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HANDBOOK

ENCOURAGE

DEVELOPMENT OF COURSES FOR SUSTAINABLE WASTE MANAGEMENT FOR MUNICIPALITIES

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Erasmus+ project

Development of Courses for Sustainable Waste Management for Municipalities

[ENCOURAGE]

Project Number 2021-1-PL01-KA220-VET-000030417

Curriculum and syllabus development for Courses for Sustainable Waste Management with the certification elements

ENCOURAGE, 2023

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Contents

1. INTRODUCTION

Almost all manufacturing processes result in waste in one form or another. The treatment and disposal of these wastes are very important, not only to keep the environment clean and aesthetic but also to minimize hazards to other forms of life on this planet. Also, such systematic management of waste is very much necessary to conserve natural resources and sustain them for future generations. As the management of waste involves scientific and engineering principles, specialists are necessary to effect proper management. For this purpose, the training of specialists is required to be properly planned in a systematic manner. As a result, the qualification of specialists has to be properly certified, and this certification has to be validated by authorities involved in the field of waste management. In this paper, the systems in vogue for certification and validation of specialists are presented.

The modern ways of life have resulted in changing the way of handling and disposal of solid waste. In the early days, the quantity of solid waste was small, and the stability times of the solid waste were long because they were of biodegradable type. But the present-day society generates large quantities of solid waste per head, resulting in much larger quantities to be disposed of. Also, the present-day technology produces waste with short-term stability periods. This required the search for finding ways to safeguard the environment. The need resulted in finding technological solutions to treat the waste and give final disposal in such a way that no hazard and risk is given to the environment. Since the technology involved in this has to be sustainable, this called for the understanding and wider use of biotechnological solutions. These require sound knowledge of biochemical and microbiological processes presented in these technologies.

There is a need for transparency of qualifications and diplomas in the waste management sector, regardless of the country or vocational training and educational system in which they were acquired. To support national strategies for lifelong learning, some countries developed mechanisms for continuing training and upgrading workforce skills. To ensure the relevance and quality of training is to ensure that it is delivered by qualified VET trainers. That is so important to develop mechanisms to assess and certify trainer competences in the waste management sector.

ENCOURAGE consortium tried to ensure courses by development of the elements of validation and certification but there is a huge need for the further development of a totally new and innovative model for validation and certification for the waste management. Proposed solutions implement quality assurance processes to maintain high standards in education and certification. By developing a structured curriculum, detailed syllabi, and elements of certification and validation processes, the ENCOURAGE sustainable waste management courses will effectively equip learners with the necessary competences to address waste management challenges, contributing to a more sustainable future.

The curriculum for sustainable waste management courses aims to provide a comprehensive education on managing waste sustainably, focusing on reducing environmental impact and promoting efficient resource use. Developed courses for the sustainable waste management will effectively equip learners with the necessary competences to address waste management challenges, contributing to a more sustainable future and also there is still a gap for further project development.

The result developed within the European consortium consists of VET providers and organisations, private educational and scientific institutions from:

- ✓ **Cyprus – EDITC;**
- ✓ **Greece - Creative Thinking Development**
- ✓ **Poland – Contentplus Sp. z o.o. and Stowarzyszenie na Rzecz Innowacji i Edukacji,**
- ✓ **Republic of North Macedonia - Private Scientific institution, institute for research in environment, civil engineering and energy**
- ✓ **Slovenia - Znanstveno raziskovalno sredisce Bistra Ptuj**

within the Erasmus+ project [2021-1-PL01-KA220-VET-000030417], titled

"Development of Courses for Sustainable Waste Management for Municipalities"

has provided a set of solutions for sustainable Waste Management for Municipalities as well as for VET education.

1. LEARNING MATERIAL DEVELOPEMENT

2.1 METHODOLOGY

Despite the waste challenges, waste management is significant for the determining both present and future environmental quality. Proper waste management has remained one of the most significant changes facing the municipalities.

Around the world, municipalities primary should be the responsibility for dealing with waste generated within their jurisdictions through collection, transportation and disposal services.

However, in recent times, there has been considerable effort and progress in devising and implementing strategies to maximise recycling, reduce waste and pollutants and encourage more efficient use of water and energy resources.

The work on the development of the project result titled "Curriculum and syllabus development for Courses for Sustainable Waste Management with the certification elements" was based on research identifying the essential skills needed to manage innovative processes in waste treatment. The curriculum aims to provide comprehensive education on sustainable waste management, equipping learners with the necessary knowledge, skills, and competences to address modern waste management challenges effectively.

This result outlines the curriculum development for courses in sustainable waste management, focusing on the identification of the best waste management policies derived from partners' countries. The starting point was development of IO1: *Benchmarking analysis of skills and competences, needs and challenges for Sustainable Waste Management* and IO2: *Qualification profile for Waste management specialist with the use of NQF/EQF*.

Presented curriculum for sustainable waste management courses developed within the ENCOURAGE project was aimed to equip learners with the knowledge, skills, and competences necessary to address waste management challenges effectively. The curriculum covered various aspects of waste management, including technical, environmental, economic, and social perspectives.

The course provides an overview of sustainable waste management principles and practices, emphasizing the lifecycle approach to managing waste. There is a description of the technical aspects of waste collection, processing, treatment, and disposal technologies.

ENCOURAGE training materials are focused on the environmental impacts of waste management and the methods for assessing and mitigating these impacts, as well as it explores the economic and social dimensions of waste management, including cost-benefit analysis, public policies, and community engagement.

