product at a specific location. The participant knows the amount of water required for the production of basic foodstuff. She can inform people about the water saving opportunities directly available by changing eating habits (water demand of 1 kg of wheat is 1,000 litre and that of 1 kg of beef is 13,000 litre).	**8**	**4**
VII	**Assessment**		**2**	
		Total	**100**	**56**

Chapter 2.2: Content of the knowledge acquired by learning the modules

Learning achievements	Questions and exercises related to the recommended content	No of hours	
The participant knows the causes and impacts of climate change. She is able to inform others of the dangers of climate change and the decrease of water resources.	Topic No.1: Presenting the phenomena of climate change. Tasks: 1.1. Explain the essence of climate change. 1.2. Describe the changes caused by climate change and their impact on everyday life. 1.3. Present the impact on climate change on water resources through examples. Present problems in people's everyday life resulting from the decrease of water resources. 1.4. Prepare a presentation in which you call attention of others to the problem of climate change and the decrease of water resources.	**8**	**4**
The participant is informed of water use and the principles of sustainable water	Topic No.2: Water base and water regulations 2.1. What is the national water-base characteristic of? 2.2. Where are the water-related European directives and action plans available?	**12**	**4**

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use. She has knowledge about the Water Policy Directive of the European Parliament, the Water Management Action Plan of the Commission and the relevant national legislation.	2.3. What are the major conclusions of European Environment Agency Signals 2018 Water is Life document related to water management? 2.4. Prepare a summary of the national implementation of the European Water Management Action Plan.		
The participant is informed about the problem of water overuse. She knows the role of agriculture, industry and residential consumption in water use.	Topic No.3: Water use, water demand 3.1. What does water overuse mean? 3.2. What is the reason for global and local water scarcity? 3.3. What do people use most drinking water for in their everyday life? 3.4. Calculate your water footprint.	**14**	**12**
The participant is informed about the water demand in agriculture. She supports the development of water use efficiency of people farming around the house.	Topic No.4: Saving water in agriculture 4.1. How can the amount of drinking water used for irrigation be reduced in agriculture? 4.2. Can rainwater be used to irrigate small gardens? 4.3 What do you know about drip irrigation?		

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The participant is informed about the water demand of industry, supports SMEs in changing to technical solutions of economic water use. She calls attention to the opportunities of using rainwater, industrial water and cleaned water in business.	Topic No.5: Water saving in SMEs 5.1. Why is the conversion of SMEs to water saving technologies important? 5.2. What role might SMEs play in changing the lifestyle of residents to a water saving way? 5.3. Does taking part in the implementation of the European Water Policy Objectives mean new business opportunities for SMEs? 5.4. Prepare a brief, awareness-raising informative material for SMEs about water saving.	**4**	**2**
The participant is informed about the problem of leaking and "lost" water. She joins the detection and prevention of leakages in the water network of her neighbourhood.	Topic No.6: Leak of water distribution networks 6.1. How can water leakage be detected without exploring the distribution pipeline? 6.2 Who is responsible for detecting water leakage in housing estate communities? 6.3. Who pays the cost of leaking water? 6.4. Prepare an activity plan for preventing and detecting water leakage.	**4**	**2**
The participant is informed about residential water using habits and the extend thereof. She can provide	Topic No.7: Water saving by residents 7.1. If I take water from my own well, should I take care of my water consumption? 7.2. Where can I get more information about saving water if I am interested? 7.3. What opportunities to save drinking water can you see in your own household?	**12**	**6**

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authentic information to people.			
The participant can examine the phenomenon of wasting water/ drinking water in her own environment. She can make proposals for saving by replacement of equipment or using alternative water sources, e.g. rainwater.	Topic No. 8: Reducing waste of drinking water 8.1. What prevents people from saving water? 8.2. Prepare a local action plan to reduce the waste of water.	**12**	**6**
The participant is informed about the domestic and local regulations on collecting and using rainwater on one' own land or roof.	Topic No.9: Rainwater Utilisation Opportunities 9.1. How can I collect rainwater on my property and what can I use it for? 9.2. What can I do with the collected rainwater? 9.3. Is there a municipal regulation about the management of rainwater in my living area? 9.4. Prepare a technological draft for the use of rainwater falling in your own living area.	**12**	**8**
The participant is informed about the legislation process related to the quality of reused water, i.e. greywater. She	Topic No.10: Greywater Utilisation 10.1. What national regulations govern greywater and its use? 10.2. What use of greywater can you imagine in your own household? 10.3. Prepare a presentation for a forum for residents where you want to inform participants about the	**8**	**6**

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knows the secondary use opportunity of drinking water.	opportunities of residential use of rainwater and other greywater.		
The participant knows the amount of water required for the production of basic foodstuff. She can inform people about water saving achievable directly by changing eating habits.	Topic No.11: Virtual Water Content 11.1. What is virtual water content? 11.2. Is there any relationship between avoiding the water crisis and the virtual water content? 11.3. In what areas of your own lifestyle can you reduce the virtual water "used"? 11.4. What role may SMEs play in reducing virtual water content?	**8**	**4**
	Total	**154 + 2 for Assessment**	

Chapter 2.3: Teaching/ Learning Equipment and Literature

Equipment:

Theoretical training: classroom equipped with school furniture, laptop computer, projector, internet access, presentation equipment.

Literature/ Sources:

- Announcement of the Commission to the European Parliament, the Council, ... Plan for the preservation of European water resources.
- Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on minimum requirements for water reuse, CELEX_52012DC0673_HU_TXT preservation of water resources

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- Announcement of the European Commission professional materials e.g. https://kontikionlineschool.com
- Documents related to responsible water management, e.g. www.fna.hu/mittehetsz/vizlabnyom, information materials of local municipalities, water suppliers.

Chapter 2.4: Further recommendations:

Learning methods: Lectures, discussions, teamwork, projects, presentation practice and virtual technological presentations, on-site inspections.

Requirements for the trainer's qualification: Instructors shall meet the applicable domestic legal regulations.

Chapter 2.5: Testing of Competence Level

The assessment of the program and identification of competences (examination) obtain consists of two parts.

1. Assessment of theoretical knowledge (multiple choice test of 20 questions)
2. Presentation related to the topic of a module

After the examination the participants receive a competence certificate or certificate of participation depending on the result of the examination.

By completing this course and the other 5 courses listed below, the participants of this course can obtain the qualification of "Environmental Consultant".

- A – Water Supply Technologies
- B – Water Saving Technologies
- C – Greywater and Rainwater Utilisation Technologies
- D – Decentralized Wastewater Treatment Technologies
- E – Fundamentals of Circular Economy
- F – Solution-oriented Consulting for Sustainable Development

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Chapter 3: Teaching Materials

The presented materials aim to provide support to trainers involved in the implementation of the professional program of the course. Furthermore, it assists the processing of the individual training modules in order to inform the trainers about the role of the areas processed by them in the course. It shall help trainers find their ways in methodological issues of the course and facilitate the methodological freedom of trainers and the diversity of processing the training contents.

In the course of the contextual processing of the specific modules, attention shall be paid to the fact that the contents to be processed shall be significantly different for the participants of the course from different countries because of the difference of the natural characteristics of the given countries. e.g. For participants from seaside countries, seawater shall have a significant role in the water base while rivers are the basic part of the water base in other countries.

Another similarly important aspect of processing the contents is that in addition to general knowledge and learning about technical development and innovation, the technical solutions and technologies already present in the daily practice of the given country shall be presented as well as contents and practical activities helping the utilisation of new theoretical knowledge in the local practice.

The shared content of the courses to be held in different countries and thus the uniform set of competences of individuals completing the courses to be organised in different countries and qualification obtained at the course that is accepted in any country is ensured.

The completion of course contents with contents taking local characteristics into account and processing these considering actual technical solutions shall ensure the direct usability of the course for participants.

Chapter 3.1: Climate change vs. climate crisis

This is the introductory part of the course in terms of content.

The trainer has a twofold role in this part:On the one hand, attention shall be called on the negative tendencies of general natural processes, waters and availability of healthy drinking water.

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It must be made clear that global warming is a situation caused by human activities causing climate change on the whole planet, the effects of which can be seen in various forms and to different extent everywhere. In 2018, most of the natural disasters striking close to 62 million people worldwide were related to extreme weather and climatic events according to the report of the World Meteorological Organization. Also in 2018, 17.2 million people were forced to leave their homes globally due to natural disasters and 9 of 10 of these people had to move because of some devastating weather or climatic event (e.g. flood, drought, forest-fire, hurricane).

A uniform standpoint shall be reached with the participants of the course that our responsible behaviour related to the use of water may influence the quality and quantity of water available for the following generations required for everyday life, producing foodstuff, and ensuring the biodiversity of Earth.

On the other hand it is an aim to be achieved that participants of the course shall be capable of becoming spokesmen for the availability of healthy drinking water for the following generations and for the people living in countries poor in water. An important effect of the course may be that participants become capable of giving rise to and supporting local initiatives to take necessary and possible measures for responsible water use.

"We live in the age of climate change.

Our climate is changing. Scientific evidence shows that global mean temperature and distribution of precipitation is shifting. Evidence also shows that glaciers, the icebergs of the Arctic Ocean and the ice cover of Greenland are melting."

In addition to the above, we recommend to process the problem of climatic change and climate crisis on the basis of the summary found on the website of the Earth Day Foundation (http://fna.hu/vilagfigyelo/eghajlatvaltozas) and the European Environment Agency and other documents, completed with the personal experiences of the participants.

In the contextual work, the document European Environment Agency Signals 2018 Water is Life, (https://www.eea.europa.eu/hu/publications/eea-jelzesek-2018-viz-elet), which presents the current situation, calls attention to the unfavourable trends and thus offers suitable topics for discussion.

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Certain parts of the report provide basis for processing certain parts of issues individually or in small groups.

"European rivers, lakes and seas are threatened by pollution, overuse and climate change. How can we ensure the sustainable use of this critical resource?"

In addition to pointing out the contextual framework of the course by the introductory part of the course, the trainer also provided an opportunity for participants to learn about data and phenomena related to their own direct environment for elaborating on the subject. The time frame provided for individual work offers the opportunity for this.

Discussing the results of individual research in the course group facilitates the development of later cooperation between participants and learning different approaches also helping the course become a cooperating team.

Chapter 3.2: Role and availability of water in the world

Water is a vital element for life. It is a fundamental resource for humanity, a facilitator and preserving force of economic growth and progress. It plays a key role in the operation of natural ecosystems and in the control of climate.

There is high load on the European water resources. According to latest data, 20% of surface waters are seriously threatened by pollution; 60% of European cities overuse their underground water resources and 50% of natural water areas are endangered. Demand for water is ever increasing.

The contents of other parts of the course shall all become important for the participants of the course in connection with these problems. In order to develop a uniform approach to the course, it may be helpful if the trainer initiates discussing the different opinions and doubts the participants may have, of course adding his own opinions making this problem important so that a uniform starting approach and knowledge base is developed.

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Chapter 3.2.1: Presence and Scarcity of Water

"The hydrological circulation of the Earth is a global circulation transferring water from the oceans to the surface and from the surface or from under the ground and form the plants to the atmosphere around our planet. (...) Major natural elements of the hydrological circulation process: precipitation, water seepage, desertification, vapouring and transpiration."

97.5% of the water reserves of Earth is the salty water of oceans and seas. The remaining 2.5% is fresh water. Easily available freshwater is however only 0.007% of the total amount of water. All flora and fauna on land shares this, including humankind. This is however the only species demanding a larger and larger portion. The population of the Earth tripled in the 20th century from 2 billion to 6 billion. Meanwhile, however, global water use increased to sixfold due to the increasing demand of the economy and consumption. The amount of water per capita has fallen to one third since 1975 but there are enormous differences between the amounts available for the population of specific countries. While for example this value is 120 thousand m3/person/annum in Canada, it is 70 m3/person/annum in Jordan.

Countries rich in water vs. areas poor in water: Effect of the water scarcity

In the course of discussing the subject the exposedness of different countries is varying, so the trainers of specific courses shall work on the recommended subject taking into account whether the participants of the given course feel the scarcity of water every day or "only" feel responsible as a resident of a country rich in water and they wish to understand it during the course. Responsible water management, including European water management cannot be successful without the collaboration of countries in different situations.

"The World Resources Institute (WRI) surveyed the water supply problems of specific regions and found 17 countries where water supply is at a critical level. In Hungary, there is no reason for concerns but in the situation is less reassuring in Southern European countries. The most

Critical regions of the Earth is the Near East and North Africa, however there are still opportunities to improve the situation."

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Shortage of water occurs when the reserves used from lakes, rivers and underground waters cannot satisfy sufficiently human needs and this competition between potential consumers increases.

Shortage of water can also be defined as a situation where the water resources per person is below 1,000 m3 in a country or region. Many regions on Earth obviously suffer from the shortage of water which means that less than 500 m3 water can be used per person annually.

Drinking water consumption is between 2 and 3 litres/person/day and other personal and household use is between 30 and 300 litres/person/day while between 2,000 and 5,000 litres/person/day is required for the production of foodstuff.

As opposed to public beliefs, Hungary is not rich in water but rather suffering from extremities, floods, inland waters and droughts. The current water management practice contributes to losing huge amounts of water, i.e. the country is becoming drier. We can prepare for the extremities of climate change if we make water retention the priority of our water management and we adapt the use of land to that too.

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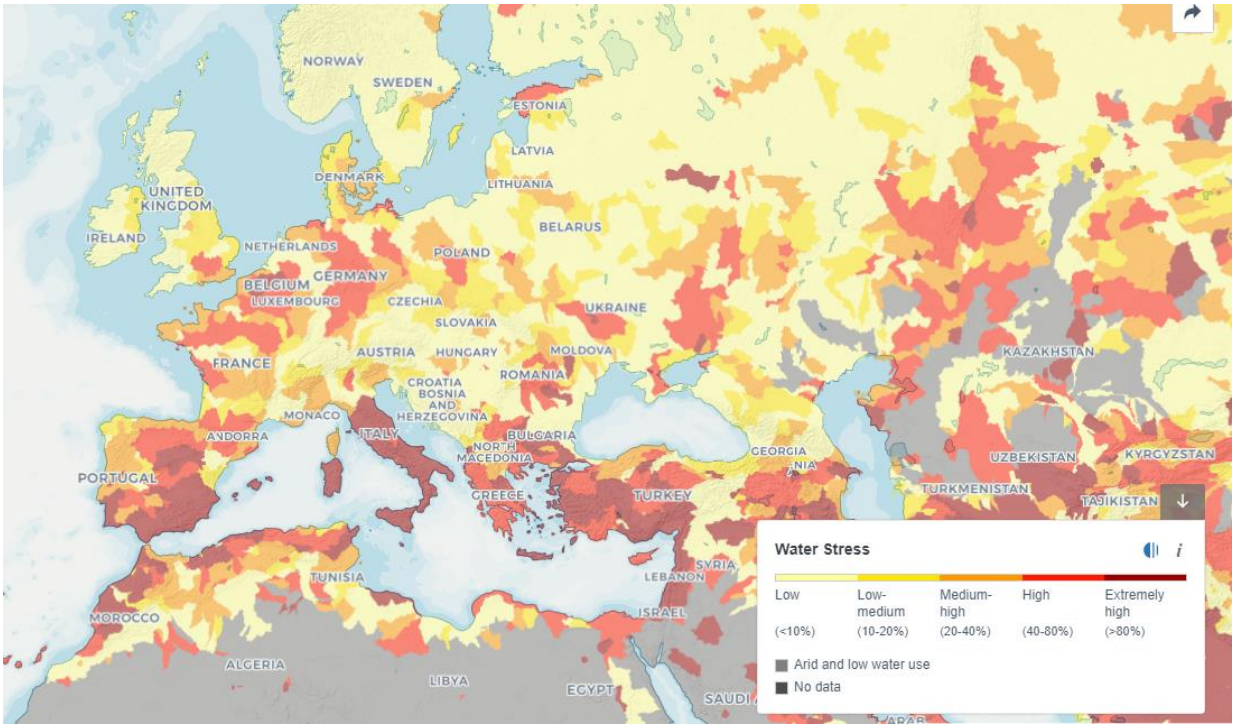

Figure 1: Water Stress Level, wri.org

Water management strategies, EU regulations, national strategies

The documents of the specialised bodies of the UN place Europe on the map of water problem. The global role of European people is more on the side of responsibility than need. The responsibility of European people is characterised by possible local problems in the future, experiences in regions poor in water and perceiving the help that can be provided for them.

Informing participants of the course about the water management situation outside Europe is important as curiosity and in order to understand the European processes.

The trainer shall be a participant who calls attention and sensitise participants and making European country strategies understandable is necessary to use as illustration to phenomena already in progress in the world.

Water is present everywhere in economy and is fundamentally required for life and subsistence. Access to safe and sufficient amount of water and effective management of freshwater ecosystems is essential for economic prosperity and environmental sustainability…….. According to

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the UN, there is enough fresh water on the planet to make clear water safely available for everyone. Locally, however, the amount of available water gives reasons for concerns speaking of either shortage of water or floods.

Water framework directive of the European Union

"The directive introduces a new approach in water management and the protection of water which is not based on country or political borders but rather on natural and geographic and hydrological media and catchment areas. It requires the harmonisation of various professional policies of the EU and sets out a precise agenda for action according to which all waters of Europe shall be in good condition by 2015."

Plan for the preservation of European water resources.

A Blueprint to Safeguard Europe's Water Resources

DESCRIPTION OF PLAN: THE CONDITION OF WATERS IN THE EUROPEAN UNION IS NOT SATISFACTORY.

Water is essential for human life, nature and the economy. It is a continuously renewing but finite resource, which cannot be produced or replaced by other resources. Fresh waters constitute only about 2% of the water resources of the Earth and competing demands may result in 40% water supply shortage globally by 2030.

European water management action plan

The proposal for the European water management action plan, which was accepted by the member states of the European Union in their conclusions of December 2012 is now presented in the work programme of the joint implementation strategy of the water framework directive.

Integrated water management in eastern and central Europe IVG vs. EU Water framework directive

The EU implemented macro level development strategies at the Baltic Sea and Danube regions. In these macro-regional strategies, priorities of water management are set out which support the implementation of measures improving and preserving the condition of waters and satisfying the

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water management demands of sustainable economic and social development. So macro-regional strategies contribute to the application of completely integrated water management methods.

Water conservation and economic policies are also integrated in rural development planning. A major part of population make a living of agriculture and the subventions of the rural development programme in the CEE region. The Rural Development Policy of the EU is strongly influenced by the Water Framework Directive, for example by setting out measures targeting to solve the problem of nitrate pollution and supporting the implementation of agricultural environmental measures set out in the Common Agricultural Policy of the EU. GWP CEE initiated the so-called Dialogue on Water, Food and the Environment, aiming to provide help for sustainable development by integrating the water conservation (VKI) and the Common Agricultural Policy.

Similar measures have been taken in the CEE region in order to facilitate the integration of water conservation and water resource management by hydroelectric power station and inland shipping development. Inland shipping provides connection between the North Sea and the Black Sea. Hydraulic power production and shipping are both particularly important for sustainable economic development in many countries of the CEE region.

The CEE countries have many strengths. There are many highly qualified water management professionals and water management education and courses are of internationally high standard. Integrated water management has had a long history in the CEE region but in the past decades - especially on macro level - significant progress has been made in integrated international water management compared to the state before the political transition (starting in 1989). Nevertheless, much more must be done in order to better harmonise water management planning on local, national and international levels. This is a serious challenge in the next 6-year design and implementation stage of VKI.

With the guidelines of trainers, the participants of the course shall survey the strategic documents generally strengthening the importance of water management and making it perceivable that the question of water management is of national concern but the effectiveness thereof may be made improved by cooperation between countries. The analyses of situations made in the course of developing individual strategies provide good references for surveying the subjects of a course later. The trainer provides help primarily in answering the questions of participants, also guiding them

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among various legal regulations and professional viewpoints. Knowing the legal regulations in details is not required for successfully completing the course but knowledge about strategic objectives and the frames set out be legal regulations are necessary pieces of information to place everyday activities in a system.

Chapter 3.2.2: Water use, water demand

Agricultural water use and industrial water use

We wish to support participants of the course with knowledge for responsible communal water use for the role of an advisor with knowledge and experiences. Thousands of SMEs is also included in this group of water users. The typical ways of water use are different from the water use characteristics of large industrial and agricultural in many terms. In spite of this, it is important that the participants of the course become informed of the water demand and water use of agriculture and industry.

The trainer can make the questions of water use more like an experience through the characteristics of water use and the phenomena seen in the environment of the participants and may also help find the necessary corrections in the responsible water use of SME participants in the water use of large consumers.

The population of the world at least quadrupled in the 20th century while the amount of water used *in agriculture* for irrigation increased to six times and the water level of certain large rivers became very low. Irrigation-based agriculture requires approx. 70% of fresh water taken from its natural flow worldwide. While the irrigation system actually takes approx. 2300 km3 fresh water from rivers and groundwater, only about 900 km3 is actually used for irrigation of crops. Water use for livestock farming is approx. 19-20 million m3, approx. 5% of agricultural water use. Other water use is also about 5% of total water use.

The water use of the electric power industry, gas, and steam supply has a major role within industry. Use for cooling is most important in the industry, Industrial water use – without electric power industry and water supply sector - : the largest water user is the food industry (40%) and the chemical industry is another major sector (46%). Cleaning activities are present in any industrial process as part of the process or by default as part of the maintenance of equipment.