Development of a common methodology was one of the activities undertaken in the project to facilitate the recognition, validation and certification of knowledge, skills and competences acquired through formal, non formal and informal learning and also to increase transparency of qualifications and diplomas in the waste management sector in EU.

Within the ENCOURAGE project, the partnership developed the curriculum and syllabus for each of five (5) different selected and thoroughly designed modules/courses, covering holistically, all different aspects of the sustainable waste management in municpalities. In more specific the modules developed are :

1. Waste management.
2. Recycling.
3. Circular economy.
4. Profitability of effective waste management.
5. Methods of waste disposal and processing.

To ensure a high applicability of the training contents, the curriculum and syllabus for each course was designed towards European standards and legislation for waste management, adapted to the national needs and possibilities. The curriculum provides tailored made, competence oriented and focus on applied education and research. It is based on research identifying the essential skills needed to manage innovative processes in waste management.

The curriculum aimed to provide a comprehensive education on sustainable waste management, equipping learners with the necessary knowledge, skills, and competences to effectively address modern waste management challenges. It is prepared in accordance with the qualifications used by project Partners and shows skills considered useful to promote a new professional qualification and update existing qualifications with new contents based on the principles of waste management in municipalities and the culture of “circular economy” as an approach to re-use and recycling of goods and materials on continuous basis.

2.1.1 Quality Assurance and Compliance

To ensure that qualification standards comply with the requirements of employers, generally agreed principles must be used. First, it requires constructive partnerships between all interested parties, including specialists, enterprises, and state, regional, and local authorities. It must ensure that the necessary flexibility in qualification standards, methods, and procedures, their development, application, and validation of compliance are realized. Secondly, common qualification standards and standards for validation procedures must be used. Thirdly, the necessary procedures for compliance management, including analysis, validation, and certification of compliance and qualification requirements, must be developed and applied. Once it is done, of course, effective, engaged employers must build a system that

ensures compliance with those standards. Finally, to get their full effect, qualification requirements, methods of examination, and personnel certification tests used in them must be based on principles of continual improvement and transparency and be thoroughly documented in the related coursework and examination schemes.

The requirements outlined in the paragraph above are acutely relevant to the core business of qualification. By monitoring the development and monitoring of a qualification, the union's policy on holding will be realized, which can lead to increased commitment, job satisfaction, and better job performance by employees. Compliance with the assessment methods helps ensure that company, industry, and national standards are equitable and transparent, so that academically able service attitude, discipline, and application, not household income, determine candidates' success. Compliance guarantees that the qualification requirements accord fully with generally defined competence standards – a fundamental prerequisite for regulatory bodies, employers, and others to have confidence in vocational qualifications and for the qualifications to function as lifelong licenses to practice. Compliance with access rules means that Ministries of Education will be able to realize the much greater social benefits from post-compulsory education that flow from ensuring more than the usual suspects, the already literate, numerate, and unemployed young, enter the process of acquiring vocational qualifications. Compliance with the prohibition of course duplication ensures that corruption will be minimized and that the university will be securing the much greater social benefits that flow when the fullest possible coverage of candidate learning – a consideration not served by the optional bypass of pre-university learning and training costs which is built into course-based methods. The requirement for substantial coursework means that the university will secure the greatest social benefits generated by sharing learning in higher education. Nevertheless, validating the qualification is not enough, by itself, to secure that their awards will confer the vocational value that the university's mission statement promises. That result flows from the material coverage and rigorous assessment of learning outcomes with great assurance, but it is essential that the learning outcomes actually suffered by candidates be considered by a means that fosters fidelity to the assurance procedure.

2.1 ENCOURAGE modules

The training program consists of five vocational training modules, which are prepared as sets of professional tasks performed in the workplace:

1. Waste management.
2. Recycling.
3. Circular economy.
4. Profitability of effective waste management.
5. Methods of waste disposal and processing.

The syllabus contains learning outcomes and verification criteria for each module, description of teaching and learnings methods, as well as the assessment and evaluation of the course (by students, peer review etc.).

The curriculum developed in the ENCOURAGE project is intended to make it easier for organisers and trainers to plan and organise the teaching process and build individual

"vocational training paths" for candidates who want to work as waste management specialists in municipalities in the future.

ENCOURAGE curriculum and syllabus is ready for download from the project website https://encourage.projectsgallery.eu/results/

The curriculum and syllabus available on the e-platform https://encourage-online.projectsgallery.eu/ has a flexible structure, and the modules included in it can be updated (modified, supplemented or replaced) without destroying the structure of the program to adapt the content to the changing needs of the labour market, the development of science and technology and the predispositions of learners.

Training implementation based on this modular programme is characterised with the following features:

- teaching and learning process is oriented towards the achievement of specific, measurable educational outcomes in the form of knowledge, skills and social competence allowing for the performance of specific professional tasks,
- the principle of transfer of knowledge, skills and social competence previously acquired by a participant in the course of formal, non-formal education or informal learning in the working environment is applied in a wide range,
- teaching takes place mainly through actions with use of activating teaching methods (learning by doing), which, on the one hand, stimulate activity, creativity, learner's ability of self-assessment, while on the other hand form the trainer's role towards advisor, partner, designer, organiser and evaluator of an educational process.

How to reach the ENCOURAGE training materials?

Students can follow the instructions below to register on the e-platform:

a. Visit https://encourage-online.projectsgallery.eu/
b. Click on New Account
c. Students must fill in their details
d. Students will receive a link to activate their account. Sometimes the email ends up in Junk mail and they should check also Junk.

Then, student must sign in with their username and password. Select the course they wish to enrol and self-register using the code 2024Encourage.