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In the course working on the subject, in addition to providing the participants of the course with more information about the extent of agricultural and industrial water use, they have an opportunity to highlight the similarities of communal and small company water use. On the basis of the experiences of agricultural irrigation, the water use of household food production in small gardens may become more economical. The water use solutions for the cooling and cleaning tasks in the industrial sector may be adapted or used in communal water use.

Discussing the subject of agriculture and industry, the ideas of participants, weighing and developing the shared ideas further may create a uniform basis for the discussion of the issues of communal water use.

Communal water use

The focus of the issue of communal water use is not making new information available about present consumption habits since it can be mapped while learning about it.

The most important effect of discussing the subject may be if the people living in their neighbourhood, helping friend-seeking advice to develop an economical life style in terms of water use, commit the participants of the course to calling attention for responsible water use.

Water using habits of an average family of four (two adults and two children) are provided in the table below. There are certainly major differences from average since the following factors greatly affect the water use of a family:

- washing habits (how and how regularly they wash/have a bath/take a shower)
- washing and washing up (how many times they wash/do the washing up, do you use running water or do you have a kitchen/bathroom with machines)

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	**Water consumption**	
Taking a bath	100-120	litres of water
Taking a shower	40-70	
Washing machine	40-60	
Washing up manually	40-60	
Dishwasher	10-15	
Toilet flush	10-15	
Hand washing	3-5 (extreme fluctuations)	

Based on the data above, a family of four uses 500-600 litres of water a day on average. If we know that 1 cubic metre (m3) of water = 1000 litres, then expressing in cubic metres, the average water consumption of a family of four is 0.5-0.6 cubic metre.(https://szamoldki.hu/hu/hirek/mennyi-vizet-fogyaszt-egy-atlagos-csalad-egy-nap)

Participants have the most direct experience of communal use. We recommend the discussion of the subject from the personal experiences of the participants via brainstorming or group discussion of presentations from individual work on the subject.

The trainer shall map the personal world, habits and commitment of the participants towards responsible water management affecting their own lives and help explore the first steps of the participants on the road to authentic economical water use.

Working on the subject individually and in small groups, e.g. preparing a water use plan for the amount of water available for people living in countries poor in water (max. 33 litres/person/day) is a provocative but also exciting task without directly having to experience the life situation of shortage of water. The trainer shall not give more theoretical knowledge and not solve the tension in participants arising from the feeling of unsolvable matter. He shall create the opportunity for

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discussion so that the participants of the course experience the tension in others and create a viewpoint for the lowest amount of water they feel possible manageable.

Illegal water use and overuse

"95% of drinking water in Hungary is supplied from underground water resources. Water is a finite natural resource which, shall only be used to the extent that the balance of water use and water supply can be maintained without damage to quality. Sustainable water management is greatly threatened in Hungary by the large number of wells constructed and operated without permits. According to estimations, 80-90% of wells are constructed without the required permits and registration in addition to the fact that many well drillers without the necessary licences lack professional know-how and adequate equipment and thus unable to perform professional work. Wells are special water facilities which obtain water from below the surface hidden from human eyes. Illegal wells are typically classified in two groups: on the one hand wells satisfying household water demands, including wells typically made for the purpose of watering household gardens and wells for agricultural irrigation on the other hand. From these well, the groundwater wells satisfying household water demand - including the shallow water facilities serving to satisfy drinking water needs for a household - belong under the permitting authority of the town clerk.

Why is that a problem?

Unprofessionally constructed wells may pollute the clear water supply layers of Hungary to be preserved strategically. In many cases, the water is taken from the aquifer below the first aquifer (deep groundwater) the permitting of which is not the competence of the town clerk. In order to work quickly and cheaply, the unprofessional well driller ignores the rules of constructing a well and does not fill the space between the drilled diameter and the pipeline built-in. Pollutants draining from the surface along the pipe structure of badly constructed wells relative quickly and in large concentration may get into underground water.

Raising the issue has a role of calling attention and is part of the conscious and responsible attitude to water management which handles the effect of the behaviour of individuals on the life of others as a factor. The problem of private wells clearly shows the everyday existence of the "we can do it together only" attitude.

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The information gives details of other problems too the presentation of which to the other participants of the course may help in representing perspectives present in our direct environment however sometimes difficult to make others understand. We do not aim to make participants official players but it is important that they should be able to help others make self-restricting decisions sometimes necessary for responsible water management. 25

Water demand and water footprint

A tool worth showing participants of the course since in our role to inform residents, the Water footprint creates a personal perception for everyone to move the current water use to the direction of a responsible water use consciously shaping their own water management.

Having a regular repeated look on our water footprint the decrease in water overuse may become perceivable for everyone as well as the personal talent and result achieved in a more economical life style.

Chapter 3.3: Opportunities of saving water

Chapter 3.3.1: Saving water in the economy

Water use and efficiency in the agricultural sector

The majority of the water consumption in the agricultural sector comes from the water usage, which is required for irrigation.

Agricultural irrigation is one of the fields where new practices and professional policies may result in saving huge amounts of water. In the countries of Southern Europe like Greece, Italy, Portugal, Cyprus, Spain and the Southern parts of France, dry and semi-dry conditions make irrigation necessary. Almost 80% of agricultural water use is used for irrigation in these areas.

In spite of this, irrigation should not necessarily require so much water. Water saving has been achieved in the field of water efficiency all over Europe both in the efficiency of water transportation (rate of water transported to irrigation area and extracted water) as well as in the field of actual water use (the amount of water actually used by the given produce compared to the total amount of water transported to the produce). For example in Greece, the more efficient water

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transportation and distribution networks produced approx. 95% water efficiency benefit compared to the irrigation methods used earlier.

The efficiency of the water use of irrigation farming shall be significantly improved. In making agricultural water use more efficient, in addition to saving water, the role of irrigation in the protection of the environment must also be taken into account. It is also important that irrigation has a role in reducing CO2, contributes to maintaining biodiversity, the population of settlements, the development of tourism and there are many other known benefits. Irrigation agriculture improves different opportunities of environment protection. (See more details: Course book p. 30-31)

Opportunities for efficient water management:

- Use new and more efficient irrigation technologies;
- Provide training for people working in the irrigation system so that they learn new technologies and aspects of environment protection;
- Use of water supervision systems;

Modernisation of traditional irrigation agriculture, improving distribution and supply channels by modernising irrigation systems (change from free-flow systems to pressure irrigation systems) if necessary and always paying attention to the appropriate balance of the environment and the economy.

Industrial water/drinking water use and reuse of water

Cleaning activities are present in any industrial process as part of the process or by default as part of the maintenance of equipment. This conventional and out of date behaviour must be changed. In production processes, where enormous amounts of water are required (e.g. in leather industry, canning, etc.), it is recommend to implement recycling procedures to reduce water consumption. Furthermore, utilise local relief (e.g. industrial premises with slopes or different side levels) to catch rainwater. Thanks to tradition, many companies continue using steam in processes where oil could be used, which results in water consumption again. .Concerning the washing of working clothes quick water boilers might be installed and placed outside of the hot water network.

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Leak of water networks

The rates of leakage show significant differences by member states and within member states too. In some places 50% of the water resources is lost before reaching the tap. The Commission think that the benefits of reducing leakages on the environment and the economy must be assessed by each case. In the world of climate change and ever restrained resources, the drinking water and sewage sector will play a fundamental role in developing and distributing good practices in connection with the so called sustainable economic leakage levels as well as in determining the strategic visions of water infrastructure.

Management of leaking and "lost" water.

Modern residential water networks consist of endless pipe and pump systems. Pipes break by time and water leaks. Up to 60% of water delivered may "get lost" due to leakage from the distribution network. Up to 340 litres of water i.e. roughly the consumption of a whole household may leak through a 3mm hole on a pipe every day. A lot of water may be saved by treating leakages. For example in Malta, the present water use in villages is approx. 60% of the levels in 1992; this significant reduction was mostly achieved by treating leakages.

Water is also wasted "at the end of the pipe". Authorities and water suppliers have different methods including water pricing policies (e.g. water use charges or fees) and encouraging the use of water saving equipment (e.g. on showers, taps and toilet flushers) or information and awareness raising campaigns.

Detecting water leakage

In case of broken pipes in sanitary rooms, water mostly appears on the adjacent walls which are usually due to the break of water or heating pipes. The broken pipe section however is not always in the wall; water flowing from pipes under the floor tiles may also cause such symptoms. In case of failures of central heating systems, the boiler regularly loses pressure and water must be refilled. The leaking water often makes the floor and carpets wet and may leave a spot on the ceiling of the floor below.

Water flowing out in the garden can be taken up by nature for a while but in case of larger amount of water, muddy spots will nevertheless indicate the broken pipe nearby. Pavement and road

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surfaces may subside because of the soil loosened by the water and this may also indicate the broken pipe. In certain cases the leaking amount of water is either not significant enough or it can flow away in the layers of covering that it remains invisible for a long time. Unfortunately, it does not necessarily mean low amount, often multiple amounts of the average water consumption may be lost this way.

How can you recognise the problem?

The water bill is one of the best starting points. It is worth taking records of water consumption, and this the increased water bill will immediately indicate if water is lost somewhere. The bill however is often received only bimonthly and in more unfortunate cases the water may have been unnecessarily flowing for two months. You can prevent this by reading the water meter weekly so you notice potential extraordinary water consumption. You can make sure about it by checking the water meter. Close all consumers and see if the small wheel in the middle of the water meter is moving or not. If it is, it proves your suspicion that water is somewhere flowing away from the system.

Discussing the parts of the chapter about agriculture and industry, the trainer's role is primarily to call attention and increase the awareness of the participants of the course and collect experiences since anecdotes related to the specific subjects will make things heard more easily remembered and recalled.

The problem of water leakage affects participants more directly since the damage may be significant in an extraordinary situation, especially if water is escaping for a long time. Avoiding and preventing leakage results in significant water saving without having to change your habits.

Chapter 3.3.1: Saving water by residents

Importance of saving water by residents – saving water by residents is mostly an issue of attitudes

The availability of clear water is often taken for granted. You just open the tap and clear water is immediately running. You use it and the "dirty" water is drained in the sewage system. Most European homes have drinking water quality tap water available 24 hours a day. The short time spent getting from the tap to the sewage system is only a fraction of the entire path of water.

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Water in the residential supply system must be of better quality than in any other sector since it is used for drinking, cooking, taking showers and cleaning clothes and dishes. 144 litres of freshwater per person per day is used on average for communal purposes in Europe, not counting reused or desalted water. This is almost three times of the amount of water determined as fundamental human need. Unfortunately, the water provided is not completely used.

Up to 340 litres of water i.e. roughly the consumption of a whole household may leak through a 3mm hole on a pipe every day. Water is also wasted "at the end of the pipe".

The use of water saving equipment (e.g. on showers, taps and toilet flushers) or information and awareness raising campaigns is to be encouraged.

By combining measures - pricing policies encouraging water saving, reducing leakages, use of water saving devices and more efficient home appliances - up to 50% of the extracted water may be saved.

Water use could be decreased to 80 litres per day in Europe These potential savings do not only refer to the available amounts of water. It is important to note that one saving water also saves energy used to extract, pump, transport and treat water and other resources too. The daily communal freshwater consumption of one (1) person per day is 144 litres on average in Europe. This value is almost three times of the required amount of water supply determined as fundamental human need. Most of this water could be saved using some simple, everyday practices.

30-45% of the water is used for showers and similar amount is used for flushing the toilet in households. If the relatively clean water from the shower is used to flush toilets - where there is no direct contact to people - than the daily water use per person can be reduced from 110 litres to approx. 70 litres. Although there is a great opportunity to save water, public health is still a priority factor. The technology must be secure since eventually you and your family's health is at stake.

The most important objective of the course is the professional support of this possibility of saving communal water use, changing the habits of families or persons, selecting and using tools and equipment taking responsible water use into account, and supporting the use of such equipment.

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The trainer's important task is to strengthen the commitment of the participants of the course in supporting activities targeting economic water use and water saving in their own environment and facilitating cooperation in cases requiring cooperation.

More economic devices and products

In addition to modified habits of people, modernising and innovation of products achieving the original functions using significantly less water is also an effective water use.

".. The Commission issued the work plan related to environmentally friendly planning for 2012-2014. Which ... products related to water (e.g. water taps, showers and toilets) ... for which environmentally friendly design norms and other means can be developed.

It has multiple benefits. It creates a transparent situation for consumes who shall only find water saving devices and products of the market in the future, the performance of which will be indicated by a clear sign."In their informative activities for water saving in their own environment, the participants of the course will be capable of providing help, knowing the indications but without knowing technical details.

Reducing our daily water consumption is an opportunity for all of us

The state of emergency due to the shortage of water in Cape Town was the result of years of record low precipitation and drought. People were asked to restrict themselves and the daily amount of water was 50 litres per person.

In the discussion of the topic, the trainer's primary role is to strengthen the idea that the water use of individuals, the potential water saving can affect the success of preventing shortage of water. If the participants of the course know the amount of water consumption related to various activities (számoldki.hu) and work out their own water management plan for 50 litres per day, you can have a nice discussion, thinking about the reality of correcting our water consumption habits.

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Residential rainwater use opportunities

The opportunity of using rainwater for individuals or families largely depends on their living circumstances. People living in detached houses can freely collect, store and use the rainwater from their own house. Naturally, the relevant rules may change by countries or regulatory regions. For people living in condominiums or housing estates it can only become available through community collaboration. Rainwater can be collected on the rooftops of buildings in housing estates or the in the gutters and if a secondary waterpipe system is installed taking rainwater to the toilets and washing machines in the apartments, then 5-10 litres of drinking water per flushing and 40-60 litres of drinking water per washing can be replaced by rainwater. Drinking water used for the irrigation of gardens around the house or washing cars and other surfaces can also easily be replaced by rainwater.

All these investments may only return with the renovation of the existing water pipe system also reducing the risk of water seepage.

Many a little makes a mickle so the participants of the course should have a role in calling attention and supporting because developing a water management strategy for a small community may rise a lot of questions to be answered to which the participants of the course may give useful advices.

Chapter 4: Use of rainwater

Who owns the rainwater? Law and Practice

Rainwater drainage is not regulated by local regulations but by Government Regulation no. 253/1997. (XII. 20.) on the National Settlement Management and Construction Requirements (OTÉK). The provisions of OTÉK are mandatory. Paragraph (8), Article 47 of the OTÉK sets out the obligation that the precipitation drainage system of the plot or territory shall be constructed so that the water shall neither cause damage to the land, buildings and the adjacent land and buildings and in public areas (dipping, backwash, corrosion, etc.) nor hinder use for the intended purpose.

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Rainwater plays a very important role in the circulation of the natural water resources of the Earth. Nature can renew the underground waters by this. This process shall not be hindered but it is important to control due to sustainable development.

Drainage of rainwater is becoming a more and more important part of water management. It is a natural source of essential water, without life would not be possible on Earth. Water is getting more and more valuable these days. Rainwater as an alternative water source is becoming more and more known worldwide. The quality of surface and underground water resources continuously worsened in the past decades. So the costs of cleansing after extraction have significantly increased. Use of foodstuff quality drinking water has significantly decreased since 1990 due to increasing water and sewage fees.

Detached houses, water supply systems for small communities

Collection, storage and use of rainwater for garden irrigation, watering and communal water supply have been applied for a long time in many households Rainwater is collected in some tank from the gutter and then pumped through a water supply system to the area to be irrigated or into the building.

In recent years, rainwater has been used in increasing numbers of buildings primarily in Germany and Austria. It is mostly used to flush toilets, wash clothes or cars, i.e. for any purpose where drinking water quality for human consumption is not required. Rainwater has an extra benefit in washing because it is less hard so less washing agent is needed. This is particularly positive because tap water is usually rather hard in Hungary. Households or larger water consumers can save large amounts of water with a well-designed and constructed rainwater collection system and a pumped water supply system.

Rainwater from prefabricated houses and public spaces

Rainwater can be legally used in case of prefabricated houses but the availability of technical and technological devices and equipment varies by countries.

Drainage problems in cities often occur due to the terrain and the soil sealing, which hinders the seepage of water. The drainage of rainwater from public spaces and the collection of rainwater

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through temporary tanks can become an innovative option to collect rainwater. Water, which can be then used in prefabricated houses.

Of course, there are already more modern ways of rainwater collection systems available. Even governmental projects, for example the rainwater collection system of DaimlerChrysler Potsdamer Platz and Belss-Luedecke-Strasse housing estate where approx. 58% of rainwater can be used.

In our training programme, an individual course is devoted to the possibilities of using rainwater. The trainers of our course must call attention to the course dealing with the utilisation of rainwater and help people apply for the course.

Chapter 5: Greywater

Legal framework for greywater usage & state of art in grey water technology

The freshwater resources of the Earth are quickly decreasing. Meanwhile we fight droughts followed by floods due to the more and more extreme weather. Today, we use water with drinking water quality for all household purposes from washing, through irrigating or even flushing the toilet, which is a proof of our spendthrift lifestyle. In case of these areas of use, the slightly contaminated, already used water would be a suitable solution so greywater could be used as well.

The sewage produced in households can be categorised in two groups: slightly contaminated water from personal hygiene and washing is called greywater while the water from washing-up and toilet flushing is called blackwater. There are chemicals in greywater while blackwater is contaminated by pathogens and fats.

Are there water quality regulations of greywater in Hungary?

In spite of all these, there is no regulation in Hungary targeting the use or quality of greywaters. In the local adaptation of the training programs of the courses, the quality regulations and requirements for the utilisation of greywaters in the given country shall be built in.

What type of sewage can be reused?

In case of sewage waters, black and grey sewage waters are differentiated. Strongly contaminated water from flushing toilets is called black sewage water. Water from washing up is often categorised

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in this group since its organic material content is very high. Other communal sewage waters belong to the category of grey sewage water (~60%). Collected rainwater is also categorised as grey sewage water since it is contaminated however to a much lower extent than sewages produced in households and it does not necessarily need cleansing before use.

What is "greywater"? What can I use it for?

Greywater is any sewage water not containing excreta, which can be collected and used for flushing toilets without cleaning, or cleaning and irrigating after cleansing. Collected water cannot be stored for longer than 24 hours since bacteria may multiply in a hazardous extent in this time. Collecting and using communal sewage water not containing excreta (e.g. washing, bath) may be justified for environmental and economic reasons however, it needs carefulness. The use of greywater has not yet been regulated from the perspective of public health in Hungary.

May there be any public health risk of using greywater?

Yes, by deliberate or accidental swallowing, through foodstuff or in case of spraying water (toilet flushing, irrigating) by inhalation. In addition to microbiological risk (excreta contamination, high organic material content facilitating the growth of bacteria), greywater has chemical risk (disinfectants, household chemicals, etc.) as well.

Can the use of greywater cause Legionnaires 'disease?

Yes, the Legionella bacteria multiplying in water during inappropriate storage and treatment of greywater may cause legionnaires' disease if it is breathed in with mists. Several cases of this disease were recorded in relation with irrigation and washing (e.g. washing buses) with greywater and rainwater. 150 litres of water per capita per day is used on average in Hungarian households and at least one third of this could be saved reusing greywater. There are several methods for the use of greywater. Currently it is technically impossible to use greywater in prefab houses. Greywater can be used in condominiums or in family houses by creating the suitable technical, hygienic conditions, constructing an independent greywater system.

It must be decided during design and construction whether they wish to use greywater because in such case, three water pipes will be necessary instead of two. Water used for washing, bathing and

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showers is collected in a large tank and the system filters, cleans and sterilise the water. This is led back to the third pipe system and this greywater is used for washing and for flushing toilets.