After completion of each module foreseen in the programme, the training participant shall obtain a training certificate (diploma), confirming its competence within one out of five areas of the Courses for Sustainable Waste Management for Municipalities.

2.2 THE SYLLABI OF ENCOURAGE MODULES

MODULE 1 : Waste management

<table>
<tr><td>Title of the module</td><td colspan="3">Waste minimization</td></tr>
<tr><td>Type</td><td colspan="3">e-learning</td></tr>
<tr><td>Workload for learner (hours)</td><td colspan="3">18 hours
10 contact hours (lectures & live sessions)</td></tr>
<tr><td>Trainer</td><td colspan="3"></td></tr>
<tr><td>Institution(s)</td><td colspan="3">Contentplus sp. z o.o./Stowarzyszenie na Rzecz Innowacji i Edukacji</td></tr>
<tr><td>Content/short description; duration; training/learning method</td><td colspan="3">Waste minimization refers to processes and practices aimed at reducing the amount of waste produced. This concept is integral to sustainable living and involves strategies to reduce, reuse, and recycle materials, thereby minimising the environmental impact and promoting efficient resource use.
Waste minimization is a critical component of sustainable development, benefiting the environment, economy, and society. By adopting waste reduction practices, we can contribute to a healthier planet and improve the quality of life for current and future generations. Embracing waste minimization not only addresses environmental challenges but also promotes economic efficiency and social well-being.
By minimising waste, less material ends up in landfills, which helps in reducing land and water pollution.
Waste minimization conserves natural resources by reducing the need for raw materials and leads to a reduction in greenhouse gas emissions from waste decomposition and the manufacturing processes of new products.
Reducing waste helps in preserving natural habitats and biodiversity what means a cleaner environment, contributing to better public health.
Waste minimization practices often involve community participation, leading to increased awareness and collaborative efforts. Implementing waste minimization can provide educational opportunities about sustainability and environmental stewardship.
Waste minimization offers substantial benefits across environmental, economic, and social dimensions. By adopting waste reduction practices, individuals, businesses, and governments can contribute to a sustainable future. Embracing these practices not only addresses environmental challenges but also promotes economic efficiency and social well-being, ultimately leading to a healthier and more prosperous world for everyone.</td></tr>
<tr><td></td><td>Topics</td><td>Duration</td><td>Method</td></tr>
<tr><td></td><td>I. Elements of waste minimization:
1) what is waste minimization (embedding this process in the Waste Management theme map)
2) waste minimization as a strategic goal in waste management (3Rs: reduce, reuse, recycle)</td><td>4</td><td>Self-learning
Readings
Videos
Lectures</td></tr>
<tr><td></td><td>II. Waste minimization strategy (case studies)
1) good examples from Poland, Cyprus, Greece, North Macedonia and</td><td>6</td><td>Self-learning
Readings
Videos
Lectures</td></tr>
</table>

	Slovenia (the aim is to promote the countries participating in our project) 2) examples from 3-4 selected companies and municipalities from other European countries		
	III. Waste minimization processes and practices 1) extension of point 2 (good practices) to indicate benefits of implementing waste minimization in municipalities and companies 2) implementing waste minimization in everyday life	4	Self-learning Readings Videos Lectures
	IV. Promoting waste minimization 1) examples of promotional activities in different countries 2) promotional tools 3) collecting arguments to help promote waste minimization in municipalities, companies and also for individuals	4	Self-learning Readings Videos Lectures
Learning outcomes	**Verification criteria**		
Distinguish elements of waste minimization	• Define waste. • Define the concept and assumptions of the concept of waste minimization (in the context of municipalities, enterprises, individuals). • Characterise the product life cycle. • Characterizes the assumptions of the concept of eco-design of finished products. • Presents solutions enabling the use of products that can be recycled in the company's operations • Describe the stages of processing paper, cotton and furniture waste into new products.		
Comply with waste minimization strategy	• Defines the concept and assumptions of an integrated waste management system. • Characterise the Cleaner Production concept and Zero Waste concept relations to the principles of minimising waste production. • Plan the process of waste processing in a form that does not threaten the environment • List solutions limiting the size of generated waste.		

Apply waste minimization processes and practices	• Present practical examples of waste minimization and present benefits of implementing waste minimisation. • Characterise the assumptions of the concept of eco-design of finished products. • Characterizes waste in terms of its impact on the environment. • Give examples of how individual consumers can implement waste minimisation in their daily lives.
Promotion of waste minimization	• Proposes solutions enabling the use of products that can be recycled in the company's operations.Characterise the benefits of waste minimization for enterprises and the economy. • Implement solutions for promotion of waste minimization in municipalities, companies and also for individuals.
Learning materials (e.g. exercises, data sets)	• Readings (course material, external resources) • Videos (course material, external resources) • PPT Presentations (virtual face-to-face classes) • Self-evaluation (test, exercises) • Case studies • Discussion Forum • Group discussion (classroom)
Language/s of instruction (oral and written material)	English will be official. Lectures will be translated to Macedonian, Greek, Slovenian and Polish languages.
Method/s for teaching and learnings	1. Pre-course - participants will be prepared for the module topics by e-learning (readings, and videos). 2. Course - where participants will engage with the trainer and their peers in a workshop with variety of interactive training methods; 3. Post-course - participants will apply their new knowledge and skills by e-learning (individual assignments and forums) and additional professional literature for knowledge expansion (optional). Thus, the course will employ the following methods: • e-learning (readings, video, ppt., forum, problem-based learning, self-assessment); • individual work (reflection – case study assessments); • group work (exercises, paper assignments, discussions, questions & answers, case-work).
Method/s of assessment	• Self-evaluation test • Self-evaluation exercises • Delivery of individual case study (optional) • Participation in discussion forum • Multiple choice selection / Quizzes
Method for evaluation of course (by students, peer review etc.)	Evaluation lists and feedback from participants, peer review