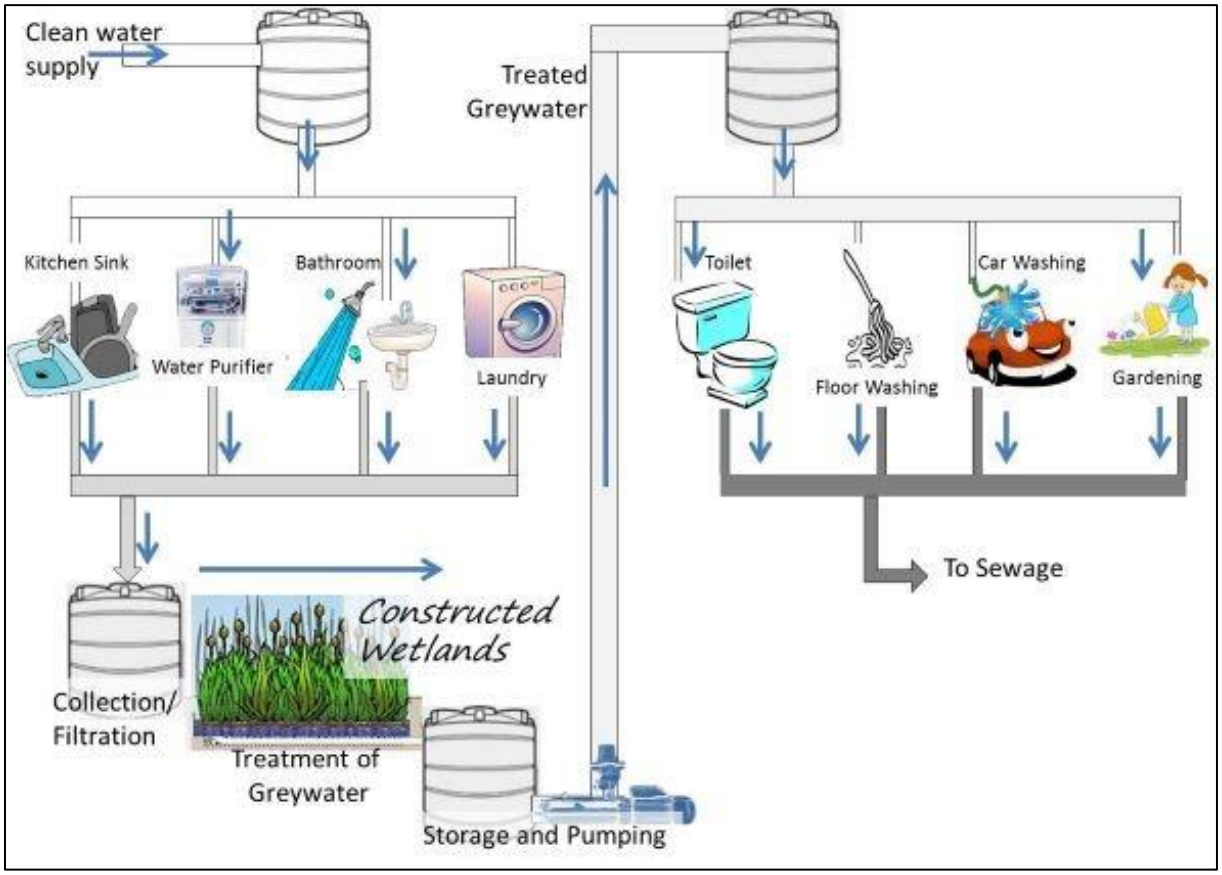

Figure 2: Greywater Recycling System, iamrenew.com

There is a solution when the greywater produced in washing is used for irrigation. Since using greywater is more dangerous than using rainwater, it must be done carefully. Greywater may be disinfected with agents containing chlorine or iodine, ultraviolet light or ozone. The previous ones are more available for the population while larger consumers can afford the latter as well.

Chapter 6: Secondary impact resulting in water saving (eating habits, etc.)

Having a look at water management globally, in addition to the already mentioned opportunities of saving water, it is inevitable to mention things that may have positive effects by reducing the

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available water resources because of a globally more water saving life style in connection with the change o habits, like eating habits.

To sum up, these savings on water extraction related to the production of goods can be made understandable by introducing the concept of virtual water content. The *virtual water content* of a product is the amount of water required to produce the product at a specific location. Anthony Allan, ecologist of King's College, London developed the concept of "virtual water" which means the total amount of water used in the production of a product. This is the total amount of clear water evaporated, used or contaminated from the irrigation of plants to the water used for cooling processing equipment. If you calculate the "water footprint" of products, you get much higher water consumption than you would have thought.

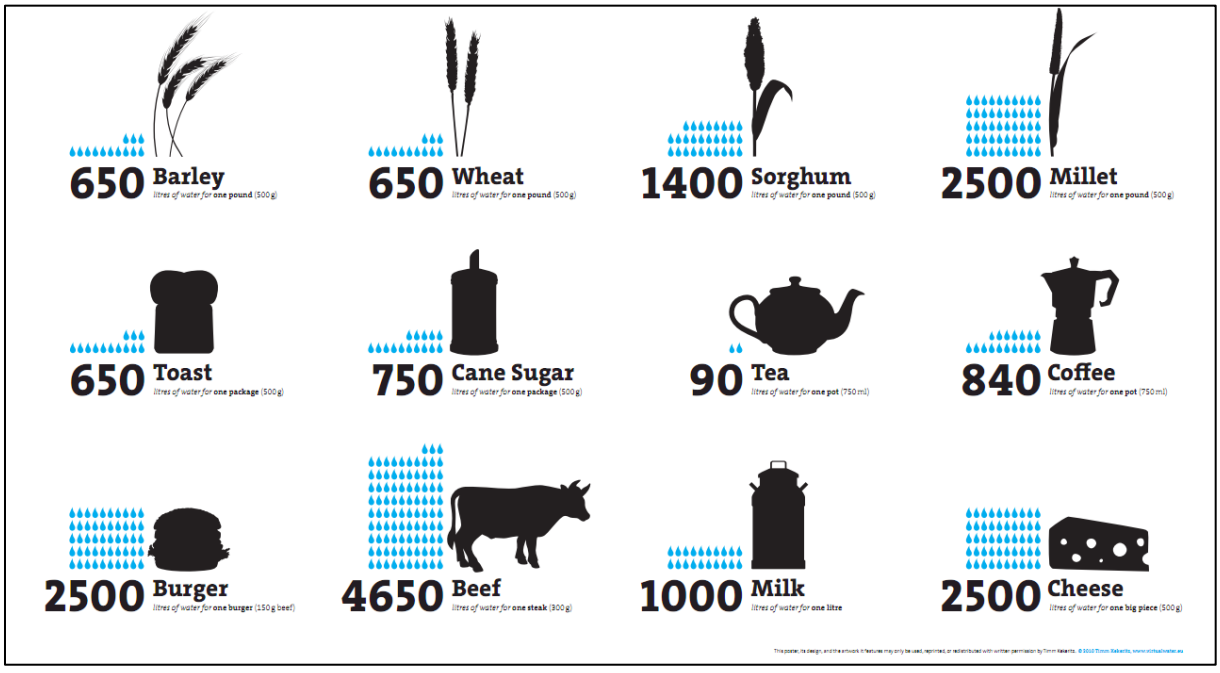

Figure 3: Virtual water inside products, virtualwater.eu

The invisible part of your water use, like **virtual waste product**, or **virtual energy.** Many consumer goods and foodstuffs have surprisingly high, invisible water content, i.e. the amount of water required for the production of the product. This amount is 1,300 litre in case of 1 kg wheat, 5,000 litres in case of 1 kg cheese, while the mass production of one single kilogram of beef requires 15,500 litres of water.

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It is worth noting in case of beef that their varieties produced in household or extensive farming (e.g. natural pasture management) would probably show a much better water balance. So, it is worth considering the virtual water content of products in our consumer decisions.

Chapter 7: Summary

The subject of the water saving course is a mosaic, each piece of which covers an important issue itself. The primary objective of the course is to strengthen commitment of participants towards responsible water use and to provide them with ammunition to provide others thinking of developing a water saving life style with knowledge and ideas to establish their strategy for action.

The course is primarily not for acquiring knowledge but rather a commitment to a responsible water management approach. The course aims to raise the opportunity that participants may become and agents in their own environment who can give founded support to others to reduce their water footprint and for their water saving lifestyle.

Chapter 8: Assessment

During the participation in the course, supporting and positive feedback is important for participants since they took part in the cooperation by their own decision and based on their own interest. It may be important for the participants to learn about each other's opinion in connection with their operation.

The trainer plays an important role in recognising if any participant is pushed to the periphery and helping them integrate into the group. Feedback given to the participants may be suitable to develop their competences in appreciating others and giving feedback in this.

During assessments, efforts shall be taken to encourage the participants by the feedback on the value of their participation that they should develop themselves in additional courses and become more informed about certain issues. The positive feedback given by the trainer may be enforced if the certificates of participation are handed over in a bit more formal situation, involving an external partner who is considered as a reference person for the participants.

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Work Package 3: First centre level "Vocational training" (EQF Level 3-4)

Activity 7: Additional Qualification Trainings

Training C – Greywater and Rainwater utilisation Technologies

BEST PRACTICE CURRICULUM

Developed by:

SAMK in 2021 in the Project "Management and Technologies of Water, Waste Water, Waste and Circular Economy (WWW&CE)"

Prepared by:

Wirtschaftsförderungsinstitut (WIFI) Steiermark

December, 2021

Co-funded by the Erasmus+ Programme of the European Union

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Chapter 1: Executive Summary

The course "Water Supply Technologies" was developed in the project "Management and Technologies of Water, Waste Water, Waste and Circular Economy – WWW&CE", which was funded by the Erasmus+ Programme of the European Union. Eleven partners from seven EU Member States developed tools according to work-based learning principles that are piloted and evaluated. For more information: https://www.sa-ce.eu

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The course "Greywater and Rainwater Utilization Technologies" covers topics regarding sustainability and puts a strong emphasis on the role of water on earth. Furthermore, the course outlines the environmental impact of wastewater and several different technologies for wastewater treatment. The focus lies on wastewater treatment processes for greywater and storm water. The knowledge acquired by the participants can be directly incorporated into their working life, so that the companies themselves can also benefit from this course. Overall, the course supports the development towards a more sustainable management.

The course "Greywater and Rainwater Utilisation Technologies" comprises of the following modules:

- Module I Introduction to sustainability and water
- Module II Rainwater utilization technologies
- Module III Greywater utilization technologies

Chapter 1.1: Introduction

Around 99% of all EU companies are SMEs providing up to 70% of all jobs, thus, they be well placed to solve environmental problems and to grow in the green economy. The environmental sector also offers excellent national and international market opportunities. Where SMEs are having many opportunities, they are also facing many challenges, for example, technological innovations, new legislative decrees and acts, climate change and more stringent environmental permits. The biggest bottleneck is the major skills shortage in most economic sectors while job

vacancies in SMEs and overall unemployment, in particular youth unemployment, is steadily growing.

To eliminate bottleneck and to respond other challenges companies need new ways of thinking, diverse expertise, and overall business reorientation. Companies should develop the knowledge and skills of their employees to solve the complex problems related to sustainable economy. These activities are particularly needed in companies involved in traditional branches, which should strive for greener business.

Collaboration between educational institutions and industry and work-based learning are visible tools to eliminate bottleneck and create the conditions for further growth in innovative market segments. This curriculum has been co-founded by the Erasmus+ program of the European Union: "Management and technologies of Water, Wastewater, Waste and circular Economy - WWW & CE". The aim of the curriculum is to train qualified environmental consultants for SMEs. After completing this training course, the student is sufficiently qualified to bring knowledge of greywater and rainwater utilization technologies into everyday life of an SME and to disseminate the knowledge and knowhow to the company's stakeholders.

The implementing educational institutions may offer and implement one, several or entire training, depending on their needs or regional conditions. The variation in regulations and circumstances, and qualification requirements are quite different in the BSR-countries, thus, the curriculum can be written only as a form of framework inside which the local actors should be able to modify the contents according to their own regulations and local requirements.

Chapter 1.2: Name of the Course

"Greywater and Rainwater Utilisation Technologies"

Chapter 1.3: Contact Details

WIFI Steiermark

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A-8010 Graz

Tel.: +43 306 602 1234

Fax: +43 316 602 301

E-Mail: info@stmk.wifi.at

Web: https://www.stmk.wifi.at

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To be adapted by each partner

Chapter 1.4: Target Group

The target group of curriculum consists of stronger learners during or directly after their regular vocational training. The individual modules are well suited to also be applied as the open vocational courses.

Chapter 1.5: Course Duration

In the curriculum, the average work required by each module is measured in ECTS credit units (abbreviated in this presentation as CU). One credit unit equals 27 hours workload. The curriculum consists of modules totaling 3 - 4 ECTS credit units corresponding 80 - 100 hours containing lectures, professional field visits, individual studies, and assignments. Cooperation with experienced local industry professionals is highly recommended. Curriculum can be studied individually, thus, it can be offered also via open study to all companies and organizations, who intend to develop their skills on sustainability and technologies related to rainwater and greywater.

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Chapter 2: Curriculum

The variation in regulations and circumstances and qualification requirements are quite different in the BSR-countries, thus, the curriculum can be written only as a form of framework inside which the local actors should be able to modify the contents of modules according to their own regulations and local requirements. Using innovative, problem-based, and experimental educational approaches, students build on their professional experience to become experts of sustainable gray water and rainwater utilization technologies.

Although many things in the BSR-countries are very different, what all the countries have in common is that the protection of water resources, ecosystems and drinking water are all specific cornerstones of environmental protection in Europe. Water is the precondition for humans, animals and plants so water is life. Water is a key issue in climate regulation, and it is necessary resource for the economy. Reasons for water and environmental protection are specifics and environmental issues transcend national borders. Effective protection of water is therefore necessary at EU level.

The overall objectives of the curriculum are to…

- Develop…
  - an overall image of the sustainability and in particular the role of water as part of Sustainable Development Goals, and
  - understanding of the basis and principles of water protection and what is the potential for further use of water.
- Increase the understanding of…
  - the environmental impacts of wastewater contaminants and wastewater treatment as well as
  - different levels of wastewater treatment and benefits of separate treatment
- Understand practical activities for SMEs to be a part of solving these challenges relying on laws and regulations.
- Become familiar with different kinds of treatment options related to greywater and rainwater and to familiarize with innovative technologies that promote the holistic treatment process towards more sustainable direction, where wastewater is seen as a resource rather than a problem.
- Create a vision of practical activities that could be undertaken by different sectors to promote options of wastewater treatment.

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After completing, the training student is sufficiently qualified to take the knowledge and skills presented above into everyday life of an SME and to disseminate the knowledge and expertise to the company's stakeholders.

The curriculum is divided in following modules:

- Module 1: Introduction to sustainability and water
- Module 2: Rainwater utilization technologies
- Module 3: Greywater utilization technologies

Figure 1 shows the overall contents of the curriculum on the Greywater and rainwater utilization technologies and tables 1- 3 the contents of the modules. Most of the proposed course material is available in European Union pages in several languages.

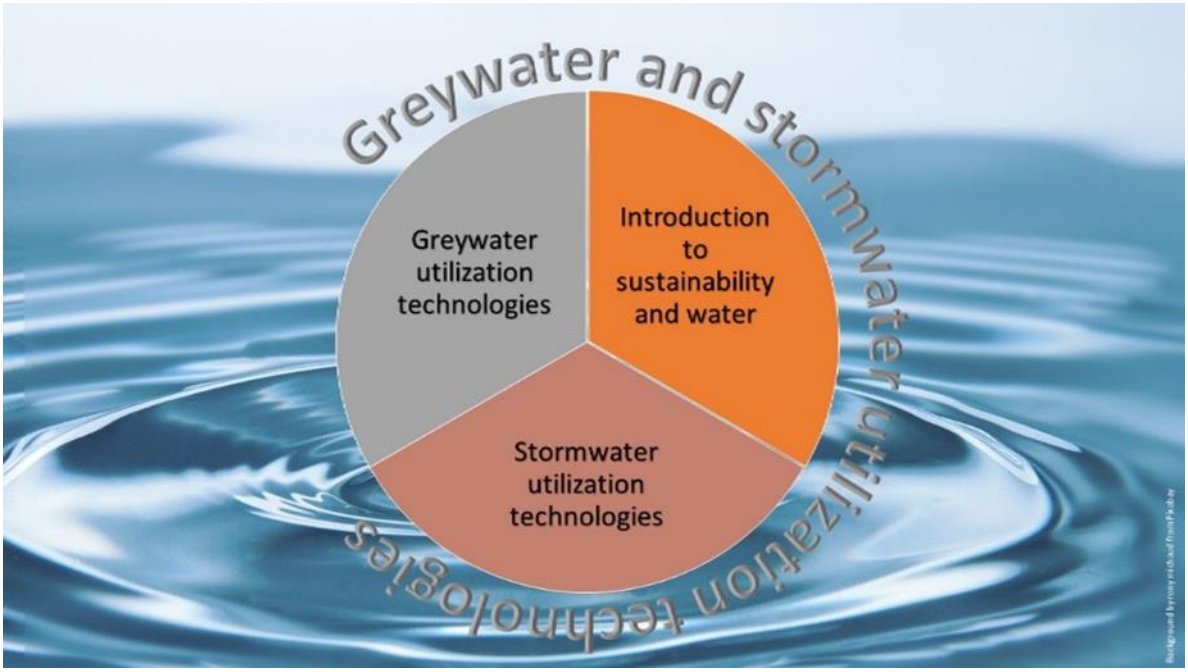

Figure 1: Contents of the curriculum on the Greywater and rainwater utilisation technologies

Chapter 2.1: Content of the Curriculum

Modules	Details

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I **Introduction to sustainability and water**	**Learning outcomes:** Students have an overall image of the sustainability and particularly the role of water as part of Sustainable Development Goals. Furthermore, they understand the basis and principles of water protection and the opportunities for further use of water
	Contents: Fundamentals of water; Water facts (UN); Main drivers towards more sustainable water management; Drought and flood risks; Sustainable development goals (SDGs); Biosphere is the basis of Sustainable Development; Water and Sustainable Development Goals; Water Cycle and climate change; Water Cycle in Sustainable Development Goals; Water footprint; Greening the grey infrastructure; Water-based solutions; Integrated solutions; European Green deal; European Commission, Ecosystem services and Green Infrastructure
	Recommended Literature: European Commission, Water reuse https://ec.europa.eu/environment/water/reuse.htm, Water reuse factsheet https://ec.europa.eu/environment/water/pdf/water_reuse_factsheet_en.pdf European Environment Agency, 2016. Is Europe's freshwater use sustainable? https://www.eea.europa.eu/highlights/world-water-day-is-europe United Nations, Water Facts https://www.unwater.org/water-facts/ European Green deal: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en EU Adaptation Strategy https://ec.europa.eu/clima/policies/adaptation/what_en Dr. Alexandros K. Makarigakis, Water Services in Urban settings and Contributions by UNESCO's IHP http://www.cadwes.com/wp-content/uploads/2021/06/A_Makarigakis_UNESCO_CADWES_2021.pdf European Commission, 2010. Water Scarcity and Drought in the European Union https://ec.europa.eu/environment/pubs/pdf/factsheets/water_scarcity.pdf SDGs: https://www.un.org/sustainabledevelopment/ SDG 6: https://sdgs.un.org/goals/goal6 SDG 6 - Clean water and sanitation (statistical annex) https://ec.europa.eu/eurostat/statistics-explained/index.php?title=SDG_6_-_Clean_water_and_sanitation_(statistical_annex)

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	Stockholm Resilience Centre (SRC) https://www.stockholmresilience.org/ The Water Cycle (Overview and video) https://gpm.nasa.gov/education/water-cycle Water footprint network: https://waterfootprint.org/en/ The EU Strategy on Green Infrastructure https://ec.europa.eu/environment/nature/ecosystems/strategy/index_en.htm European Commission, Ecosystem services and Green Infrastructure https://ec.europa.eu/environment/nature/ecosystems/index_en.htm Integrated urban water management (IUWM): Switch final report: Sustainable Water Management in the City of the Future http://www.switchurbanwater.eu/outputs/pdfs/SWITCH_-_Final_Report.pdf Sustainable Water management (SUWM): European Environment Agency, Sustainable water management https://www.eea.europa.eu/themes/water/european-waters/water-management Integrated Water Resources Management (IWMR) The United Nations World Water Assessment Programme: Integrated Water Resources Management in Action https://www.gwp.org/globalassets/global/toolbox/references/iwrm-in-action-unescounwwapunep-dhi-2009.pdf Water sensitive Urban Design (WSUD) and Low impact Development: Video explaining Water sensitive Urban Design (WSUD): https://www.youtube.com/watch?v=b_DTnOzYTR4 iWater Toolsheets /Approaches and concepts: https://www.integratedstormwater.eu/sites/www.integratedstormwater.eu/files/toolsheet_lid_wsud.pdf European Commission, Smart cities https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en European Commission, Green capital: https://ec.europa.eu/environment/europeangreencapital/applying-for-the-award/2021-competition/
II **Greywater utilization technologies** (Note: Module 2 must be designed country wise to meet the	**Learning outcomes:** Participants become familiar with wastewater and especially with greywater. They understand the environmental impacts of wastewater contaminants and wastewater treatment as well as different levels of wastewater treatment and benefits of separate treatment. Students get a vision of practical activities that could be undertaken by different sectors to promote options of greywater

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legislative frameworks and strategies)	utilization relying on good practices, technical solutions, tools and innovations that have already implemented.
	Contents: European legal framework related to waste water; Household wastewater; Greywater; Wastewater contaminants; Target hierarchy for wastewater handling; Different stages of wastewater treatment; Benefits of separate treatment; Reuse options; Dual piping; Indoor and outdoor reuse; The total costs for a greywater recycling system; Greywater treatment technologies;
	Recommended Literature: Dictionary of Water Terms https://www.usgs.gov/special-topic/water-science-school/science/dictionary-water-terms?qt-science_center_objects=0#qt-science_center_objects Book: Paul G. Smith and John S. Scott, 2005. Dictionary of water and waste management. Definitions and terminology https://onlinelibrary.wiley.com/doi/pdf/10.1002/9781118731741.oth EU Water Framework Directive 2000/60/EC (WFD) https://ec.europa.eu/environment/water/index_en.htm EU Urban Wastewater Directive 91/271/EEC (UWD) (Overview) https://ec.europa.eu/environment/water/water-urbanwaste/index_en.html Urban Waste Water Treatment Directive – Review https://ec.europa.eu/environment/water/water-urbanwaste/evaluation/index_en.htm Interreg CENTRAL EUROPE; Greywater (Include Quality requirements for greywater recycling and reuse; Technical and operational requirements; Reuse options; Treatment technologies; Benefits of greywater recycling https://www.interreg-central.eu/Content.Node/Digital-Learning-Resources/01-Greywater.pdf A state of the art review on greywater management: a survey from 2000 to 2020s https://iwaponline.com/wst/article/82/12/2786/78152/A-state-of-the-art-review-on-grey-water-management Greywater Webinar Recordings https://greywateraction.org/greywater-webinar-recordings/#Design%20and%20Install%20Your%20Own%20Laundry-to-Landscape%20System Regulation on minimum requirements for water reuse https://ec.europa.eu/environment/water/reuse.htm European Commission, Water performance of Buildings – Final report