LECTURERS OF MODULE 1

Katarzyna SŁAWIŃSKA – Completed university studies in the field of Administration, post-graduate studies in the field of pedagogy and MBA structure at SGH in Poland. Finished certified training course as a trainer-educator. Since 2010 she has been participating in work related to the modernization of the VET system, developing descriptions of professional qualification standards,

competence profiles, which included research on the content of work at job positions, and in particular in the development of program bases, subject-specific and modular teaching programs for professions along with their support in the form of guides for students and guides for teachers. Professional tasks conducted as the senior lecture at Łukasiewicz Research Network – Institute for Sustainable Technologies were dedicated to implementation of national and international projects concerning vocational education and training specialists in non-formal and informal education.

Main methodologist in the VISTULA project for the development of multimedia projects.

Methodological expert in the system project: Expert in development of national standards of professional competences required by employers. Co-author of the description of professional competence standards in Poland. Leader of the Working Group on competencies shaped in vocational education in the project "Capital for vocational training" co-financed by the EU under the ESF and concluded with the Ministry of Development.

Specialist in ORE for the acceptance of products of competition projects in the project Verification and acceptance of competition products from Measure 2.14 and expert for the implementation of educational pledges in the area of foreign languages and vocational school of the first and second degree.

Manager, coordinator and executor of many European projects from LLL, Erasmus + (20) for vocational education and training and adult sector. Author and co-author of scientific articles and monographs, including 19 multi-author scientific editions, authorship of 15 and co-authorship of 24 chapters.

Katarzyna SKOCZYLAS- Master's degree in international relations at the University of Lodz. Postgraduate studies: Modern business services at K. Pulaski University of Technology and Humanities in Radom.

Participates in scientific research, development and implementation work on vocational education and qualifications and competencies required in an innovative economy.

For 15 years, she worked at Łukasiewicz Research Network – Institute for Sustainable Technologies where was responsible for the development of the research on qualifications and professions, developed core curricula, qualification programs for vocational courses,

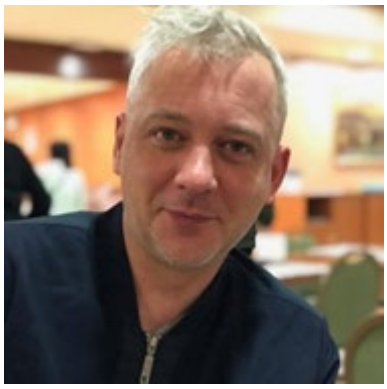
vocational information, descriptions of qualifications, curricula, recommended equipment, etc. were influenced by program changes in the education system, the educational offer of schools, and the work of teachers.

Conducts research and prepares analyses for the preparation of new projects under European, national, regional and local programs.

Methodological expert of Polish Ministry of Economy. Author of competence standards in Poland. Methodological expert for the development of occupational information and member of teams for validation and quality of occupational information.

Project coordinator with 15 years of experience in the implementation of projects including EQUAL, COST, Leonardo da Vinci, Erasmus+. She specializes in vocational education and training, education for the labour market, professional competence standards. Member of the project team of the task "PROFESSIONALS for the future of the Radom Metal Cluster-[ZPRKM]", "Industry of the future as an opportunity for Radom [P4.0R]" and "Competencies of the Industry Leader 4.0" subsidized from the budget of the Mazowieckie Voivodeship.

Author and co-author of scientific articles.



Dr Rafał Otręba currently works at University of Economics in Katowice. Rafał does research in Educational Leadership and Social Logistics.

His last publication i "Gospodarka współdzielenia – kontekst miejski" (The sharing economy - the urban context). He specializes in the following areas: environmentalism, city logistics,logistics processes and systems, logistics management.

Author of such studies as Building Managerial Competencies, Human Capital Management Skills, Determinants of Quality of Life in Building City Green Mobility Concept and many others. He has co-authored material on Waste Minimization in our course, as well as consulted on content prepared by other partners.

MODULE 2: Recycling

Title of the module	**Recycling**
Type	Blended learning(face to face on on-line learning)
Workload for learner (hours)	13 hours
Trainer	Athena Antoniou Athena Antoniou has been working in Education and Information Technology Centre(EDITC Ltd) since 1996. She has a vast experience as a researcher

<table>
<tr><td></td><td>in Erasmus+Plus projects with focus on environmental,social and vocational education subjects. She is also a trainer delivering courses on the above subjects and in digital skills.</td></tr>
<tr><td>Institution(s)</td><td>EDITC LTD</td></tr>
<tr><td>Content/short description; duration; training/learning method</td><td>Recycling is the process of converting waste materials, that would usually be thrown away, into new materials and objects. Recycling waste reduces the number of harmful materials produced and reduces energy usage, therefore benefiting the environment.

Recycling plays a crucial role in reducing the volume of waste that ends up in landfills and incinerators. Here’s a closer look at how recycling helps mitigate environmental impacts and the associated challenges of current waste management practices.

Recycling significantly decreases the amount of waste that is deposited in landfills. This helps in reducing the environmental footprint of waste management and extending the lifespan of existing landfills.

Recycling is a critical component of sustainable waste management. It reduces the amount of waste destined for landfills and incinerators, mitigating the risks of water contamination and air pollution. By diverting materials from landfills and incinerators, recycling helps conserve natural resources and reduce greenhouse gas emissions. To maximize these benefits, it is essential to support and expand recycling programs, enhance public awareness, and adopt policies that encourage waste reduction and material recovery. Through collective efforts, we can address the environmental challenges associated with waste management and move towards a more sustainable future.