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	https://ec.europa.eu/environment/water/quantity/pdf/BIO_Water PerformanceBuildings.pdf Guide to wastewater https://vesiensuojelu.fi/jatevesi/wpcontent/uploads/2018/10/SVYL_EN_esite_2018_intra.pdf Greywater Action https://greywateraction.org/greywater-reuse/ Investing water, Greywater recycling (Video) https://www.youtube.com/watch?v=y8kipgTJDUw AQUALOOP installation kit for water treatment and greywater recycling https://www.youtube.com/watch?v=rvtX3_uqCKU Products: Raita BioBox https://raitabiobox.com/eng/all/
III Stormwater utilization technologies (Note: Module 3 must be designed country wise to meet the availability of finance	**Learning outcomes:** Students become familiar with storm water, storm water quality, different kinds of stormwater management solutions, and understand at a basic level sustainable technologies that promote the holistic treatment process towards more sustainable direction, where storm water is seen as a resource rather than a problem.
	Contents: European legal framework related stormwater management; Rainwater quality; Rainwater harvesting; Types of rainwater harvesting system; Stormwater management solutions; On-site management; Infiltration: Detention; Conveying along on-site structures and piped systems; Stormwater management priorities; Integrated Stormwater Management (ISWM); Biochar; Good practices, technical solutions, tools and innovations
	Recommended Literature: EU Water Framework Directive 2000/60/EC (WFD) https://ec.europa.eu/environment/water/water-framework/index_en.html EU Floods Directive 2007/60/EC https://ec.europa.eu/environment/water/flood_risk/ EU Urban Wastewater Directive 91/271/EEC (UWD) https://ec.europa.eu/environment/water/water-urbanwaste/index_en.html Directive 2008/105/EC on environmental quality standards in the field of water policy https://eur-lex.europa.eu/eli/dir/2008/105/oj Directive 2006/118/EC on the protection of groundwater against pollution and deterioration

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	https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32006L0118 Sustainable Urban Drainage System (SUDS) https://www.susdrain.org/delivering-suds/using-suds/background/sustainable-drainage.html European Commission, Natural water retention measures (NWRM) https://ec.europa.eu/environment/water/adaptation/ecosystemstorage.htm Rainwater Harvesting in the UK https://www.renewableenergyhub.co.uk/main/rainwater-harvesting-information/ Interreg-Central Europe; Rainwater harvesting https://www.interreg-central.eu/Content.Node/Digital-Learning-Resources/Rainwater-harvesting.html Interreg-Central Europe; Digital Learning related rainwater harvesting https://www.interreg-central.eu/Content.Node/Digital-Learning-Resources/02-Rainwater-2.pdf Rainwater harvesting in Germany – Examples (Video) https://www.youtube.com/watch?v=5_69Za5grik Towards better environmental option in flood risk management https://ec.europa.eu/environment/water/flood_risk/better_options.htm Suomen kuntaliitto 2012, Hulevesiopas https://www.kuntaliitto.fi/yhdyskunnat-ja-ymparisto/tekniikka/hulevesien-hallinta/hulevesiopas-1 RT 89-11196 Hulevesien hallinta (MAKSULLINEN) https://kortistot.rakennustieto.fi/kortit/RT%2089-11196 Videos of Structure of sedum-moss roof both light weight and with substrate soil, products and construction examples: https://www.kerabit.fi/en/products/green-roofs/beautiful-and-practical-green-roofs Holt, E. Kivikoski, H. Kling, T. Korkealaakso, J. Kuosa, H. Loimula, K. Niemeläinen, E. Törnqvist, J. 2015. Vettä läpäisevät päällysteet - Käsikirja suunnitteluun, rakentamiseen ja ylläpitoon. 2015. VTT. (Only in Finnish, Free translation Water permeable coatings - Manual for Design, Construction and maintenance) https://www.vttresearch.com/sites/default/files/pdf/technology/2015/T201.pdf Holt, E. Koivusalo H. Korkealaakso, J. Sillanpää, N & Wendling, L. Vtt 2018; Filtration Systems for Stormwater Quantity and Quality Management Guideline for Finnish Implementation https://www.vttresearch.com/sites/default/files/pdf/technology/2018/T338.pdf Marttunen, M. &Parjanne, A. 2021. Antti Parjanne ja Mika Marttunen. Luonnonmukaiset tulvariskien hallintaratkaisut Itämeren alueella. Finnish Environment Institute. http://hdl.handle.net/10138/325482 iWater Toolsheets / Design & structural solutions

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	https://www.integratedstormwater.eu/sites/www.integratedstormwater.eu/files/toolsheet_descriptions_of_swm_solutions.pdf Integrated Stormwater Management Regional and national policy recommendations for implementing the integrated stormwater management in the Baltic Sea Region https://www.bsrwater.eu/sites/bsrw/files/stormwater_report_v1.pdf Report includes: Stormwater regulations in the Baltic Sea Region Analysis of local stormwater management governance and practices Recommendations for implementing ISWM at the EU, BSR, national and local level Stormwater management legislation both EU level legislation and National, regional and local level legislation and guidance documents Implementation of different aspects of ISWM at national, regional and local level and generic recommendations for including these aspects Examples of local actions plans and programmes for sustainable stormwater management ISWM Local adaptions material available in English, Finnish, Estonian, Latvian and Swedish http://www.integratedstormwater.eu/content/integrated-storm-water-management ISWM System guidelines, http://www.integratedstormwater.eu/sites/www.integratedstormwater.eu/files/iswm_guidelines_2.pdf ISWM: The three points approach www.integratedstormwater.eu/toolbox/ism/three-points-approach Biochar Carbons Ltd https://carbons.fi/en/biochar/ Carbofex Ltd https://www.carbofex.fi/?view=Home A Field Study of Biochar Amended Soils: Water Retention and Nutrient Removal from Stormwater Runoff https://biochar-us.org/sites/default/files/presentations/4.6.3%20Brown,%20Joseph.pdf Biochar Research Projects in Europe http://cost.european-biochar.org/en/projects Ramboll Finland Oy, Biohiilen hyödyntäminen kaupungin hulevesien puhdistuksessa, 2020. (only in Finnish) https://www.ouka.fi/documents/18161254/19559701/Hanna-Leena_Ventin_Biohiilen+hy%C3%B6dynt%C3%A4minen+kaupungin+hulevesien+puhdistuksessa.pdf/d365775f-14ee-4ea0-a055-04f37711c887 Biochar Research Projects in Europe http://cost.european-biochar.org/en/projects Good practices:

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	Use of rainwater in the Regional Fund for Environmental Protection and Water Management https://www.interregeurope.eu/policylearning/good-practices/item/4290/use-of-rainwater-in-the-regional-fund-for-environmental-protection-and-water-management/ Reducing urban flood risk through innovation procurement (PPI) https://www.interregeurope.eu/policylearning/good-practices/item/4413/reducing-urban-flood-risk-through-innovation-procurement-ppi/ Improved storm water quality in an industrial area in Helsinki https://www.balticwaterhub.net/good-practice/stormwater-industrial-area-helsinki EEA Report No 1/2021, Nature-based solutions in Europe: Policy, knowledge and practice for climate change adaptation and disaster risk reduction https://www.eea.europa.eu/publications/nature-based-solutions-in-europe Kaupunkipurot – Lähiympäristömme arvokkaat pienvedet Streams in cities – Small waterways in surrounding neighbourhood (Original in Finnish) http://julkaisut.turkuamk.fi/isbn9789522167736.pdf Check out: Case example: City of Turku, Pääskyvuori; The planning process integrated diversity of the environment and particularly important areas, the effects of construction on the environment, human well-being and the future of rainwater. Pioneering cities 1 iWater project – City of Turku, Environmental Division. Integrated Stormwater Management System Guidelines, iWater project website, www.integratedstormwater.eu/sites/www.integratedstormwater.eu/files/iswm_guidelines_2.pdf References / More information Peer review of the climate policies and stormwater management in Helsinki, Turku and Lahti (in Finnish only): http://ilmastotyokalut.fi/files/2014/07/ILKKA_raportti_vertaisarviointi.pdf City of Copenhagen Cloudburst Management Plan 2012, https://en.klimatilpasning.dk/media/665626/cph_-_cloudburst_management_plan.pdf Stockholm Stormwater Strategy, http://miljobarometern.stockholm.se/content/docs/vp/Stockholms_dagvattenstrategi_2015-03-09.pdf Stormwater management in Malmö and Copenhagen with regard to climate change scenarios:https://www.researchgate.net/publication/267631302_Storm-water_management_in_Malmo_and_Copenhagen_with_regard_to_climate_change_scenarios City of Helsinki Storm Water Management Programme, www.hel.fi/static/liitteet/kaupunkiymparisto/julkaisut/julkaisu-03-18-en.pdf

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Chapter 2.2: Additional Literature

Material can be applied according to needs. Following links, e.g., are worth looking into:

- Peter Senge: Five Disciplines of Learning Organizations
- PDAC -Cycle https://kanbanize.com/lean-management/improvement/what-is-pdca-cycle
- EQF https://europa.eu/europass/en/european-qualifications-framework-eqf
- Lifelong learning and wastewater treatment in the Baltic Sea region http://www.iwama.eu/sites/iwama/files/outputs/files/lifelong_learning_and_wastewater_treatment_in_the_baltic_sea_region.pdf
- The future of education and skills Education 2030 https://www.oecd.org/education/2030/E2030%20Position%20Paper%20(05.04.2018).pdf
- Eligibility: who can get funding? https://ec.europa.eu/info/funding-tenders/how-apply/eligibility-who-can-get-funding_en#companies
- Main funding opportunies https://ec.europa.eu/info/funding-tenders/how-apply/eligibility-who-can-get-funding/funding-opportunities-small-businesses_en
- Europe's programme for small and medium-sized enterprises COSME https://ec.europa.eu/growth/smes/cosme

Chapter 2.3: Further recommendations

Learning methods: Lectures, visiting lectures, professional fields visits, visits in enterprises, videos approaching the topics (reliability of the sources must be evaluated), individual studies and assignments. Teachers are encouraged to use varying methods containing e.g.

Cooperation with experienced local industry professionals is highly recommended. Curriculum can be studied individually, so it can be offered via open studies also to all companies and organizations, who intend to develop their skills on technologies in decentralised wastewater treatment.

Requirements for the trainer's qualification: Instructors shall meet the applicable domestic legal regulations.

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Chapter 2.4: Competence Level Testing

Examinations will be coordinated and competences will be evaluated according to local regulation and locally required qualifications. It is each local actor's responsibility to take care that the admission requirements are fulfilled before the qualification application.[1]

Chapter 3: Teaching Material

The teaching material can be found in the file "3LoE_WP3_CC_Greywater and Rainwater Utilisation Technologies_Teaching Material.ppt".

Chapter 4: Notes for teachers

The material enclosed in the file "3LoE_WP3_CC_Notes for teacher.docx" is an example showing how the topics of this course could be presented. Each teacher should adjust this to the circumstances of his own country, considering the local regulation and the study programme of the students; are they studying engineering, environmental topics, finance or marketing, some examples to be given. Each programme may require different weightings and highlights, and it is on the responsibility of each teacher to consider these special needs.

[1] An examination regulation and a procedure for the international recognition of the educational qualification can be found under Result 5 Examination Regulation and international Recognition

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Work Package 3: First centre level "Vocational training" (EQF Level 3-4)

Activity 7: Additional Qualification Trainings

Training D – Technologies Decentralized Wastewater Treatment

BEST PRACTICE CURRICULUM

Developed by:

SAMK in 2021 in the Project "Management and Technologies of Water, Waste Water, Waste and Circular Economy (WWW&CE)"

Prepared by:

Wirtschaftsförderungsinstitut (WIFI) Steiermark

November, 2021

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Chapter 1: Executive Summary

The course "Technologies Decentralized Wastewater Treatment" was developed in the project "Management and Technologies of Water, Waste Water, Waste and Circular Economy – WWW&CE", which was funded by the Erasmus+ Programme of the European Union. Eleven partners from seven EU Member States developed tools according to work-based learning principles that are piloted and evaluated. For more information: https://www.sa-ce.eu

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The overall goal of the course "Technologies Decentralized Wastewater Treatment" is to outline the role of water and in particular to illustrate the relevance of water in connection to sustainability. Moreover, the participants will gain valuable knowledge of wastewater treatment practises and technologies as well as the legal framework in order to ensure legal compliance. After successful completion of the training, the participants are empowered to apply the acquired knowledge in their company and promote a conscious use of water as well as the use of efficient treatment processes.

The course "Technologies decentralized wastewater treatment" comprises the following modules:

- Module I Introduction to sustainability and water
- Module II Regulatory frameworks and strategies
- Module III Decentralized wastewater treatment and different options for its implementation
- Module IV Technologies decentralized wastewater treatment

Chapter 1.1: Introduction

Around 99% of all EU companies are SMEs providing up to 70% of all jobs so they are well placed to solve environmental problems and grow in the green economy. The environmental sector also offers excellent national and international market opportunities. Where SMEs are having many opportunities, they are also facing many challenges for example, technological innovations, new legislative decrees and acts, climate change and more stringent environmental permits. The biggest bottleneck is the major skills shortage in most economic sectors while job vacancies in SMEs and overall unemployment, in particular youth unemployment, is steadily growing.

To eliminate bottleneck and to respond other challenges companies need new ways of thinking, diverse expertise, and overall business reorientation. Companies must reskill and upskill their employees to solve the complex problems related to sustainable economy. Measures are especially needed in traditional companies, which should strive for greener business.

Collaboration between educational institutions and industry and work-based learning are visible tools to eliminate bottleneck and create the conditions for further growth in innovative market segments. This curriculum has been co-founded by the Erasmus+ program of the European Union: "Management and technologies of Water, Wastewater, Waste and circular Economy - WWW & CE". The aim of the curriculum is to train qualified future environmental consultants for SMEs. After completing this training course, the student is sufficiently qualified to take knowledge of technologies decentralized wastewater treatment into everyday life of an SME and to pass on the knowledge and expertise to the company's stakeholders.

The implementing educational institutions may offer and implement one, several or all the trainings, depending on their needs or regional conditions. The variation in regulations and circumstances and qualification requirements are quite different in the BSR-countries, thus the curriculum can be written only as a form of framework inside which the local actors should be able to modify the contents according to their own regulations and local requirements.

Chapter 1.2: Name of the Course

"Technologies Decentralized Wastewater Treatment"

Chapter 1.3: Contact Details

WIFI Steiermark

Körblergasse 111-113

A-8010 Graz

Tel.: +43 306 602 1234

Fax: +43 316 602 301

E-Mail: info@stmk.wifi.at

Web: https://www.stmk.wifi.at

To be adapted by each partner

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Chapter 1.4: Target Group

The target group of curriculum consists of stronger learners during or directly after their regular vocational training. The individual modules are well suited also to be applied as the open vocational courses.

Chapter 1.5: Course Duration

In the curriculum, the average work required by each module is measured in ECTS credit units (abbreviated in this presentation as CU). One credit unit equals 27 hours workload. The curriculum consists of modules totaling 3 - 4 ECTS credit units corresponding 80 - 100 hours containing lectures, professional field visits, individual studies, and assignments. Cooperation with experienced local industry professionals is highly recommended. Curriculum can be studied individually, thus, it can be offered also via open study to all companies and organizations, who intend to develop their skills on sustainability and technologies related to rainwater and greywater.

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Chapter 2: Curriculum

The variation in regulations and circumstances and qualification requirements are quite different in the BSR-countries, thus the curriculum can be written only as a form of framework inside which the local actors should be able to modify the contents of modules according to their own regulations and local requirements. Using innovative, problem-based and experiential teaching methods, students build on their professional experience to become experts in creating and implementing effective and sustainable wastewater treatment solutions to regions outside of the sewage network.

Although many things in the BSR-countries are very different, what we all have in common is that the protection of water resources, ecosystems and drinking water are all specific cornerstones of environmental protection in Europe. Water is the precondition for humans, animals and plants so water is life. Water is a key issue in climate regulation, and it is necessary resource for the economy. Reasons for water and environmental protection are specifics and environmental issues transcend national borders. Effective protection of water is therefore necessary at EU level.

The overall objectives of the curriculum are to…

- develop an overall image of the sustainability and in particular, the role of water as part of Sustainable Development Goals and understand the basis and principles of water protection and what is the potential for further use of water.
- understand the environmental impacts of wastewater contaminants and wastewater treatment in regions outside of the sewage networks and develop practical activities for SMEs to be a part of solving these challenges relying on laws and regulations.
- become familiar with different levels of wastewater treatment, wastewater treatment options and technologies that promote the treatment of wastewater in regions outside of the sewage networks.
- create a vision of practical activities that could be undertaken by different sectors to promote options of wastewater treatment and after completing the training student is sufficiently qualified to take that knowledge into everyday life of an SME and to pass on the knowledge and know-how to the company's stakeholders

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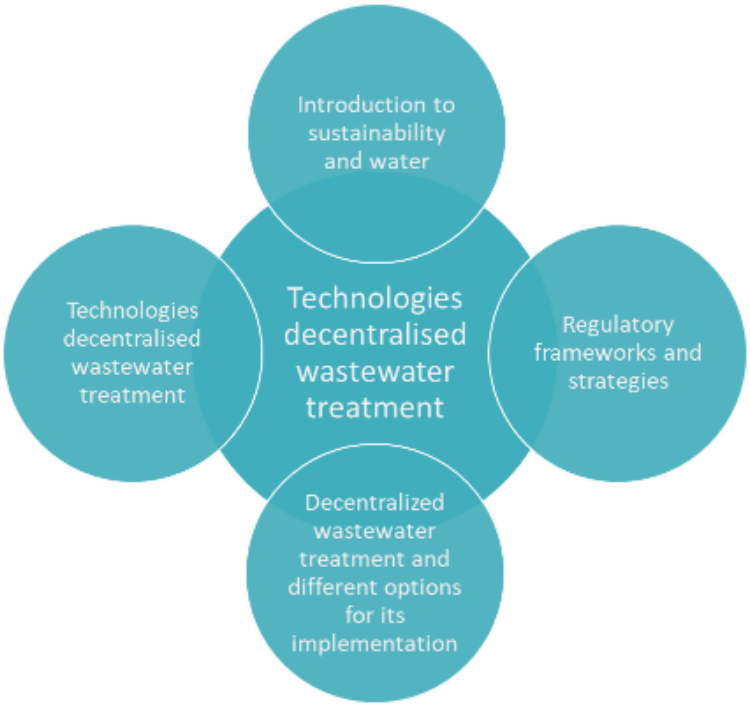

Figure 1: Contents of the curriculum on the Technologies decentralised wastewater treatment

Figure 1 shows the overall contents of the curriculum on the Technologies decentralized wastewater treatment and tables 1- 4 the contents of the modules. Most of the proposed course material is available in European Union pages in several languages.