<table>
<tr><th>Topics</th><th>Duration</th><th>Method</th></tr>
<tr><td>1. Precycling and Upcycling

What is Precycling?
• Precycling
• Examples of precycling
• Importance of Precycling

What is Upcycling?
• Upcycling
• Examples of Upcycling
• Importance of Upcycling</td><td>2</td><td>• Lecture
• Video</td></tr>
</table>
</td></tr>
</table>

	2. Recycling • The history of Recycling • What is recycling? • Why Recycle?	1	• Lecture • Video • Self-assessment
	3. Municipal Solid Waste Management • Solid waste collection Recycling solid wastes (paper, glass, plastic, aluminium) • Composting municipal solid wastes • Incineration of municipal solid wastes	3	• Lecture • Video • Self-assessment
	4. Other recycling programs apart from the programmes ran by the municipalities • E-waste • Clothing • Batteries • Light bulbs • Textiles	3	• Lecture • Video • Self-assessment
	5. Implementing recycling in everyday life • How to apply recycling in your daily life	2	• Lecture • Video • Self-assessment

	6. Social and economic impact of recycling • Health and wellbeing of people • Happiness of people • Creation of jobs • Minimize production costs to manufacturers • Increase sales through the trade and sale of recyclables	2	• Lecture • Video • Self-assessment
Learning outcomes	**Verification criteria**		
Precycling and upcycling	• Understand the meaning of precycling and upcycling. • List examples of precycling an upcycling. • Implement precycling and upcycling. • Integrate precycling and recycling in municipality policies were possible. • List examples of precycling an upcycling. • Implement precycling and upcycling. • Integrate precycling and recycling in municipality policies were possible. • Identify other people that want to promote precycling and upcycling within the municipalities and to other companies as well. • Promote the importance of precycling and upcycling within the municipalities and to the public. • Develop and support information campaigns to raise awareness about precycling and upcycling.		

Recycling	• Understand the meaning of recycling. • List examples of recycling. • Explain the importance of recycling. • Implement recycling. • Identify the social and economic consequences of recycling.
Municipal Solid Waste Management	• List different types of solid waste. • Identify and discriminate among different types of solid wastes. • Provide examples of different types of solid waste. • Demonstrate familiarity of recycling of different types of solid wastes. • Apply recycling methods for different solid waste categories. • Examine what types of solid waste is recycled in municipalities.
Recycling programs apart from the programmes ran by the municipalities	• Apply recycling methods that are not ran by the municipalities like for electronic equipment, batteries , light bulbs, textiles, cooking oil, hazardous materials. • Identify potential environmental hazards. • Proceed according to the environmental management standards. • Coordinate operational and operational works carried out in the municipality or enterprise/plant.
Social and economic impact of recycling	• Value the importance of recycling and be able to argue in favour of recycling. • Identify other people that want to promote recycling within the municipalities and to other companies as well. • Develop and support information campaigns to raise awareness about waste prevention and recycling.
Learning materials (e.g. exercises, data sets)	• PowerPoint presentation • Exercises • Videos • Quizzes for self-evaluation

	• Links to other relevant web pages
Language/s of instruction (oral and written material)	English and later in other partners' language
Method/s for teaching and learnings	• Lecture • Videos • Self-assessment
Method/s of assessment	• Self-assessment through Test(Quiz with multiple choice questions, true or false etc.) • Delivery of assignment(optional)
Method for evaluation of course (by students, peer review etc.)	Online Evaluation form filled in by students

LECTURERS OF MODULE 2

Athena Antoniou has been working in Education and Information Technology Centre(EDITC Ltd) since 1996. She holds a degree a Management Science degree. She has participated in many European funded and Cofunded project in the last fifteen years(Erasmus Projects, Refugees Fund). She has been involved in the development of Qualification Frameworks curricula and training materials on environmental, social and vocational education subjects and the development of interactive e-learning platforms in the European projects. Athena Antoniou is also a certified Human Resource Development Authority VET trainer and a holder of ECDL certificates and delivers trainings on Digital Skills and other subjects.

MODULE 3 – Circular economy

Title of the course	**Circular economy**
Type	Face-to-face lessons and e-learning (use of diverse methods)
Workload for learner (hours)	20 hours (approximately 1 ECVET) 6-8 contact hours – lectures & live sessions
Trainer	1. Dušan Klinar, Štefan Čelan, Klavdija Rižnar 2. Angelina Taneva Veshoska, Elena Nikolovska, Tanja Dimitrova Filkoska
Institution(s)	1. Znanstveno-raziskovalno središče Bistra Ptuj 2. Institute for Research in Environment, Civil Engineering and Energy (IECE)
Content/short description;	*Systems Thinking and Circular Design:* This paradigm underpins much of the development of the circular economy and is a powerful professional tool.