The curriculum is divided in modules as follows:

- Module I Introduction to sustainability and water
- Module II Regulatory frameworks and strategies
- Module III Decentralized wastewater treatment and different options for its implementation
- Module IV Technologies decentralized wastewater treatment

Chapter 2.1: Content of the Curriculum

Modules	Details

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I Introduction to sustainability and water	**Learning outcomes:** Develop an overall image of the sustainability and in particular the role of water as part of sustainable development goals. Student understands the basis and principles of water protection and what is the potential for further use of water.
	Contents: Perspectives on water resources, water challenges and the potential of further use of water; Water Facts (UN); Sustainability and Circular Economy; Sustainable Development Goals (SDGs); Sustainable Development Goal 6; The water cycle and climate change; The Water Cycle in the Sustainable Development Goals
	Recommended Literature: Definitions and terminology https://onlinelibrary.wiley.com/doi/pdf/10.1002/9781118731741.oth Book: Paul G. Smith and John S. Scott, 2005. Dictionary of water and waste management. United Nations, Water Facts https://www.unwater.org/water-facts/ SDGs: https://www.un.org/sustainabledevelopment/ SDG 6: https://sdgs.un.org/goals/goal6 SDG 6 - Clean water and sanitation (statistical annex): https://ec.europa.eu/eurostat/statistics-explained/index.php?title=SDG_6_-_Clean_water_and_sanitation_(statistical_annex) The Water Cycle (Overview and video) https://gpm.nasa.gov/education/water-cycle European Commission, Water reuse https://ec.europa.eu/environment/water/reuse.htm, check out Water reuse factsheet https://ec.europa.eu/environment/water/pdf/water_reuse_factsheet_en.pdf The World Bank, Water https://www.worldbank.org/en/topic/water EU Commission Water https://ec.europa.eu/environment/water/index_en.htm EU Science Hub; Water https://ec.europa.eu/jrc/en/research-topic/water
II Regulatory frameworks and strategies	**Learning outcomes:** This section focuses on legislation, strategies and action plans related to waste water treatment. It develops practical activities for SMEs to be a part of solving challenges relying on laws and regulations, relevant

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(Note: Module 2 must be designed country wise to meet the legislative frameworks and strategies. Policies that regulate discharges form dwellings not connected to the wastewater collection (Water Framework Directive, The Bathing Water Directive, Urban Waste Water Treatment Directive)	standards and strategies that support international and transboundary water cooperation.
	Contents: European legal framework related to water; National legislation and regulations; international and transboundary water cooperation; European Green Deal; Biodiversity strategy for 2030; The HELCOM Baltic Sea Action Plan; HELCOM recommendation 28E/6; River Basin Management Plans; Urban wastewater treatment in Europe; Wastewater from outside of the sewage networks;
	Recommended Literature: EU Water Framework Directive 2000/60/EC (WFD) https://ec.europa.eu/environment/water/index_en.htm EU Urban Wastewater Directive 91/271/EEC (UWD) (Overview) https://ec.europa.eu/environment/water/water-urbanwaste/index_en.html Urban Waste Water Treatment Directive – Review https://ec.europa.eu/environment/water/water-urbanwaste/evaluation/index_en.htm The Bathing Water Directive https://ec.europa.eu/environment/water/water-bathing/index_en.html Regulation on on minimum requirements for water reuse https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0741&from=EN European Environment Agency, 2019. Urban Waste Water – Non-Connected Dwellings, Final report (Check out 1.2 Key European legislation context of its relevance to non-connected dwellings) Examples of national legislation and the implementation of directives can be found (*): *European Environment Agency, Urban Waste Water – Non-Connected Dwellings, Final report (Bulgaria, Finland, France, Ireland, Poland) *VillageWaters Project, 2019. A survey of available wastewater treatment technologies for sparsely populated areas https://www.villagewaters.eu/s2/994_608_70_A_survey_of_availabl e_WWTT_-_User8217s_Manual.pdf?v=18230656 (Estonia, Finland, Latvia, Lithuania, Poland, Sweden) European Green Deal https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en Biodiversity strategy for 2030 https://ec.europa.eu/environment/strategy/biodiversity-strategy-2030_en

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	The HELCOM Baltic Sea Action Plan https://helcom.fi/baltic-sea-action-plan/ HELCOM recommendation 28E/6 https://www.helcom.fi/wp-content/uploads/2019/06/Rec-28E-6.pdf River Basin Management Plans https://ec.europa.eu/environment/water/participation/map_mc/map.htm Urban wastewater treatment in Europe https://www.eea.europa.eu/data-and-maps/indicators/urban-waste-water-treatment/urban-waste-water-treatment-assessment-5 National legislation (Case example from Finland): Environmental Protection Act https://www.finlex.fi/fi/laki/kaannokset/2014/en20140527_20190049.pdf Valtioneuvoston asetus talousjätevesien käsittelystä viemäriverkostojen ulkopuolisilla alueilla (Only in Finnish) https://www.finlex.fi/fi/laki/alkup/2017/20170157 Guide to wastewater https://vesiensuojelu.fi/jatevesi/wp-content/uploads/2018/10/SVYL_EN_esite_2018_intra.pdf Haja-asutuksen jätevedet – Lainsäädännöt ja käytännöt (Only in Finnish) https://julkaisut.valtioneuvosto.fi/handle/10024/80090 Suomen vesiensuojeluliitto (Only in Finnish) - https://vesiensuojelu.fi/ Jätevesien käsittely haja-asutusalueella (only in Finnish) https://www.doria.fi/bitstream/handle/10024/158531/Opas%202_2018_VARELY_J%C3%A4tevesien%20k%C3%A4sittely%20haja-asutusalueella.pdf?sequence=5&isAllowed=y
III Decentralized wastewater treatment and different options for its implementation	**Learning outcomes:** Understand in a basic level why wastewater should be treated. Student can identify wastewater contaminants and different stages of wastewater treatment. Student understands the challenges and opportunities related to different kind of treatment systems.
	Contents: Wastewater contaminants; Different levels of wastewater treatment; Implementation options for decentralised wastewater treatment; Wastewater treatment systems which separate black and greywater; Black and greywater treatment in a single system; Benefits of separate treatment;
	Recommended Literature: European Environment Agency, Urban Waste Water – Non-Connected Dwellings, Final report Training Materials and Guidelines for Wastewater Treatment (Part 1: Considering the future of the Baltic Sea, Part 2: Consider before

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	flush, Part 3: Consider and act): https://villagewaters.eu/Guides_for_Wastewater_Treatment_996 The Federation of Water Protection Associations in Finland, Guide to wastewater https://vesiensuojelu.fi/jatevesi/wp-content/uploads/2018/10/SVYL_EN_esite_2018_intra.pdf Vorne & Silvenius etc. 2019: A survey of available wastewater treatment technologies for sparsely populated areas https://www.villagewaters.eu/s2/994_608_70_A_survey_of_available_WWTT_-_User8217s_Manual.pdf?v=18230656 Global Dry toilet association of Finland https://huussi.net/en/frontpage/ Varsinais-Suomen elinkeino-, liikenne- ja ympäristökeskus, 2018. Jätevesien käsittely haja-asutusalueella (Only in Finnish) https://www.doria.fi/bitstream/handle/10024/158531/Opas%2022018_VARELY_J%C3%A4tevesien%20k%C3%A4sittely%20haja-asutusalueella.pdf?sequence=5&isAllowed=y Jätevesiopas (Only in Finnish) https://vesiensuojelu.fi/jatevesi/ Ympäristöministeriö, 2017. Haja-asutuksen jätevedet – Lainsäädännöt ja käytännöt (Only in Finnish) https://julkaisut.valtioneuvosto.fi/handle/10024/80090 Muoviteollisuus ry, 2018. Hajajätevesiopas Jätevesijärjestelmien toteutus haja-asutusalueella (Only in Finnish) https://www.plastics.fi/putkijaosto/putkijaoston_julkaisut/ Suomen vesiensuojeluliitto (Only in Finnish) - https://vesiensuojelu.fi/ Särkelä & Lahti, 2013. Haja-asutuksen jätevesien koostumus ja jätevesijärjestelmien toimivuus (Only in Finnish): http://www.vhvsy.fi/files/upload_pdf/1617/julkaisu682013.pdf
IV Technologies decentralized wastewater treatment	**Learning outcomes:** Become familiar with wastewater treatment options and technologies that promote the treatment of wastewater in regions outside of the sewage networks. Create a vision of practical activities that could be undertaken by different sectors to promote options of wastewater treatment relying on good practices, technical solutions, tools and innovations that have already implemented.
	Contents: Wastewater treatment systems: Holding tank / Cesspool, Septic tank and its level of purification, Soil treatment, Packaged wastewater treatment plant, Natural wastewater treatment, Waterless toilet; Designing, dimensioning and maintenance of sewage system; Selecting a suitable wastewater solution; Good

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	practices, technical solutions, tools and innovations related to regions outside of the sewage networks.
	Recommended Literature: VillageWaters Project https://villagewaters.eu/ Introduction Animation Video https://villagewaters.eu/Introduction_Animation_Video_1011 Constructed Wetland Design Video https://www.youtube.com/watch?v=deKenkkhMuY Building a Constructed Wetland for Better Water Quality Video: https://www.youtube.com/watch?v=O93YuK-p-hw Batch treatment plant Video https://www.youtube.com/watch?v=5aA_MVPJOno Wastewater Solutions Information Tool (helps households and village communities in sparsely populated areas to make successful solutions for wastewater treatment.): https://villagewaters.eu/945#1|4|1|1,2,7|6.2;4.9||1-100|49-420|1|0|0|en Types of Technology: https://villagewaters.eu/Technologies_for_on-site_Wastewater_Treatment__958 Vorne & Silvenius etc. 2019: A survey of available wastewater treatment technologies for sparsely populated areas https://www.villagewaters.eu/s2/994_608_70_A_survey_of_available_WWTT_-_User8217s_Manual.pdf?v=18230656_(Check out Appendix 2: "Available wastewater treatment systems": Estonia, Finland, Latvia, Lithuania, Poland, Sweden) European Environment Agency, 2019. Urban Waste Water – Non-Connected Dwellings Final report (Check out Annex 2 Overview of the most common IAS (=Individual or other Appropriate Systems)) Individual and other Appropriate systems (IAS) for waste water treatment https://www.eureau.org/resources/briefing-notes/5833-briefing-note-on-ias/file WaterAid, 2017: Technical guidelines for designing a decentralised waste water treatment system https://washmatters.wateraid.org/sites/g/files/jkxoof256/files/Technical%20guidelines%20for%20designing%20a%20decentralised%20waste%20water%20treatment%20system_0.pdf Mallipiirroksia jätevesijärjestelmästä (Only in Finnish, Free translation: Technical drawings of waste water systems) https://www.ymparisto.fi/fi-fi/rakentaminen/rakennushanke/talotekniset_jarjestelmat_lvi/kiinteiston_jatevesien_kasittely/Syventavaa_tietoa/Mallipiirroksia_jatevesijarjestelmasta Vertaile kuivakäymälöitä (Compare dry toilets, Only in Finnish) https://huussi.net/kuivakaymala-vertailu/

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	Good practices, technical solutions, tools and innovations: https://www.balticwaterhub.net/hub/sector/waste-water-4/type/tool IWAMA Project (Interactive Water management) http://www.iwama.eu/materials/outputs (Wastewater management in the Baltic Sea Region by developing the capacity of the wastewater treatment operators and implementing pilot investments to increase the energy efficiency and advance the sludge handling.) Ce-marking https://ec.europa.eu/growth/single-market/ce-marking_en Products and innovations: iMETLand http://imetland.eu/ ("iMETland is an eco-friendly device which purifies urban wastewater from small communities at zero-energy operation cost, creating a virtuous circle safeguarding local environment and connecting water, energy, ICT and land resources") Different bioreactors for greywater (The Bioreactor has been independently tested for six years): https://www.vestelli.fi/en/products https://www.vestelli.fi/wp-content/uploads/2018/02/Vestelli_Tutkimustulosten_Koonti.pdf https://www.vestelli.fi/blog/2017/12/17/biopuhdistaja-soveltuu-myos-tiukemman-vaatimustason-alueille/ https://www.vestelli.fi/blog/2018/04/05/biopuhdistajalle-parhaat-kayttajaarvioinnit-syken-munputsari-hankkeessa-2/ Pipelife (Different types of wastewater treatment plants, holding tanks ets.): https://www.puhdastulevaisuus.fi/tuotteet.html Biolan (different types of wastewater treatment and toilets): https://www.biolan.com/products.html Uponor (Different types of wastewater treatment plants, holding tanks ets.) https://www.uponor.fi/tuoteluettelo/jateveden-puhdistamot-ja-sailiot Uponor Clean 1 batch treatment plant for all wastewaters https://www.youtube.com/watch?v=vkEqhHt6Tdw FANN Blue (kolmeosastoinen saostussäiliö) https://fann-suomi.fi/fann-blue-kolmeosastoinen-saostussailio/ FANN IN-DRÄN Plus (toilet water + greywater) https://fann-suomi.fi/ratkaisut/jarjestelma-wc-harmaavesi/ FANN IN-DRÄN Biosuodatin (toilet water + greywater) https://fann-suomi.fi/ratkaisut/jarjestelma-fosforinpoistolla/ IN-DRÄN i3 Plus (for greywater) https://fann-suomi.fi/ratkaisut/jarjestelma-ilman-wc-harmaavesi/ FANN-jätevesijärjestelmä umpisäiliöllä (holding tank) https://fann-suomi.fi/ratkaisut/jarjestelma-umpisailiolla/ IN-DRÄN Max – suuret järjestelmät https://fann-suomi.fi/in-dran-max-suuret-jarjestelmat/

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The proportional division suggested above can be changed if local conditions or needs of participants could be responded better by other solutions.

Chapter 2.2: Additional Literature

Further material can be applied according to needs. Following links, e.g., are recommended:

- European waters and their pollution: a political, scientific and technical introduction, 2017: https://ec.europa.eu/environment/legal/law/7/pdf/01_Vindimian_European_waters_pollution.pdf
- The Baltic Sea Challenge http://www.itamerihaaste.net/en
- Kemira's Water Handbook https://www.kemira.com/insights/water-handbook-2020/
- European Sustainable Phosphorus Platform https://phosphorusplatform.eu/
- Ympäristönsuojelulaki 527/2014 (Environmental Protection Act) https://www.finlex.fi/fi/laki/kaannokset/2014/en20140527_20190049.pdf
- Further Vocational Qualification in Sustainability and Environmental Technology, see https://eperusteet.opintopolku.fi/eperusteet-service/api/dokumentit/5960722
- Specialist Vocational Qualification in Sustainability and Environmental Technology, see https://eperusteet.opintopolku.fi/eperusteet-service/api/dokumentit/6035687
- Finnish Water Forum, Introduction to Finnish Water Sector actors http://www.syke.fi/download/noname/%7B8111B247-92A8-4304-9F0C-0CDB3D50A533%7D/125506
- Finnish Environment Institute SYKE, Urban water supply and wastewater treatment in Finland Legislation and Practices http://www.syke.fi/download/noname/%7BBC8A00A3-698C-4529-A7D3-8B369D51E2FE%7D/125511
- Transboundary Cooperation between Estonia and Latvia in the frame of River Basin Management Planning in Gauja/Koiva River Basin District http://www.envir.ee/sites/default/files/2016.07.08_est-latbg_signed_koik.pdf
- City of Helsinki - Real estate specific wastewater management https://www.suomi.fi/services/real-estate-specific-wastewater-management-city-of-helsinki/ae94920d-b200-4754-bf67-1c2aef72e007
- City of Espoo - Water protection and wastewaters https://www.espoo.fi/en-US/Housing_and_environment/Environment_and_nature/Environmental_supervision/Water_protection_and_wastewaters
- Peter Senge: Five Disciplines of Learning Organizations
- PDAC -Cycle https://kanbanize.com/lean-management/improvement/what-is-pdca-cycle
- EQF https://europa.eu/europass/en/european-qualifications-framework-eqf
- Lifelong learning and wastewater treatment in the Baltic Sea region http://www.iwama.eu/sites/iwama/files/outputs/files/lifelong_learning_and_wastewater_treatment_in_the_baltic_sea_region.pdf

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- The future of education and skills Education 2030 https://www.oecd.org/education/2030/E2030%20Position%20Paper%20(05.04.2018).pdf
- Eligibility: who can get funding? https://ec.europa.eu/info/funding-tenders/how-apply/eligibility-who-can-get-funding_en#companies
- Main funding opportunies https://ec.europa.eu/info/funding-tenders/how-apply/eligibility-who-can-get-funding/funding-opportunities-small-businesses_en
- Europe's programme for small and medium-sized enterprises COSME https://ec.europa.eu/growth/smes/cosme

Chapter 2.3: Further recommendations:

Learning methods: Lectures, visiting lectures, professional fields visits, visits in enterprises, videos approaching the topics (reliability of the sources must be evaluated), individual studies and assignments. Teachers are encouraged to use varying methods containing e.g.

Cooperation with experienced local industry professionals is highly recommended. Curriculum can be studied individually, so it can be offered via open studies also to all companies and organizations, who intend to develop their skills on technologies in decentralised wastewater treatment.

Requirements for the trainer's qualification: Instructors shall meet the applicable domestic legal regulations.

Chapter 2.4: Competence Level Testing

Examinations will be coordinated, and competences will be controlled according to local regulation and locally required qualifications. It is each local actor's responsibility to take care that the admission requirements are fulfilled before the qualification application.[1]

Chapter 3: Teaching Material

The teaching material can be found in the file "3LoE_WP3_CD_Technologies decentralised wastewater treatment_Teaching Material.pptx".

[1] An examination regulation and a procedure for the international recognition of the educational qualification can be found under Result 5 Examination Regulation and international Recognition

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Chapter 4: Notes for teachers

The material enclosed in the file "3LoE_WP3_CD_Notes for teachers.pdf" is an example showing how the topics of this course could be presented. Each teacher should adjust this to the circumstances of his own country, considering the local regulation and the study programme of the students; are they studying engineering, environmental topics, finance or marketing, some examples to be given. Each programme may require different weightings and highlights, and it is on the responsibility of each teacher to consider these special needs.

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Work Package 3: First centre level "Vocational training" (EQF Level 3-4)

Activity 7: Additional Qualification Trainings

Training E – Fundamentals of the Circular Economy

BEST PRACTICE CURRICULUM

Developed by:

VILNIAUS STATYBININKŲ RENGIMO CENTRAS in 2020 in the Project "Management and Technologies of Water, Waste Water, Waste and Circular Economy (WWW&CE)"

Prepared by:

Wirtschaftsförderungsinstitut (WIFI) Steiermark

August, 2021

Co-funded by the Erasmus+ Programme of the European Union

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With the support of the Erasmus+ Programme of the European Union

Chapter 1: Executive Summary

The course "Fundamentals of the Circular Economy" was developed in the project "Management and Technologies of Water, Waste Water, Waste and Circular Economy – WWW&CE", which was funded by the Erasmus+ Programme of the European Union. Eleven partners from seven EU Member States developed tools according to work-based learning principles that are piloted and evaluated. For more information: https://www.sa-ce.eu

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The course is part of a training package for "Environmental Consultants", dealing with six key areas of sustainable economy. The courses are designed to provide additional qualifications on the European Framework Qualification Level 3 to 4. Furthermore, the six courses are primarily designed for young people with strong learning skills for vocational training. Completing all six courses enables the participants to support others, especially small and medium sized companies, to steer towards a more environmentally conscious approach to their personal and business objectives in order to generate a more sustainable world.

The six courses in the "Environmental Consultant" programme are:

- A – Water Supply Technologies
- B – Water Saving Technologies
- C – Greywater and Rainwater Utilisation Technologies
- D – Decentralized Wastewater Treatment Technologies
- E – Fundamentals of Circular Economy
- F – Solution-oriented Consulting for Sustainable Development

Each course may be completed individually or as part of the "Environmental Consultant" training programme. For each participated and completed course, a participation degree is provided. The degree for this course, which is achieved with a successful completion of the course, is called "Consultant in Water Supply Technologies".

The main objective of the course "water supply technologies" is to introduce an environmentally conscious perspective of qualified professionals in the field of water supply technologies to

attending course participants. Thereby, the participants are able to obtain qualifications in the field of sustainability in water supply technologies.

The course aims to provide participants with knowledge about water access, the necessity of sustainable water management and water saving to transform their own personal or business activities or consult others in these areas.

The course "Fundamentals of the Circular Economy" comprises of following modules:

- Module I Definition of Circular Economy
- Module II Phases of the Circular Economy
- Module III Climate Change
- Module IV Waste Management
- Module V Management of specific waste types
- Module VI Management of hazardous waste

Chapter 1.1: Name of the Course

"Fundamentals of the Circular Economy"

Chapter 1.2: Contact Details

WIFI Steiermark

Körblergasse 111-113

A-8010 Graz

Tel.: +43 306 602 1234

Fax: +43 316 602 301

E-Mail: info@stmk.wifi.at

Web: https://www.stmk.wifi.at

To be adapted by each partner

Chapter 1.3: Type of Course

Training course for additional qualifications. Specifically, for qualification of young people with strong learning skills for vocational training.

Chapter 1.4: Target Group

The target group of the whole "Environmental Consultant" training programme comprises of students in vocational training related to water management, water supply and sewage water management, skilled workers already working in these professional fields or other people interested in the topic of responsible water management.

Chapter 1.5: Competences Obtained

ENVIRONMENTAL MOTIVATION	Acting and behaving to a set of reasons and facts to preserve materials, resources and products for the circular economy.
LEGAL KNOWLEDGE	Knowledge of EU documents regulating the implementation of the principles of the circular economy. Furthermore the United nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol, Paris Climate Change Agreement, national regulatory requirements applicable to the waste management.
RESPONSIBILITY	Knowing, evaluating and comparing one's own and others behaviours, thoughts, values and emotions in the preservation of materials and resources to contribute to the circular economy.
CREATIVITY	Responding in a circular economy approach to a complicated situation to optimize resources and products in a new and original way and furthermore to develop innovate solution for our problems.
TAKING ENVIRONMENTAL INITIATIVE	Showing initiative and encouraging others in dealing with environmental behaviours to promote the principles of the circular economy.
VALUING ENVIRONMENTAL IDEAS	Identifying, analysing, measuring and considering ideas to face the challenge of resource preservation in the field of circular economy.

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WORKING WITH OTHERS	Combining different contributions and finding ideas (also from outside of the environment) to create environmental value to reuse and optimise resources and products.
WORK SUSTAINABLE	Application of the most relevant environmental principles in the given scenarios.
SPOTTING OPPORTUNITIES	Making connections between ideas and concepts from different fields, linking different disciplines and ideas with a circular economy approach..
RISK MANAGEMENT	Assumption of the challenges, reducing risk to aminimum, accepting residual risks in order to succeed in critical situations.
ENVIRONMENTAL VISION	Develop a compelling and inspired vision or sense of the core environmental purpose and communicate this message to others. It contributes to a successful transition to a circular economy.

Chapter 1.6: Course Duration

The course comprises of

- 88 contact hours,
- 54 hours of individual learning and
- 2 hours of assessment.

The total duration of this course amounts to 144 hours.