<table>
<tr><td>duration; training/learning method</td><td colspan="3">Through this course, students will develop the skills necessary to integrate a systems-based perspective into their analysis of situations. Systems Thinking will be cultivated through case studies and analysis projects.</td></tr>
<tr><td></td><td>Content</td><td>Duration</td><td>Method</td></tr>
<tr><td></td><td>1. Elements of circular economy:
Principles of circular economy (9R of waste management)
Criteria and indicators for the circular economy (material efficiency, socio-economic efficiency)
Comparative analysis of the linear economy
Strategies and directives for transition into the circular economy (EU level)</td><td>4 h</td><td>Self-learning
Readings
Videos
Lectures</td></tr>
<tr><td></td><td>2. Main system and tools for implementation in the CE:
Eco-design
LCA (Life cycle assessment)
Eco-labelling (EMAS, ISO 14001 etc.)
Green public procurement</td><td>3 h</td><td>Readings
Lectures
Videos</td></tr>
<tr><td></td><td>3. Business models of CE:
New and changed business models for CE. Overview of business models:
financing and running a circular system,
global supply chains and circular economies.</td><td>2 h</td><td>Readings
Lectures
Exercise
Self-assessment</td></tr>
<tr><td></td><td>4. Measuring the Circular Economy:
Available tools and methods to measure the impact of CE in the systems.</td><td>2 h</td><td>Readings
Lectures
Exercise</td></tr>
<tr><td></td><td>5. Implementation of Circular Economy (CE) in municipalities:
Good practices in the EU according to 9R - principles
Case study of CE (Slovenia, IECE)
Raising awareness and promoting CE (9R) principles
This course will consider the practicalities of delivering a circular economy, addressing the key incentives of all stakeholders involved.</td><td>9 h</td><td>Readings
Videos
Lectures
Case study
Exercise
Self-assessment test</td></tr>
<tr><td>Learning outcomes</td><td colspan="3">Verification criteria</td></tr>
<tr><td>Understand and implement basic elements of circular economy</td><td colspan="3">✓ Demonstrate a clear understanding of the fundamental principles of Circular Economy, including resource efficiency, waste reduction, and circular design concepts.</td></tr>
</table>

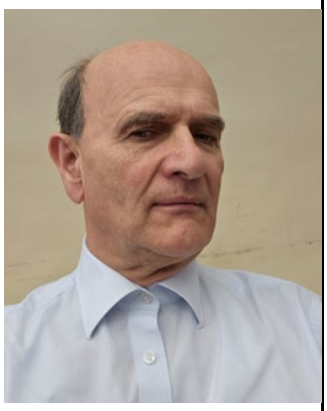
	✓ Identify different circular economy practices that can be applied within municipal roles. ✓ Apply circular economy concepts in practical situations into municipal project. ✓ Integrate circular economy principles (9R) into existing municipal policies, plans and projects to foster sustainable practices and resource efficiency. ✓ Collaborate with relevant stakeholders to implement circular economy initiatives effectively. ✓ Problem-solving skills and innovative thinking by developing creative solutions to improve municipal processes and reduce waste. ✓ Effectively communicate circular economy principles and practices to stakeholders, promoting awareness and knowledge sharing with the municipality.
Use and understand main system and tools use at implementation of CE	✓ Demonstrate familiarity with various systems and tools commonly used in Circular Economy implementation, such as life cycle assessment (LCA), eco-design guidelines, green public procurement … ✓ Explain the functionality and purpose of each system and tool related to Circular Economy implementation and how they contribute to sustainable practices and resource efficiency. ✓ Integrate the use of Circular Economy systems and tools into ongoing municipal projects to enhance resource efficiency and sustainable practices in waste management. ✓ Collect relevant data using the identified systems and tools and analyse the data to make informed decisions and identify opportunities for improvement. ✓ Collaborate with stakeholders to share knowledge and best practices related to the use of Circular Economy systems and tools.
Understand the role of business models at implementation of circular economy in companies	✓ Demonstrate an understanding of various business models that facilitate circular economy practices within companies. ✓ Explain how circular economy business models contribute to sustainable practices, waste reduction, and resource efficiency within companies. ✓ Identify ways to integrate circular economy business models into municipal strategies and initiatives to promote sustainable development. ✓ Provide examples of how circular economy business models have been successfully implemented in companies, either within the municipality or in other relevant contexts. ✓ Analyse the benefits and challenges associated with adopting circular economy business models and their implications for companies and the community. ✓ Identify key stakeholders and collaborators, both within and outside the municipality, to foster the implementation of circular economy business models in companies. ✓ Effectively communicate the role of circular economy business models to stakeholders, promoting awareness and knowledge sharing within the municipality.
Understand and apply tools for measuring the	✓ Demonstrate an understanding of various tools and methodologies used for measuring the impact of circular economy initiatives.

impact at CE implementation	✓ Identify and select the most appropriate impact measurement tools based on the specific circular economy initiatives being implemented within the municipality. ✓ Interpret the results of impact assessments and communicate the findings to relevant stakeholders, providing insights on the effectiveness of circular economy initiatives. ✓ Use the impact assessment results to inform decision-making processes and identify areas for improvement in circular economy implementation. ✓ Effectively communicate impact measurement results to colleagues and stakeholders, promoting awareness and knowledge sharing within the municipality.
Understand the working cases of CE in different countries EU	✓ Demonstrate familiarity with successful circular economy initiatives and projects implemented in different EU countries. ✓ Explain the different circular economy models and strategies that have been employed in various EU countries to promote sustainable practices. ✓ Collaborate with colleagues and stakeholders to share knowledge and insights gained from studying circular economy cases in different EU countries. ✓ Identify and assess how circular economy practices implemented in other EU countries can be adapted to suit the unique needs and circumstances of the municipality. ✓ Effectively communicate their understanding of working cases of circular economy in different EU countries to relevant stakeholders within the municipality. ✓ Explore opportunities to integrate successful circular economy practices from other EU countries into existing municipal strategies and initiatives
Got awareness regarding 9R principles of CE implementing in EU	✓ Demonstrate awareness of the 9R principles of circular economy, including concepts such as Reduce, Reuse, Recycle, Repair, Refurbish, Rethink, Remanufacture, Redesign, and Recover. ✓ Identify examples of how the 9R principles have been applied in circular economy projects or practices within the EU. ✓ Explore opportunities to integrate the 9R principles into existing municipal strategies and initiatives to promote circular economy practices. ✓ Effectively communicate the importance of the 9R principles to stakeholders, promoting awareness and knowledge sharing within the municipality. ✓ Assess how circular economy projects within the municipality align with the 9R principles and identify areas for improvement. ✓ Identify and apply best practices related to the 9R principles, considering the specific needs and challenges of the municipality.
Prepare basic plan for CE implementation and measuring	✓ Create a basic plan outlining the steps and strategies for implementing circular economy practices in waste management within the municipalities. ✓ Clearly identify the specific objectives and goals of the circular economy plan, such as waste reduction targets, resource efficiency, and sustainable practices in waste management. ✓ The plan demonstrates the integration of the 9R principles of circular economy (reduce, reuse, recycle, repair, refurbish, rethink,