Based on the principles set out in the European credit system for vocational education and training (ECVET), the total of the following activities shall be taken into consideration in calculating the duration of the training:

- Contact hours (theoretical): expected number of hours of joint activity of teacher and student, including the lectures, processing teaching materials, seminars and workshops required to learn the theoretical parts.

- Self-study times (individual work): individual study some topic or technical literature by the participant of the training programme without supervision or participation in the training group.
- Assessment hours: time to prepare for exams including the time of the exams.

The training content has been available via digital tools on a platform supporting distant learning for people living farther from the venues of the course or to meet the measures of the COVID-19 epidemic.

Chapter 1.7: Required Prerequisites

The content of the course is designed as a training according to level four (4) of the European Qualifications Framework (EQF).

The participants entering the training programme shall meet at least one of the following requirements based on the content of the curriculum:

a) They attend a school or dual basic programme, they have appropriate educational results and they wish to obtain additional qualification in addition to their normal qualification.
b) They already have a completed vocational qualification and wish to obtain an additional qualification.

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Chapter 2: Curriculum

Chapter 2.1: Content of the Curriculum

Number	Module Name	Content	Training Time	
			Contact Hours	Self-Study Time
I	**Definition of the circular economy**		**10**	**6**
	What is circular economy?	The participants acquires the basic facts and knowledge about circular economy. EU documents regulating the implementation of the principles of the circular economy (Report of the implementation of the Circular Economy Action Plan, Documents on the circular economy package) support the learning process. New business opportunities as well as case studies are part of this module.		
	Why is a shift towards circular economy important?			
	Principles of the circular economy			
	Aims, objectives and regulations			
	Opportunities for businesses			
II	**Stages of the circular economy**		**36**	**20**
II.1	**Resources**		4	2
	Primary raw materials	The participant knows the commonly use minerals in the industry (oil, metal ores, peat, dolomite, limestone, gravel, chalk, clay)		
	Secondary raw materials	The participant is aware of the common waste products (paper, glass, plastic, metal, etc.) and its procedures to convert them into secondary resources.		

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	Secondary raw materials by composition	The participant knows the various consistencies of plastic, paper, glass, metals, wood and biological materials.		
II.2	**Design**		4	2
	Eco-design strategies for products	The participants gain knowledge on the following aspects: How to choose the better, more environmentally friendly and less hazardous materials. The importance of the reduction of the resources employed. Furthermore, optimization of production management, sustainable logistics, avoidance of end-of-life scenarios and the extension of the product life are part of this module.		
	Effects of Eco-Design	The participants receive best practise examples in eco-design strategies for products and discuss important ideas.		
II.3	**Production**		4	2
	Effective technologies applied in the production industry	One acquires knowledge on innovative and environmentally friendly technologies within this course.		
	Eco-labels	The participants are aware of the most important eco-labels and their regulations as well as some labelled goods and products.		
II.4	**Distribution**		**4**	**2**
	Types of packaging	The participants are able to classify packaging according to their purpose, type, use and material.		
	Labelling of the packaging	The participants are informed about the different labelling techniques of plastic, metal, paper, glass, textile and composite packaging.		
II.5	**Re-use**		8	4
	Zero waste concept	One gains knowledge on the zero waste philosophy and movement.		

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	Sharing economy	The participants are taught best practise examples of the sharing economy.		
	Possibilities of waste re-use	One is aware of the different re-using possibilities of the waste components, like plastic, glass, paper, metal, wood, ceramic, concrete brick, car tires and so on.		
II.6	**Waste collection**		8	6
	Waste sorting	The participants receives knowledge on the advantages and disadvantages of the waste sorting process.		
	Glass, paper and plastic	The participants will be informed about the sorting system of the different materials in the respective country and the associated national requirements.		
	Biodegradable (organic) waste			
	Construction and demolition waste			
II.7	**Recycling**		4	2
	Advantages and disadvantages of waste recycling	The participant receives a common understanding of the waste recycling technologies and gets good practice examples of EU companies in recycling plastic waste.		
	Waste Recycling technologies			
III	**Climate Change**		**8**	**4**
	Consequences of air pollution	The participant is aware of environmental issues like global warming, acid rain formation, ozone depletion and so on. The impact on Europe and the world is also part of this Module. Furthermore, the action everyone can take are discussed in class as well.		
	International agreements and obligations of the parties	The participant is informed of the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto protocol and the Paris Climate Change Agreement.		

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IV	**Waste management**		**12**	**8**
	Regulations of waste management	The participant gets familiar with the national regulatory requirements applicable to waste management.		
	Economic and financial measures for waste management	The participant knows funding and financial support procedures for environmental projects as well as financial measures for waste management.		
	Hierarchy of waste management	One gains knowledge on the principles of waste management.		
	Responsible consumption, waste reduction			
	Organization of waste management and accounting	The participants learn the usage of waste catalogs, codes, quantification, waste storage and the related accounting requirements for businesses.		
V	**Management of specific waste types**		**14**	**8**
	Household waste management	The participant gets educated on the requirements for the management of the specific waste types.		
	Biodegradable waste management			
	Packaging waste management			
	Construction and demolition waste management			
	Bulky waste management	The participants are educated on the requirements concerning bulky waste management.		
	Waste disposal in landfills	One is taught about the requirements and national regulations for setting up a landfill.		

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	Using waste for energy production	The participant gets an overall understanding of the methods of the waste energy production and knows the positive and negative aspects of waste incineration.		
VI	**Management of hazardous waste**		**8**	**8**
	Properties that create hazardous waste	The participants are able to identify hazardous waste and are aware of the impact of chemicals on the environment and the human health.		
	Labelling of hazardous materials	The participants are informed about legal regulations concerning the labelling of hazardous materials and know the warning icons.		
	Management of electronic waste	The participants know the requirements for the specific waste component and the danger of improper handling.		
	Management of oil waste			
VII	**Assessment**		**2**	
		Total	**90**	**54**

Chapter 2.2: Content of the knowledge acquired by learning the modules

Learning achievements	Questions and exercises related to the recommended content	No of hours	
		Contact hours	Self-study
One knows the principles of the circular economy and EU legal documents in this field	Topic No.1: Definition of the circular economy Tasks: 1.1. Define the term Circular Economy. 1.2. Describe principles of the circular economy. 1.3. Get acquired with the EU documents which regulate the implementation of the circular	**10**	**6**

	economy principles (Report of the implementation of the Circular Economy Action Plan, Documents on the circular Economy package). 1.4. Give practical examples of new business opportunities.		
The participant knows and can describe all stages of the circular economy	Topic No. 2: Stages of the circular economy 2.1. Know the difference between primary and secondary resources. 2.2. Familiarize yourself with the eco-design strategies for products. 2.3. Get acquainted with innovative and environmentally friendly technologies, eco-labels and their value. 2.4. Identify different packaging types. 2.5. Provide examples of re-using possibilities for plastic, glass, paper, metal, wood… 2.6. Get acquainted with national frameworks applicable to the sorting of waste. 2.7. Have a common understanding of waste recycling technologies and provide good practice examples of EU companies and how they deal with recycling plastic waste.	**36**	**20**
The participant should get familiar with the international agreements and the obligation of the parties as well as with the consequences of the pollution.	Topic No.3: Climate Change 3.1. List and describe the consequence of human activities on the environment. 3.2. Know the following regulatory instrument: United Nations Framework Convention on Climate Change (UNFCCC), Kyoto protocol, Paris Climate Change Agreement.	8	4
One is aware of the national regulations on waste	Topic No.4: Waste management 4.1. Know and follow the national regulations concerning waste management.	12	6

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management and is able to apply them	4.2. Know and apply the principles of waste management. 4.3. Explain waste storage and accounting requirements for businesses.		
The participant knows how to deal with different types of waste.	Topic No. 5: Management of specific waste types 5.1. Know and apply requirements for the management of various types of waste. 5.2. Know the requirements for setting up a landfill.	14	8
Evaluate properties, which create harmful waste and know how to deal with hazardous waste components.	Topic No. 6: Management of hazardous waste 6.1. Evaluate the impact of hazardous waste on the environment and human health. 6.2. Know the requirements for the management of hazardous waste and be able to explain them.	8	8
	Total	**142 +2 for assessment**	

Chapter 2.3: Teaching/Learning Equipment and Literature

The classroom is equipped with school furniture, demonstration tools and IT devices to facilitate a learning environment.

Literature/Sources:

- Textbooks and methodical handout material of topic relevance
- EU documents regulating the implementation of the principles of the circular economy (Report of the implementation of the Circular Economy Action Plan, Documents on the circular economy package), Convention on Climate Change (UNFCCC), Kyoto Protocol, Paris Climate Change Agreement

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- National regulatory requirements applicable to the different types of waste management, good practices examples (https://circulareconomy.europa.eu/platform/en/good-practices).

Chapter 2.4: Further recommendations:

Learning methods: Lecture, presentation, discussions, group work, projects, hands-on activities, company visits.

Requirements for the trainer's qualification: The trainer must meet the requirements for a VET trainer according to the national regulatory framework.

Chapter 2.5: Competence Level Testing

The assessment of the program and identification of competences (examination) consists of two parts:

1. Assessment of theoretical knowledge (multiple choice test of approximately 20 questions)
2. Analysis of a case study

After passing the course, the participants will receive a qualified certificate of participation. If all six qualifications are completed, the degree "Environmental Consultant „is granted.

Chapter 3: Teaching Material

The Content can be found on the following sides.

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VILNIAUS
STATYBININKŲ
RENGIMO
CENTRAS

WWW&CE Water, Waste & Circular Economy

TECHNOLOGIES OF THE CIRCULAR ECONOMY MODEL

LEARNING OUTCOMES

- Why does we need to apply the circular economy aspects in construction sector?
- What are technologies of circular economy in non-construction sector?
- What are the best practices for use alternative technologies for the site management?

IMPACT OF THE CIRCULAR ECONOMY TECHNOLOGIES IN WASTE MANAGEMENT

Improved Recycling Rates	• Recycling and waste management companies are investing in improving their tools and techniques.
Automated Waste Collection	• Technology has transformed the way waste management works with automated sensors that trigger instant alerts every time a container is full and needs service.
Route Optimization	• Technology has made point-to-point pickups eco-friendly and financially viable while improving energy -efficiency.
Landfill Modernization	• Solar panel systems integrated with geomembrane are facilitating the production of sustainable energy while preventing carbon from re-entering the environment.
Enhanced Safety	• Recycling and waste management companies are making consistent efforts to improve safety which is of prime importance to an industry running several 30-ton trucks through residential areas.
Quick Turnaround Time	• Technology has greatly reduced the complexity and cost of modern day waste management systems making them all the more efficient, safer and productive while reducing their environmental impact.

CIRCULAR ECONOMY ASPECTS ACROSS A BUILDING'S LIFE CYCLE STAGE

LIFE CYCLE STAGE	CIRCULAR ECONOMY ASPECT
Design	DfD, design for adaptability and flexibility, design for standardisation, design out waste, design in modularity, specify reclaimed materials, specify recycled materials.
Manufacture and supply	Eco-design principles, use less materials/optimise material use, use less hazardous materials, increase the lifespan, design for product disassembly, design for product standardisation, use secondary materials, take-back schemes, reverse logistics.
Construction	Minimise waste, procure reused materials, procure recycled materials, off-site construction.
In use and refurbishment	Minimise waste, minimal maintenance, easy repair and upgrade, adaptability, flexibility
End of life	Deconstruction, selective demolition, reuse of products and components, closed-loop recycling, open-loop recycling

EXISTING TECHNOLOGIES FOR SIMILAR WASTE STREAMS

Segregation and sorting	• Manual sorting, multi-compartment bins, automatic bottle sorting system, mechanical biological treatment (MBT), optical sorting, Eddy current sorting, multi compartment bins, optical sensor based sorting technologies.
Collection and transporting	• Underground collection system, Web based GIS technology, Waste bin monitoring system using GSM, Waste compactors.
Recycling	• De-Inking technology for paper recycling, biodegradable and degradable plastic, cullet remanufacturing (for glass).

Click on each technology for more information

EXISTING TECHNOLOGIES FOR SIMILAR WASTE STREAMS

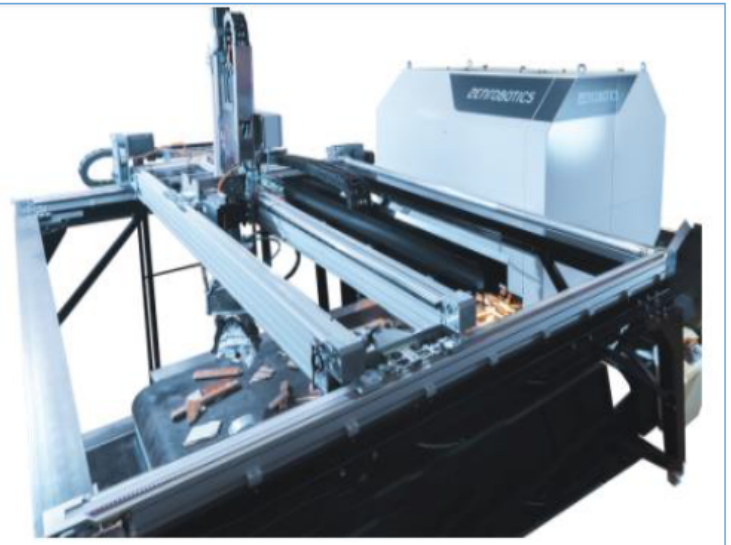
Processing	• Autoclaving, Fluffing, Melting technology, Incineration, Vermicomposting
Energy recovery	• Thermal Conversion, advance thermal treatment technologies (pyrolysis, gasification), plasma gasification and plasma pyrolysis, refuse derived fuel (RDF), fluidized bed technology, bio-conversion, dry anaerobic composting.
Disposal	• Bioreactor technology, landfill gas recovery technologies (microturbine technology, fuel cell technology).

Click on each technology for more information

EXAMPLE FOR USE TECHNOLOGY FROM NON-CONSTRUTION SECTOR

- **ZenRobotics Heavy Picker**

ZenRobotics Heavy Picker is the strongest waste sorting robot on the market. It can easily lift objects weighing up to 30 kg. It minimizes the need for pre-shredding of waste and also reduces the need for pre-sorting with an excavator.



https://zenrobotics.com/solutions/applications/

Watch this material for more information

USING ZENROBOTICS FOR C&D MANAGEMENT

SORTED FRACTIONS:	KEY BENEFITS:
1. Metals; 2. Wood mixed and by type (A-wood, B-wood, C-wood); 3. Inert mixed and by type (asphalt, bricks, concrete etc.); 4. Rigid plastics mixed and by polymer (PE, PET, PVC, OCC).	1. Simple, automated sorting process, the possibility for 24/7 continuous sorting; 2. High purity of recycled materials, higher aftermarket revenues; 3. Sort weighty and large objects; 4. Sort multiple fractions with one robot; 5. Reduce excavator sorting; 6. Reduce shredding.

EXAMPLES OF GOOD PRACTICES

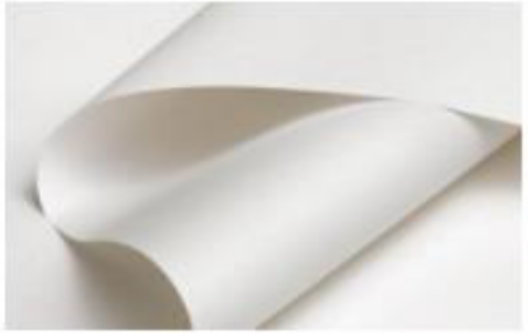
EcoAllene® is a product of recycling, yet it boasts the most important properties of a raw product: consistency and uniformity of supply.
virgin plastic is made from crude oil, whereas the source of EcoAllene® is waste from food packaging, which is consistent over time in terms of composition and characteristics.

https://circulareconomy.europa.eu/platform/en/good-practices/ecoplasteam-recycles-multi-layer-packaging-integrally-produce-ecoallene

Watch this material for more information

EXAMPLES OF GOOD PRACTICES

Description:
Shiro Alga Carta paper, patented by Favini in the ’90s, is the pioneer in their upcycling ecological paper range. It uses algae from the Venice lagoon, whose proliferation would put at risk the lagoon’s fragile ecosystem.



Watch this material for more information

https://circulareconomy.europa.eu/platform/en/good-practices/favinis-upcycled-ecological-papers-shiro-alga-carta-tackles-harmful-algae

EXAMPLES OF GOOD PRACTICES

UK startup uses recycled plastic to build stronger roads

British engineer Toby McCartney has devised an innovative process to replace much of the crude oil-based asphalt in pavement with tiny pellets of plastic created from recyclable bottles. The result is a street that's 60 percent stronger than traditional roadways, 10 times longer-lasting, and a heck of a lot better for the environment.

Watch this material for more information

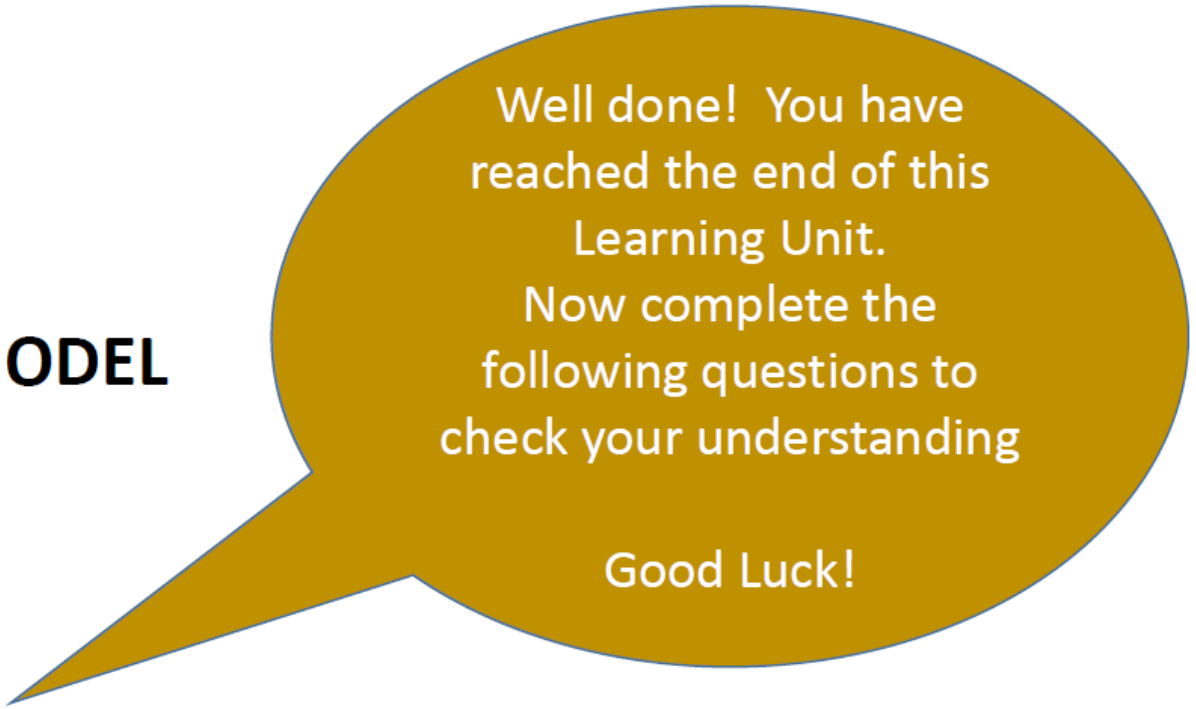
https://www.curbed.com/2017/4/26/15428382/road-potholes-repair-plastic-recycled-macrebur

ALTERNATIVE TECHNOLOGIES FROM NON CONSTRUCTION SECTOR FOR CONSTRUCTION SECTOR

- Vacuum Tube Window;
- Self-Cleaning Coatings;
- Phase Change Materials;
- Aerogel and Vacuum Insulated Panels;
- Passive zenithal light guides;
- PV Systems and Facade Integrated PV Systems;
- Solar Thermal Heating Systems;
- Gas absorption Heat Pumps.

Click on each technology for more information

TECHNOLOGIES OF THE CIRCULAR ECONOMY MODEL



MULTIPLE CHOICE QUESTIONS

1. What is the correct sequence of waste management processes?
A. Energy recovery → Reuse → Landfill
B. Prevention→Landfill→Reuse →Recycle →Energy recovery
C. Prevention→Reuse →Recycle →Energy recovery → Landfill
D. Reuse →Energy recovery → Recycle

2. What are processing technologies for waste treatment ?
A. Autoclaving and incineration ;
B. Thermal conversion and pyrolysis;
C. Bioreactor technology and microturbine technology ;
D. Biodegradable and degradable plastic and Cullet remanufacturing .

3. What type of technology is used to segregate and sort the waste?
A. De-Inking technology for paper recycling;
B. Underground collection system;
C. Cullet remanufacturing (for glass);
D. Optical sorting.

4. What is the alternative technology for waste treatment?
A. Landfill gas recovery technologies ;
B. Pyrolysis;
C. Self-Cleaning Coatings;
D. Shredding .

5. What new material Ecoplasteam produces from „tetrapack "?
A. EcoAllene;
B. EcoTetrapack;
C. EcoPaper;
D. EcoPlastic.

MULTIPLE CHOICE QUESTIONS: ANSWERS

1. What is the correct sequence of waste management processes?
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D. EcoPlastic

Exercise 1. Fill the table

LIFE CYCLE STAGE	CIRCULAR ECONOMY ASPECT
Design	
Manufacture and supply	
Construction	
In use and refurbishment	
End of life	

Answer of Exersice 1.

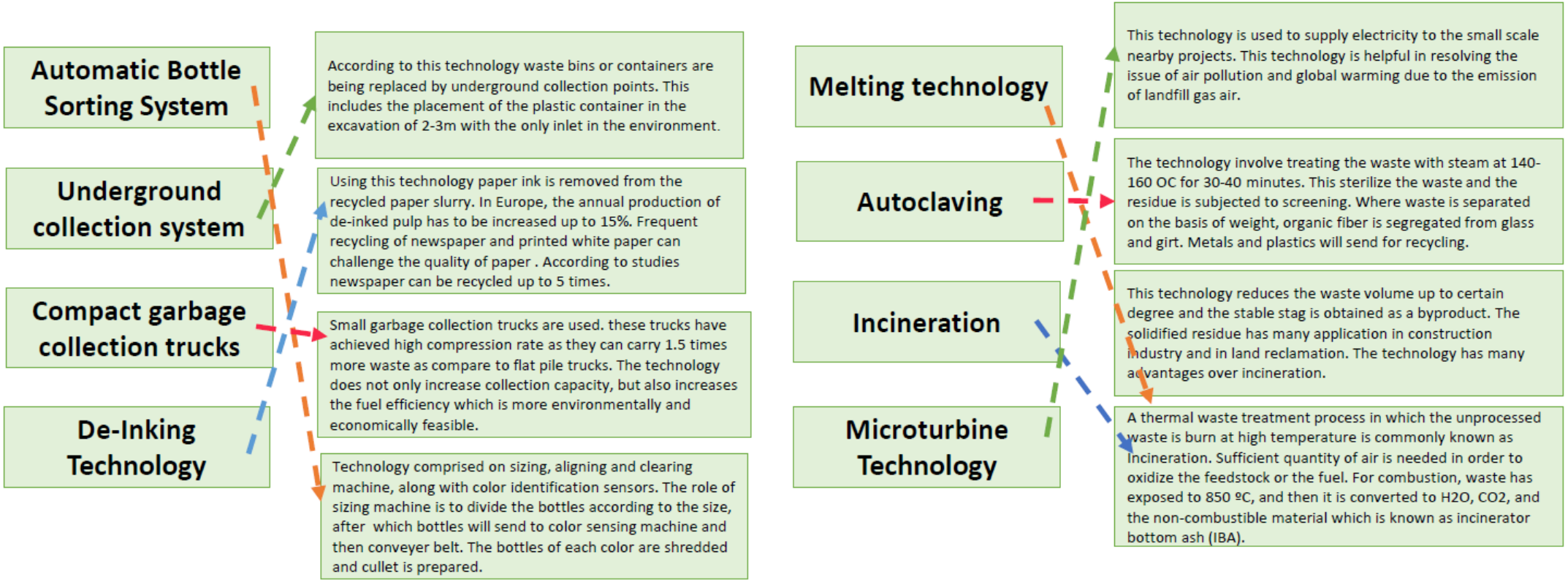
LIFE CYCLE STAGE	CIRCULAR ECONOMY ASPECT
Design	DfD, design for adaptability and flexibility, design for standardisation, design out waste, design in modularity, specify reclaimed materials, specify recycled materials.
Manufacture and supply	Eco-design principles, use less materials/optimise material use, use less hazardous materials, increase the lifespan, design for product disassembly, design for product standardisation, use secondary materials, take-back schemes, reverse logistics.
Construction	Minimise waste, procure reused materials, procure recycled materials, off-site construction.
In use and refurbishment	Minimise waste, minimal maintenance, easy repair and upgrade, adaptability, flexibility
End of life	Deconstruction, selective demolition, reuse of products and components, closed-loop recycling, open-loop recycling

Exersice 2.

Automatic Bottle Sorting System	According to this technology waste bins or containers are being replaced by underground collection points. This includes the placement of the plastic container in the excavation of 2-3m with the only inlet in the environment.
Underground collection system	Using this technology paper ink is removed from the recycled paper slurry. In Europe, the annual production of de-inked pulp has to be increased up to 15%. Frequent recycling of newspaper and printed white paper can challenge the quality of paper . According to studies newspaper can be recycled up to 5 times.
Compact garbage collection trucks	Small garbage collection trucks are used. these trucks have achieved high compression rate as they can carry 1.5 times more waste as compare to flat pile trucks. The technology does not only increase collection capacity, but also increases the fuel efficiency which is more environmentally and economically feasible.
De-Inking Technology	Technology comprised on sizing, aligning and clearing machine, along with color identification sensors. The role of sizing machine is to divide the bottles according to the size, after which bottles will send to color sensing machine and then conveyer belt. The bottles of each color are shredded and cullet is prepared.
Melting technology	This technology is used to supply electricity to the small scale nearby projects. This technology is helpful in resolving the issue of air pollution and global warming due to the emission of landfill gas air.
Autoclaving	The technology involve treating the waste with steam at 140-160 OC for 30-40 minutes. This sterilize the waste and the residue is subjected to screening. Where waste is separated on the basis of weight, organic fiber is segregated from glass and girt. Metals and plastics will send for recycling.
Incineration	This technology reduces the waste volume up to certain degree and the stable stag is obtained as a byproduct. The solidified residue has many application in construction industry and in land reclamation. The technology has many advantages over incineration.
Microturbine Technology	A thermal waste treatment process in which the unprocessed waste is burn at high temperature is commonly known as Incineration. Sufficient quantity of air is needed in order to oxidize the feedstock or the fuel. For combustion, waste has exposed to 850 ºC, and then it is converted to H2O, CO2, and the non-combustible material which is known as incinerator bottom ash (IBA).

Link each technology to the correct discription

Answer of exersice 2



Chapter 4: Assessment

The taught content can be assessed through various methods. A Few examples of tasks, open questions as wells as multiple questions are provided in Chapter 3: Teaching Material.

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Work Package 3: First centre level "Vocational training" (EQF Level 3-4)

Activity 7: Additional Qualification Trainings

Training F – Systematic Solution-oriented Consulting for Sustainable Development

BEST PRACTICE CURRICULUM

Developed by:

Bialystok Foundation of Professional Training in 2020 in the Project "Management and Technologies of Water, Waste Water, Waste and Circular Economy (WWW&CE)"

Prepared by:

Wirtschaftsförderungsinstitut (WIFI) Steiermark

August, 2021

Co-funded by the Erasmus+ Programme of the European Union

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Chapter 1: Executive Summary

The course "Systematic solution-oriented Consulting" was developed in the project "Management and Technologies of Water, Waste Water, Waste and Circular Economy – WWW&CE", which was funded by the Erasmus+ Programme of the European Union. Eleven partners from seven EU Member States developed tools according to work-based learning principles that are piloted and evaluated. For more information: https://www.sa-ce.eu

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The course is part of a training package for "Environmental Consultants", dealing with six key areas of sustainable economy. The courses are designed to provide additional qualifications on the European Framework Qualification Level 3 to 4. Furthermore, the six courses are primarily designed for young people with strong learning skills for vocational training. Completing all six courses enables the participants to support others, especially small and medium sized companies, to steer towards a more environmentally conscious approach to their personal and business objectives in order to generate a more sustainable world.

The six courses in the "Environmental Consultant" programme are:

- A – Water Supply Technologies
- B – Water Saving Technologies
- C – Greywater and Rainwater Utilisation Technologies
- D – Decentralized Wastewater Treatment Technologies
- E – Fundamentals of Circular Economy
- F – Solution-oriented Consulting for Sustainable Development

Each course may be completed individually or as part of the "Environmental Consultant" training programme. For each participated and completed course, a participation degree is provided. The degree for this course, which is achieved with a successful completion of the course, is called "Consultant in Water Supply Technologies".

The main objective of the course "water supply technologies" is to introduce an environmentally conscious perspective of qualified professionals in the field of water supply technologies to

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attending course participants. Thereby, the participants are able to obtain qualifications in the field of sustainability in water supply technologies.

The course aims to provide participants with knowledge about water access, the necessity of sustainable water management and water saving to transform their own personal or business activities or consult others in these areas.

The course "Fundamentals of the Circular Economy" comprises of following modules:

- Module I Introduction to consulting
- Module II Universal Consulting competencies
- Module III Workshop techniques for a solution-oriented consultant
- Module IV Practical examination in the working environment

Chapter 1.1: Name of the Course

"Systematic Solution-oriented Consulting for Sustainable Development"

Chapter 1.2: Contact Details

WIFI Steiermark

Körblergasse 111-113

A-8010 Graz

Tel.: +43 306 602 1234

Fax: +43 316 602 301

E-Mail: info@stmk.wifi.at

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To be adapted by each partner

Chapter 1.3: Type of Course

Training course for additional qualifications. Specifically, for qualification of young people with strong learning skills for vocational training.

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Chapter 1.4: Target Group

The target group of the whole "Environmental Consultant" training programme comprises of students in vocational training related to water management, water supply and sewage water management, skilled workers already working in these professional fields or other people interested in the topic of responsible water management.

Particularly for this training, participants include students (graduates) of vocational schools with potential for growth and working with clients (strong learners) or professional experience (working graduates), i.e. employees with professional knowledge in environmental protection and their trade, but lacking the necessary interpersonal (soft) competences for providing comprehensive consulting services for clients in the course of their work.

Chapter 1.6: Course Duration

The course comprises of:

- 73 contact hours
- 15 hours of individual learning and
- 2 hours of assessment

The total duration of this course amounts to 88 hours. Depending on the type of groups and participants, the training can be conducted in blocks (3 days per week, duration of training: 3 weeks, students) or themes (1 day per week, training duration: 12 weeks, employees) in conjunction with practical sessions in the workplace between the activities (dual education system: theory, exercises, practice) and practical end examination.

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Chapter 2: Curriculum

Chapter 2.1: Content of the Curriculum

Number	Module Name	Content	Training Time	
			Contact Hours	Self-Study Time
I	**Introduction to consulting**		**24**	**0**
	Objective	The objective of the module is to shape motivation and attitudes in participants to provide reliable solution-oriented consulting in environmental protection. Participants brainstorm their roles in implementing environmental solutions in their every-day professions - as significant components of bottom-up environmental policy implementation. Participants learn the steps and principles of reliable, objective consulting focused on environmental solutions instead of temporary benefits resulting from the sale of products or services, using mind maps to experience the significance of these principles in convincing consumers to implement such solutions.		
II	**Universal Consulting Competencies**		**24**	**6**
	Objective	The objective of the module is to train universal consulting competencies based on social and interpersonal skills, which are exercise through practice in various scenarios relevant to the project's themes (water, RES,		

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		wastewater, waste, air) and participants' work environments (work places). Following the theoretical part concerning consulting skills (listening, presenting, convincing), the participants will go through role plays in the assessment center (recording, replaying, and analysing in groups) aimed at refining interpersonal competencies based on feedback and training.		
III	**Workshop techniques for a solution-oriented consultant**		**22**	**8**
	Objective	The aim of the module is to provide consultants with practical work tools used in subsequent stages of consulting: market research (desk research: finding alternative, reliable solutions), financial analysis(programmes, grants and calculator: determining sources of financing and calculating the financial viability of the solution) and reports (tablet: presenting solutions in real-life environment using smartphones, Internet).		
IV	**Practical examination in the working environment**		**1**	**3**
	Objective	The participants are able to apply the newly acquired knowledge in their working environment. The conduction of a case study is mandatory and facilitates this process.		
		Total	**71**	**17**

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Lesson topics: each block of classes or the thematic module consists of 3 class days, with the possibility of practising the acquired knowledge, skills and attitudes within the block in the working environment within the profession or practice (dual system of education) between classes. The subsequent lessons within each block correspond to the stages of building the participant's attitude and commitment to the consulting role, the logical stages of solution-oriented consulting and the corresponding skills and working tools, which will ensure that the participants' attention and motivation to practise the subsequent skills are constantly maintained. The programme starts with values and attitudes and goes through jointly created knowledge to practicing skills and practical work tools.

Chapter 2.2: Content of the knowledge acquired by learning the modules

Learning achievements	Questions and exercises related to the recommended content	No of hours	
		Contact hours	Self-study
The participant acquires elementary knowledge of consultancy	Topic No.1: Introduction to consulting 1.1. Role and importance of environmental consulting 1.2. Stages of the solution-oriented consulting process. 1.3. Principles of reliable consulting	**24**	**0**
The participant obtains skills required for consultancy	Topic No. 2.: Universal Consulting Competencies 2.1. Listening and observing: identifying the problem 2.2. Presenting and explaining: looking for solutions 2.3. Persuasion and motivation: exerting influence.	**24**	**6**
One learns essential consulting practises	Topic No.3: Workshop techniques for a solution-oriented consultant 3.1.Market research: alternative solutions 3.2. Economic analysis and sources for financing: efficiency of the solution 3.3. Report presentation: consulting result	**24**	**6**
The participant conducts a case study within the	Topic No.4: Practical Examination in the working environment 4.1. Case study: solution selection 4.2. Financial analysis: justification of the solution 4.3. Report: Final solution		**2**

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scope of this subject	4.4. Implementation: Consulting scene with presentation of the solution		
Assessment	Presentation and Interview	**2**	
	Total	**88**	

Exercises: Practical exercise of new skills during classes is a key element of training to provide experience, survival, articulation of new knowledge and skills together with practical attitude building in accordance with the principles of Improvement of skills in the green economy through an advanced training program Cradle to Cradle - C2C in SMEs (C2C). Therefore, the programme will use all recommended forms of active learning, such as brainstorming, case study and active search for information at the stage of gaining knowledge. As well as role-playing, experiencing problem situations and feedback at the stage of skills training using multimedia techniques. Furthermore, the internalization of values, pro-environmental goals, defining one's own role at the stage of attitude building. For all these elements detailed instructions for the Trainer will be developed, according to the examples below:

Chapter 2.3: Teaching/Learning Equipment and Literature

Required tools: projector, lecture, sheets of papers, markers, flipchart, electronic device like phone or laptop,

Chapter 2.4: Further recommendations:

Requirements for trainers: Trainers should involve participants in thinking, asking questions and self-experiencing. Therefore, trainers should not talk by themselves all the time, because the learning efficiency decreases very quickly if participants are not included in the training. When planning and implementing training sessions, trainers must create and maintain a high level of motivation, give the ability to do things easier and give something that requires action. The training should give a positive learning experience and a sense of victory. Effective training and learning rely on motivation. Instructors face challenges that make lectures more interesting and motivating. Unfortunately, there is no single answer how to motivate participants. Trainers are recommended to consider different learning styles, such as visual, oral, or kinaesthetic, during training sessions. When implementing the Train the Trainer (C2C) programme, trainers should consider how they

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can translate theory into practice. Experimental learning is especially useful when trainers can combine participants' experiences with the content of the training programme.

C2C rules: Learning should include visual (including multimedia), verbal and kinaesthetic (experience) elements and techniques. Students can easily assimilate information by viewing or reading it. Such students use written instructions, diagrams, information materials, overheads, films, and other visual information. Students also prefer verbal communication - they are best able to assimilate information when they hear it. They are best responsive to speakers, audio conferences, and discussion groups. Other students learn by touch and experience. They react well to demonstrations and practical exercises. When planning a training session, remember that students remember: 10% of what they read, 20% of what they hear, 30% of what they see, 40 - 50% of what they see and hear, 50% of what they discuss 70% of what they experience and 90% of what they say. Several exercises engage the learner in the learning process. The best way for adults to learn is to base new material on their experiences and on discussion and debate. Many of the participants are experienced employees who have valuable information to share. Therefore, one way of activating participants is to include the story in the training sessions. Stories can facilitate communication and make personal corrections in the sessions. Stories can be used as examples of good and bad ways to perform tasks or skills. They can be used to activate participants to find different views on a topic. Instructors should also speak up for participants' stories. The training should include the following techniques and methods for activating learners: interesting materials that will also be used after the training; discussions in pairs or groups; case studies and examples from real-life situations; role-playing is excellent, for example in situations related to supervision, mentoring or training, and demonstrations, films, material samples, process simulations, etc. During a brainstorming session, the trainer asks an open question and participants come up with as many solutions as possible. The idea of brainstorming is to involve participants and get involved in the training. To get the best results, the brainstorming should be based on several principles. An example of a rule is that there are no stupid or bad ideas.

Chapter 2.5: Competence Level Testing

The assessment of the participant is split into the following parts:

- Case study: solution selection
- Financial analysis: justification of the solution
- Report: Final solution

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- Implementation: Consulting scene with presentation of the solution

A more detailed description is provided in the Chapter 3.1, in the table section called "IV Practical examination in the working environment".

Chapter 3: Teaching Material

Chapter 3.1: Guidelines for the practical part of the programme (exercises)

Training Programme for Solution-oriented Consultants		**88**
I	**Introduction to consulting**	**24**
I.1.	**Role and importance of environmental consulting**	
	Icebreakers, presentation of performed work, defining your own role	
	Brainstorm: what can I do for ecology?	
Info	• Instruction: Participants present their professions, working environments (this will later be used in designing various genre scenes) - the presentation has the importance of breaking the ice, group integration (group exercise: 1 x 45 minutes). • Next, the trainer presents the basic pillars of environmental policy, current social problems related to ecology (climate warming, ecological disasters, goals and vision of Europe about the world in this area). Participants share their views, examples, current media themes - common conclusions about the role that can be played by every citizen, citizen, end customer, consumer in reducing the negative impact on the environment through their behaviour or purchasing decisions, private investments. (mini lecture, discussion, collection of ideas, common conclusions, brainstorming about pro-ecological behaviour at the base level of the consumer, citizen, end customer: 2 x 45 minutes) • Lecture and discussion: Environmental policy challenges, Impact of the consumer's behaviour on the environment, Environmental protection at the level of Europe, country,	8

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	region, company and household, Ecological consulting system and its main recipients. • Exercise A1.1: What can I do for ecology Participants are divided into 2-3 groups (homogeneous) by occupation or workplace. Next, they brainstorm ideas and examples of how they can influence the decisions or behaviour of their clients, consumers (brainstorming areas of influence on consumers: 1 x 45 minutes). Presentation of groups' results and commentary from other participants, ranking ideas (analysis of results: 1 x 45 minutes). • Exercise A1.2: Consulting roles catalogue Participants are divided into groups according to identified types of services, consumer relations, problem areas (e.g. according to project areas: water. RES, wastewater, air) or according to consumer activity (kitchen, bathroom, garden, boiler room, car, RES, small retention) after you to develop a catalogue of possible consultation interventions. Areas of potential implementation of pro-ecological solution (improvements) (development of catalogues in groups: 2 x 45 minutes, presentation of group work results: 1 x 45 minutes)	
	Materials: Presentation – Challenges, Consumer Behaviour, Environmental Protection Levels, Consulting System and its recipients. **Worksheets**: A1.1, A1.2	
I.2	**Stages of the solution-oriented Consulting Process**	**8**
	Implementation of consulting in the working environment: shop, installation, service	
	Task-based thinking, case study	
Info	• Instruction: Participants learn about the key stages of solution-oriented consulting, which is identifying a problem, seeking solutions, and implementing solutions by exerting influence, convincing the end customer, the consumer. (mini lecture on the logic of the consultation process, its key stages, presentation of popular consulting models: 2 x 45 minutes).	8

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	• These stages can be implemented in different ways depending on the consulting context. The type of meeting with the client depends on the motive of the customer (in the process of making a purchasing decision, designing a new solution, searching for pro-environmental solutions). On the other hand, if the client uses the installation service after the purchase in which he did not foresee or needed a pro-environmental solution or if the customer only uses the service in a completely different ad hoc need. • These three types of consulting situations will be further defined by model: shop, installation, service. The trainer discusses with the group the method of discussion, submission of ideas, examples from his own work, different attitude, the needs of the client in this situation (discussion and summary of client characteristics in three model situations: 1 x 45 minutes). • Next, subsequent exercises are carried out in the whole group or in homogeneous groups according to the types of jobs, performed or learned professions. • Lecture and discussion: Consulting process - logic of consulting, Implementation consulting - from problem to solution, Stages of consulting tailored to the context or needs of the client. • <u>Exercise A2.3: Shopping</u> The Group describes three stages of consulting (identifying the problem, looking for solutions, implementing the solution and convincing the customer) in a shopping situation (in a shop). Groups can be divided into different kinds of shops: household, bathroom equipment, garden shop, car showroom, plumbing shop, RES installation design office. The effect of the exercise is a short description of each stage through an example from practice or possible activities, examples of specific solutions (hot water dishwasher, washbasin or shower aerator, watering timer or rain sensor, etc.). The groups do a case study: 1 x 45	