	remanufacture, redesign, and recover) as guiding principles for implementation. ✓ Allocate necessary resources (e.g., budget, personnel, technology) to support the successful implementation of the circular economy plan. ✓ The plan includes strategies for engaging key stakeholders, both within and outside the municipality, to support and participate in circular economy initiatives. ✓ Effectively communicate the circular economy plan to relevant stakeholders and create a reporting mechanism to keep stakeholders informed of progress and achievements. ✓ The circular economy plan aligns with existing municipal strategies and initiatives to ensure coherence and synergy in sustainable development efforts.
Learning materials (e.g. exercises, data sets)	Readings (course material, external resources) Videos (course material, external resources) PPT Presentations (virtual face-to-face classes) Self-evaluation (test, exercises) Case studies Discussion Forum Group discussion (brainstorming)
Language/s of instruction (oral and written material)	English will be official. Lectures will be translated into Macedonian, Greek, Slovenian and Polish languages.
Method/s for teaching and learning	The uniqueness of this programme lies in its tailor-made origin and development based on the principles of vocational training, using methods and techniques that help to develop new knowledge and skills. E-learning methodology with a virtual platform. The teaching/learning methods in each course will be organised within three phases: ● Pre-course - participants will be prepared for the module topics by e-learning (readings and videos); ● Course - where participants will engage with the trainer and their peers in a workshop with a variety of interactive training methods (virtual experiments etc.); ● Post-course - participants will apply their new knowledge and skills through e-learning (individual assignments and forums) and additional professional literature for knowledge expansion (optional). Thus, the course will employ the following methods: ● e-learning (readings, video, PPT, forum, problem-based learning, self-assessment); ● individual work (use of real-time surveys and case study assessments); ● group work (exercises, paper assignments, structured discussions, questions & answers, casework).

Method/s of assessment:	• Self-evaluation exercises; • Self-evaluation test; • Participation in the discussion forum; • Multiple choice selection / Quizzes; • Delivery of individual case study (optional).
Method for evaluation of the course (by students, peer review etc.)	Evaluation lists, feedback from participants and peer review.

LECTURERS OF MODULE 3



Doc. Dr. Dušan Klinar

Assistant Professor at University of Maribor, Faculty of Chemistry and Chemical Engineering teaching Economics.

Ph.D. in Chemical Engineering, and M.Sc. in Economics and Business, Senior Research and Project Manager at Scientific Research Centre BISTRA Ptuj since 2007. Preparing, managing and reporting on national and international scientific research and application projects, managing teams, organizing workshops and seminars, coordination the national and international projects and participate in the integration of business with science and education sector.

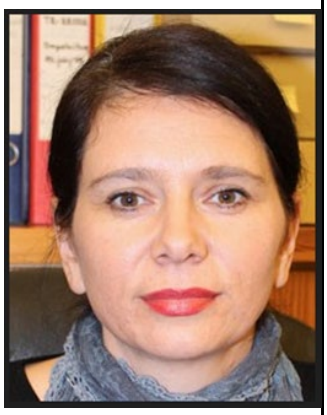
Active participation in EU projects:

- VIRIDI, project SI-AT, 2023 - 2026

- SPLCycle, KIC – EIT Raw Materials, feb 2018 – mar 2021, partner

- ZERO-WASTE-PRO, MED project 2014

And others.

	**Dr. Klavdija Rižnar** **Started as a professional research assistant in the SRC Bistra Ptuj, where for 13 years successfully involved in the design, management and coordination of work in development, research and application projects on national and international level. She worked with many actors in economic and business environment for the effective integration of R&D institutions and industry, participated in the transfer of scientific research findings and innovative technologies in the economy. She actively worked in the preparation and conduct of international and national projects, preparation of scientific and professional publications, demanding posts and discussions from the broader area of research and advice and assistance in protecting intellectual property rights.** **Leader and participant in EU projects:** **- Studio krog; EEA NorwayGrants, 2024** **-SPLCycle, KIC – EIT Raw Materials, feb 2018 – mar 2021, partner** **- 2SoKroG social activation, SI – CRO 2020** **- BRAVER – EMAS, LIFE project 20216** **- ZERO-WASTE-PRO, MED project 2014** **And many others.**

MODULE 4 Profitability of effective Waste Management

Title of the course	**Profitability of effective Waste Management**
Type	Online face-to-face lessons and e-learning (blended learning)
Workload for learner (hours)	28 hours (approximately 1 ECVET) 6 contact hours – lectures & live sessions
Trainers	Elena Nikolovska, Tanja Dimitrova Filkoska, Klavdija Rižnar, Dušan Klinar
Institution(s)	Institute for Research in Environment, Civil Engineering and Energy Znanstveno-raziskovalno središče Bistra Ptuj

<table>
<tr><td>Content/short description; duration; training/learning method</td><td>
This course will support the setting up and provide access to upskilling pathways on sustainable waste management (WM).