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	minutes and then present them to the whole class: 1 x 45 minutes. • Exercise A2.4: Installation The Group modifies the descriptions of the stages in a situation where the client did not envisage pro-environmental solutions, focusing on how the consulting stages change, the client's attitude, and the possibility of providing consulting in this new situation. Work on a case study and presentation of key differences: 1 x 45 minutes • Exercise A2.5: Service The Group modifies the descriptions of the stages in a service situation, when the client reports a different, immediate need without thinking about pro-ecological solutions, focusing on how the consulting stages change, the client's attitude, the possibility of performing consulting in this new situation, with the possibility of removing the defect, improvement through a pro-ecological solution. Work on a case study and presentation of key differences: 1 x 45 minutes. • Exercise A2.6: Solution catalogue The participants collect ideas for solutions that can be proposed in different consulting situations, in different industries and types of shops. This catalogue will be used in the following modules to practise skills or consulting tools: 1 x 45 minutes.	
	Materials: Presentation – Consulting process, Implementation logic and Consulting stages, Context and client specific stages **Work sheets**: A2.3,A2.4, A2.5, A2.6	
I.3	**Principles of reliable consulting**	**8**
	Objectification, making the consulting process reliable at individual stages	
	Mind map: how to inspire trust?	
	• Instruction: Participants learn the key principles of reliable consulting: problem orientation (not product orientation), customer orientation (not supplier orientation) and alternative	

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	solutions (the customer chooses any technology based on financial and environmental arguments, without product marketing). Mini lecture on the psychology of consumer decisions and image building, trust: 2 x 45 minutes). • Discussion with participants on professional experience - discussion of examples of client doubts, comparing offers and selection factors: (discussion and summary of conditions, ways to ensure objectivity of consulting in three model situations: 1 x 45 minutes). • Next, subsequent exercises are carried out in the whole group or in homogeneous groups according to the types of jobs, professions performed or learned adequately to the three model situations, consulting contexts (shop, installation, service). • Lecture and discussion: Confidence building factors, Objectivity conditions; Problem orientation methods, Customer orientation methods, Examples of comparing offers, products. • <u>Exercise A3.7: Mind map: How to inspire trust?</u> • Following the Trainer's instructions on this method of work, the participants draw a diagram of factors that build customer trust and reliable, objective consulting. The groups can work on a universal diagram or a diagram specific to the model consulting situation (shop, installation, service), develop a mind map or an Ishikawa diagram according to their preferences 1 x 45 minutes and then present and explain the result of the work to the whole class: 1 x 45 minutes. • <u>Exercise A3.8: Comparison of offers, solutions</u> Participants use online comparison machines (phones, washing machines, cars, according to their interests) and note down the parameters, comparison criteria: 1 x 45 minutes. Then the participant work in groups on the following topics: model consulting situations or industries, project areas, criteria for comparing pro-ecological solutions. 1 x 45 minutes and then	

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	present and explain the results of the work on the forum: 1 x 45 minutes.	
	Materials: Presentation – Trust, Objectivity, customer Orientation **Work sheets:** A3.7, A3.8	
II	**Universal Consulting competencies**	**30**
II.1	**Listening and Observing: Identifying the problem**	
	Practising, listening skills at the stage of identifying a need	
Info	• Instruction: Participants will learn the psychological basis of interpersonal skills: listening (attentiveness, asking questions), paraphrase (agreeing on understanding), verbal and non-verbal communication (central and peripheral message) Socratic method (extracting knowledge, attitudes, beliefs, needs). • Mini lecture on the psychology of listening and understanding needs articulated and not articulated: 2 x 45 minutes. • Discussion with participants about professional experience - discussion of exemplary types of client's communication and ways, styles of communication adapted to the type (at least according to, C2C: 2 x 45 minutes. • Movies available on the Internet, scenes with a difficult, undecided client: 1 x 45 minutes. • Lecture and discussion: Psychological fundamentals, Principles of good listening, Paraphrase, Non-verbal communication, Types of clients and communication styles, listening, searching for needs. • <u>Exercise B1.9: Scene: how can I help?</u> Participants are divided into pairs and play the scene according to the instruction based on the model consulting situation (shop, installation, service). 1 x 45 minutes and then selected pairs play the scene on the forum which is recorded: 1 x 45 minutes and then they are played on the screen, monitor with the trainer's commentary, self-assessment of the participants in the scenes, sharing the impressions: 1 x 45 minutes.	8

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	Materials: Presentation – Communication, Customer types, Communication styles **Work sheets**: B1.9,	
II.2	**Presenting and Explaining: Looking for solutions**	**8**
	Practise explaining skills at the solution-building stage	
	Role-play: how does it work?	
Info	• Instruction: Participants learn the psychological and sales basis of presentation and explanation of technological solutions depending on the type of client, which is another key interpersonal skill for consulting customer-specific communication (gender, age, education), customer styles (lion, setter, beaver, otter), explanation (facts and evidence, authority and research, logic and comparison, image and example) and presentation (central and peripheral message). Mini lecture on the psychology of presentation and explanation tailored to the client: 2 x 45 minutes • Discussion with participants on professional experience - discussion diversity client and effectively explain and argue according to the type of customer: 1 x 45 minutes. • Lecture and discussion: Sales presentation basics, Explanation and providing arguments, Client styles, Presentation and knowledge transfer styles. • <u>Exercise B2.10: Lion</u> Participants divided into pairs play the scenes according to the instructions based on a the model consulting situation (shop, installation, service) assuming that the client represents the lion's style: 1 x 30 minutes and then the selected pairs play the forum scene that is being recorded: 1 x 15 minutes • Exercise B2.11: Setter Participants divide into pairs and play the scenes according to the instructions based on the model consulting situation (shop, installation, service) assuming that the client represents the setter's style: 1 x 30	8

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	minutes and then the selected pairs play the forum scene that is being recorded: 1 x 15 minutes Exercise B2.12: Beaver Participants divide into pairs and play the scenes according to the instructions based on the model consulting situation (shop, installation, service) assuming that the client represents the beaver style: 1 x 30 minutes and then the selected pairs play the forum scene that is being recorded: 1 x 15 minutes Exercise B2.13: Otter The participants divide into pairs and play the scenes according to the instructions based on the model consultancy situation (shop, installation, service) assuming that the client represents the otter style: 1 x 30 minutes and then the selected pairs play the forum scene that is recorded: 1 x 15 minutes Next they are played on the screen, monitor with the trainer's commentary, self-assessment of the participants in the scenes, sharing the impressions: 1 x 45 minutes.	
	Materials: Presentation – Customer diversity, customer styles, presentation and explanation methods. **Work sheets:** B.2 10-13,	
II.3	**Persuasion and motivation: exerting influence**	**8**
	Practice of persuasive skills at the solution implementation stage	
	Playing the scene: why is it worth doing?	
Info	• Instruction: The participants learn the psychological basis for exerting social influence in the process of making decisions by the client. The aim of the consulting process is for the client to make a pro-ecological decision, therefore the consultant exerts influence on the client, which constitutes the final interpersonal skills closing the consulting process. Principles of social impact: Rule of reciprocity, Social proof of equity; Rule of sympathy; Rule of authority, Rule of inaccessibility, Rule of commitment and consequence, Rule of contrast, Reduction of cognitive	8

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	dissonance and self-evaluation. Persuasion techniques (foot in door, door in face). Mini lecture on the psychology of social impact and techniques of persuading the client to make a pro-ecological decision: 2 x 45 minutes. Discussion on professional experience - examples of successful client persuasion: 1 x 45 minutes. • Lecture and discussion: Social influence, Principles of social influence in the client's decision-making process, Persuasion techniques in pro-ecological decision-making. • Exercise B3.14: Foot in the door Participants divide into pairs and play the scenes according to the instruction based on the model consulting situation (shop, installation, service) using the "foot in the door" technique: 1 x 45 minutes and then the selected pairs play the forum scene that is recorded: 1 x 45 minutes. • Exercise B3.15: Door to face Participants divide into pairs and play the scenes according to the instructions based on the model consulting situation (shop, installation, service) using the "door to face" technique: 1 x 45 minutes and then the selected pairs play the forum scene that is recorded: 1 x 45 minutes. Next, they are played on the screen, monitor with the trainer's commentary, and self-assessment of the participants in the scenes, sharing the impressions: 1 x 45 minutes.	
	Materials: Presentation – Principles of Social Influence, persuasive techniques in environmental decision-making. **Work sheets**: B3.14-15,	
II.4	**Self-study environment**	**6**
III	**Workshop techniques for solution-oriented consultant**	**30**
III.1	**Market research: alternative solutions**	
	Methods of market analysis and comparison of solutions	
	Group work: reliable solutions	

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Info	• Instruction: Participants will learn the rules of conducting market research in available internet resources: data analysis (keywords, technology leaders), exploration, compilation, verification. Participating lecture: 2 x 45 minutes. Discussion with participants on professional experience: examples of ways to search for information: 1 x 45 minutes. • Lecture and discussion: Basics of secondary data analysis, public and private data, data verification, data compilation. • <u>Exercise C1.16: Desk research</u> Participants divide into groups according to branches, problem area of the project and then individually search the Internet for information about solutions, technology for the given area and make a list of solutions. 1 x 45 minutes. Then compare in a group the lists they prepared and look for the same results and differences. 1 x 45 minutes. Discuss the strategies used, the ideas for searching the data and evaluate them in the context of the results obtained. 1 x 45 minute. Then present the results on the forum: 1 x 45 minutes. Participants create with the trainer a list of rules for reliable data analysis 1 x 45 minutes.	8
	Materials: Presentation – Data analysis, Exploration, Compilation, Verification **Work sheets:** C1.16	
III.2	**Economic analysis and sources of financing: efficiency of the solution**	
	Exercise with calculator: costs and benefits of solution implementation	
	Desk research: source funding	
Info	• Instruction: Participants will learn the basics of economic analysis: cost-benefit account (universal parameters and according to the specificity of project areas), sources of funding (non-refundable grants, co-financing, preferential credits, tax breaks), costs of financing sources, rate of return on private investment (short and long term perspectives), market forecasts	8

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	(dynamics of media prices, penalty fees, limits) lecture: 3 x 45 minutes. Discussion with participants: examples of economic analyses at work: 1 x 45 minutes. • Lecture and discussion: Economic fundamentals of private investment, Types of financing sources, Costs of credits, taxes, penalties, and legal limits related to environmental protection • <u>Exercise C2.17: Sources of funding</u> The participants are divided into groups according to the industry, the problem area of the project and search the Internet for information about funding sources: 1 x 45 minutes and then present the results on the forum: 1 x 45 minutes - participants create catalogues of funding sources for the next exercises • <u>Exercise C2.18: Calculator</u> The participants are divided into groups according to the industry, the problem area of the project and they use the xls form - a template calculator developed for each area of the project with specific parameters of the economic analysis of the investment and universal parameters and additional variables according.	
	Materials: Presentation – Cost-benefit account, Financing sources, Rate of Return, Market forecasts, **Work sheets:**C2.17, C2.18,	
III.3	**Report presentations: consulting results**	
	Reporting methods and presentation exercise	
	Exercises with tablet and smartphone: cards on the table	
Info	• Instruction: Participants learn the principles of presenting a report for a pro-ecological project costs (replacement costs, implementation costs, funding sources), benefits (rate of return, forecasts, social and environmental benefits), alternatives (solution comparison, contract and contact). Participating lecture: 2 x 45 minutes. Discussion with	8

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	participants on professional experience: examples of ways to present solutions: 1 x 45 minutes. • Lecture and discussion: Basics of secondary data analysis, public and private data, data verification, data compilation. • Exercise C3.19: Report Participants divide into groups according to the industry, problem area of the project and then develop a report using the Power Point program (or other popular presentation program according to participants' preferences) using the elements of the model report discussed in the lecture: 2 x 45 minutes. • Exercise C3.20: Presentation at a meeting The groups present the reports including them in the previously practised scene of a conversation with a client - the report is presented on a laptop (as a simulation of a paper printout), tablet or mobile phone using Internet access according to the participants' ideas and initiative: 2 x 45 minutes. Presentations and scenes are discussed by the Trainer with the participants, indicating good and weak points of the presentation and ideas for improving the report and the way it is presented at the meeting with the client: 1 x 45 minutes.	
	Materials: Presentation – Report structure, Presentation programs, Report presentation methods at the meeting with the client **Work sheets:** C3.19	
III.4	**Self-study in the working environment**	**8**
IV	**Practical examination in the working environment**	**4**
IV.1	**Case study: solution selection**	
	Case study: problem	
Info	• Instruction: the examination is carried out in the participant's work environment (employees) or in a simulated assessment centre work environment (in case of a student). The participant draws a case study with a description of a model-	1

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	consulting situation (shop, installation, service) and solves the issue using the knowledge acquired during the training, skills in using tools and methods from the training. The drawn case will be continued in subsequent stages of the examination. • **Examination tasks:** D1.1: Shopping The customer is interested in purchasing a device or tool (bathroom, kitchen, heating room, garden, car, other). The role of the consultant is to diagnose the customer's needs in terms of pro-ecological solutions and to select an adequate solution or to indicate the possibilities, advantages of purchasing an ecological solution with the use of cases, ideas developed within the framework of exercises A2.3 and A2.6 D1.2: Installation: The consultant installs at the customer's premises a device, an installation (bathroom, kitchen, heating plant, garden, car, other) that does not provide an ecological solution. The role of the consultant is to interest the client in adding or expanding their installation with a pro-ecological solution and selecting a solution appropriate for the installation with the use of cases, ideas developed under exercises A2.4 and A2.6 D1.3: Service: The consultant services a piece of equipment, instrument, customer's installation (bathroom, kitchen, boiler room, garden, car, other), which can be repaired by adding a pro-ecological solution or completely replaced by such a solution (at choice). The role of the consultant is to interest the client in implementing such a solution outside of a typical, cheaper service with the use of cases, ideas developed within the framework of exercises A2.5 and A2.6	
IV.2	**Financial analysis: justification of the solution**	
	Desk research, spreadsheet: searching	

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Info	• **Examination tasks:** D2.4: Shopping: The consultant continues with task D1.1, looks for solutions, and makes calculations using the selected calculator using the results of A3.8, C2.14 and C2.15. D2.5: Installation: The consultant continues with task D1.2 and looks for solutions and makes calculations using the selected calculator applying the results of A3.8, C2.14 and C2.15 D2.6: Service: The consultant continues with task D1.3 and looks for solutions and makes calculations using the selected calculator applying the results of A3.8, C2.14 and C2.15	1
IV.3	**Report: final solution**	
	Presentation, tablet, smartphone: solution	
	• **Examination tasks:** D3.7: Shopping: The consultant continues with task D1.1, D2.4 by preparing a final report with a presentation using the results of C3.19 and C3.20 D3.8: Installation: The consultant continues with task D1.1, D2.4 by preparing a final report with a presentation using the results of C3.19 and C3.20. D3.9: Service: The consultant continues with task D1.1, D2.4 by preparing a final report with a presentation using the results of C3.19 and C3.20	**1**
IV.4	**Implementation: consulting scene with presentation of the solution**	
	Consulting scene: a consulting interview	

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Info	• **Examination tasks:** D3.10: Shopping: The consultant role plays with the examiner or other participant a scene with the presentation of a report prepared in D3.7 based on D1.1, D2.4 using B1, B2 or B3 D3.11: Installation: The consultant plays with the examiner or other participant a scene with the presentation of the report prepared in D3.8 according to the following D1.2, D2.5 using B1, B2 or B3 D3.12: Service: The consultant role plays with the examiner or other participant a scene with the presentation of a report prepared in D3.9 based on D1.3, D2.6 using B1, B2 or B3.	**1**
V	**Performance evaluation grade and issuance of consultant's certificate**	

Exercise instructions: The Table above in Chapter 3.1 shows sample lesson instructions. In addition to each exercise (A1.1, A1.2 - C.214, C2.15 etc.) there are instructions for the trainer and the participants. A description of the exercises, guidelines and the rules of the exercise, expected results is included.

The results and exercise base: the effects of the participants' work, for example: Catalogue of consulting roles (A1.2). Catalogue of solutions (A1.6), or Sources of funding (C2.14) can be used within the framework of subsequent exercises, creating remote educational resources for the training programme. Similarly, films with consulting scenes (B1.9, B2.10, B3.11) could be used (subject to participants' consent) and analysed by participants of other training courses.

Chapter 3.2: Overview of the training materials

Presentation templates: PowerPoint slideshow templates with sample information or cover pages of slides to be completed by Trainers:

1. A1: Challenges, Consumer Behaviour, Environmental Protection Levels, Consulting System, and its recipients

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2. A2: Consulting process, Implementation logic and consulting stages, Context, and client-specific stages
3. A3: Trust, Objectivity, Customer Orientation
4. B1: Communication, Customer types, Communication styles
5. B2: Customer diversity, customer styles, presentation and explanation methods
6. B3: Principles of Social Influence, persuasive techniques in environmental decision making
7. C1: Data analysis, Exploration, Compilation, Verification
8. C2: Cost-benefit account, Financing sources, Rate of return, Market forecasts
9. C3: Report structure, Presentation programs, Report presentation methods at the meeting with the client

Work sheets: Activity instructions, descriptions of cases or conditions of generic scenes to be played by participants, tables to be filled, diagrams to be completed:

10. A1: Instruction manuals up to A1.1, A1.2; Model table of consulting roles up to A.1.2
11. A2: Instructions to A2.3, A2.4, A.2.5, A.2.6; Solutions template table to A.2.6
12. A3: Instructions to A3.7, A3.8, table template for offer comparison A3.8
13. B1: Instructions up to B1.9, Scene evaluation card template (B1.9)
14. B2: Instructions up to B2.10 -13, Scene evaluation card template (B2.10 -13)
15. B3: Instructions up to B3.14 -15, Scene evaluation card template (B3.14 -15)
16. C1: Instructions for C1.16, Results Table, Comparative Results Table
17. C2: Instructions for C2.17, C2.18
18. C3: Instructions to C3.19, Description of functions of the presentation program (Power Point or other)

Reports: reliable and systematic consultancy whose primary objective is to implement a pro-ecological solution in the conditions and typical situations of a consultant's working environment, considering all the above definitions.

19. A3: report for A3.7: sample thought map
20. A3: report for A3.8: sample comparison of offers
21. B1: Online clips, scenes with a difficult, undecided client
22. B2: report on styles: lion, setter, beaver, otter - drawing with description of thinking and messages
23. C3: sample presentation of the environmental solution effectiveness report

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Spreadsheets: reliable and systematic consultancy whose primary objective is to implement a pro-ecological solution in the conditions and typical situations of a consultant's working environment, considering all the above definitions.

24. C2: Xls sheets templates, www calculators (C2.18) adjusted to the project areas (water, waste water, RES, waste, air) - calculating the efficiency of the installation when providing data for selected variables with the "case Study" tab withan example of calculations with variables filled in based on the case description (4-5 sheets).

Chapter 4: Key definitions

Reliable: Reliable consulting is one that is solution-oriented in the field of environmental protection (environmental solutions), which inspires the trust of the client through objectivity (alternative solutions from different suppliers and manufacturers). It should also be customer-oriented (consulting avoids the marketing of a product and must not only serve to sell a product or service, but to solve the problems of the client, the consumer or, to a wider extent, the environmental, social problem by implementing an environmental solution). The expected context for reliable consulting is the corporate social responsibility of the company employing the consultant, and the benefits of providing consulting services should be secondary, deferred, or non-financial, related to building the image or trust of the client.

Systematic: systematic consulting, to comprehensive consulting from problem to implementation. Is possible in different consulting contexts, in different consulting situations and different awareness of the end customer. The consumer who is looking for a solution at the stage of the purchase decision (shop), made a purchase decision but did not take into account environmental solutions, which can be corrected at the stage of installation (installation), or finally has an ad-hoc problem, but does not look for environmental solutions (service). In terms of the system, the consultancy is carried out from the bottom up, at the lowest level of the end customer (consumer, citizen) as a complement to horizontal, national, European environmental policies. In this perspective, the solution-oriented consultant is the basic instrument of the policy implemented "from scratch" (working at grassroots level), a direct tool to influence decisions, consumer behaviour.

The solution: technology, device, tool, spare part, manufacturing method, environmentally friendly use, which can be proposed by consultant in his work within the framework of typical

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contacts with the end customer. Solutions from the bathroom, kitchen, to boiler rooms, garden, or roof installations. From a simple aerator in a washbasin, a rainwater container shower, a rain sensor to the way pipes are insulated, a burner in the stove, a more efficient solar panel, the type of insulation of the building, roof, gas or hybrid installation in the car.

In the working environment: Consulting carried out "on the occasion" of typical professional tasks in the consultant's natural working environment. The environmental effect in the social dimension is achieved at minimum cost through additional universal consulting competences of the employee who has contact with the final client. Consultant training takes place in the environment by taking into account the professional contexts of the participants, model consulting situations (shop, installation, service), practical exercises and stage completion in the assessment centre methodology, own practice between classes and exam passes corresponding to the working conditions.

Solution-oriented consulting: reliable and systematic consultancy whose primary objective is to implement a pro-ecological solution in the conditions and typical situations of a consultant is working environment, considering all the above definitions.

Chapter 5: Assessment

The assessment of the course consists of two parts. The presentation of the case study and the chosen solution as well as an interview part (questions & discussion). After the successful completion of the course and the passing of the examination, the participant will receive a certificate.

Certificate template: the certificate of a solution-oriented environmental consultant will correspond to the training programme and will confirm the acquirement of competences in the role, stages and principles of solution-oriented consulting (A), universal consulting skills and interpersonal competences (B) and the workshop of an environmental consultant with the use of consulting tools (C). The certificate may present the assessment from the practical examination consulting to 4 examination tasks (C1, C2, C3 and C4) and the opinion (optional) of the trainer (on participation in the training, especially in the field of attitudes and commitment) and the employer's opinion on own practice in the working environment between classes (dual system of education).

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