The knowledge and skills acquired by the participants will empower them to apply sustainable waste management practices within the municipalities.

The training course will cover topics that will provide implementation of WM legislation, the realization of the obligations of the municipalities, waste management challenge's solutions, reducing waste quantities, and proper waste management through case studies and good practices.

The course will address the best available technics of WM, identifying the gaps in current waste management, and real case studies, and this result will be ready to be used by the participants, proposing the path for the municipality toward overall long-term planning for sustainable waste management, in order to prepare them to establish sustainable WM system, and implement the current waste management legislation.
<table>
<tr><th>Topics</th><th>Duration</th><th>Method</th></tr>
<tr><td>1. Organization of waste management in municipalities
• Current waste management practices
• Documentation of waste management (EU and international strategies/planning of sustainable waste management)
• Effects from appropriate and inappropriate waste management</td><td>7 h</td><td>Self-learning / Readings
Videos
Lectures</td></tr>
<tr><td>2. Gaps in the current waste management practices and innovative way of improving the waste management in the municipalities</td><td>3 h</td><td>Readings
Lectures
Exercise</td></tr>
<tr><td>3. Waste management towards circular economy</td><td>3 h</td><td>Readings
Videos
Lectures
Exercise</td></tr>
<tr><td>4. Challenges in waste management and sustainable solutions</td><td>3 h</td><td>Readings
Lectures
Exercise
Self-assessment</td></tr>
</table>
</td></tr>
</table>

	5. Implementation of sustainable waste management in municipalities • Good practice – case study from Slovenia • Good practices in the EU • Raising awareness and promoting simple ways to reduce waste at home • Economic benefits of sustainable waste management	12 h	Readings Videos Lectures Case study Exercise Self-assessment test
Learning Outcomes	**Verification criteria**		
Analyze institutional, socio-economic, and policy issues related to waste management	• Demonstrate a clear understanding of the key institutional stakeholders involved in waste management at the municipal level. • Identify and analyze socio-economic factors that influence the waste generation and disposal patterns in the municipality. • Evaluate existing waste management policies and regulations and their impact on waste reduction and resource recovery. • Accepting and gaining innovative thinking and use applicable creative solutions to improve municipal waste management and reduce waste generation. • Be able to apply critical thinking and problem-solving skills to identify and evaluate waste management and environmental health issues and solutions. • Following the latest developments, trends, and innovations in the field of sustainable waste management.		
Recognize the need for complying with EU and international waste management standards	• Demonstrate awareness of relevant EU waste management directives and international agreements related to waste management. • Explain the importance of complying with these standards to foster sustainable waste management practices and international cooperation.		
Determine the possibilities for circular economy to achieve sustainable waste management within the municipality	• Identify opportunities for waste prevention and material reuse within a circular economy framework. • Assess the potential benefits of adopting circular economy principles in waste management, such as reduced resource consumption and greenhouse gas emissions. • Explain how circular economy business models contribute to sustainable practices, waste reduction, and resource efficiency within companies. • Identify ways to integrate circular economy business models into municipal strategies and initiatives to promote sustainable development. • Provide examples of how circular economy business models have been successfully implemented in companies, either within the municipality or in other relevant contexts. • Analyze the benefits and challenges associated with adopting circular economy business models and their implications for companies and the community. • Identify key stakeholders and collaborators, both within and outside the municipality, to foster the implementation of circular economy business models in companies.		

	• Effectively communicate the role of circular economy business models to stakeholders, promoting awareness and knowledge sharing within the municipality.
Identify waste management challenges and discuss long- and short-term solutions	• Identify common challenges faced by municipalities in waste management, such as improper waste disposal and limited recycling infrastructure. • Propose both long-term and short-term solutions to address these challenges, considering factors like technological advancements and policy changes.
Examine sustainable solutions towards the establishment of an Integrated waste management system	• Evaluate the concept of an Integrated Waste Management System (IWMS) and its benefits over traditional waste management approaches. • Propose strategies for integrating waste prevention, collection, recycling, and disposal in a holistic and sustainable manner.
Recognize the profitability of converting waste into valuable products and its environmental benefits through analyzing case studies	• Analyze case studies showcasing successful waste-to-product initiatives that demonstrate economic viability and positive environmental impacts. • Assess the potential of waste valorization projects to reduce waste disposal costs and create revenue streams.
Motivate creative thinking and awareness creation to change citizens' behavior towards more sustainable consumption	• Design creative awareness campaigns or initiatives to educate citizens about the importance of waste reduction and responsible consumption. • Evaluate the effectiveness of such initiatives in influencing citizens' behavior towards sustainable waste management practices.
Prepare a basic plan for waste management reforms oriented to reduce municipal waste, recycle properly, and protect the environment from pollution	• Assess the level of engagement and collaboration by involving various stakeholders, such as local communities, businesses, waste collectors, NGOs, and governmental agencies, in the planning and implementation process. • Compare the waste management reforms with best practices from other regions or countries. • Develop a basic waste management plan that includes specific strategies for waste reduction, recycling, and pollution prevention. • Justify the chosen strategies based on their potential impact on waste generation, resource recovery, and environmental protection. • Clearly identify the specific objectives and goals of the circular economy plan, such as waste reduction targets, resource efficiency, and sustainable practices in waste management. • Precisely outline the distinct aims and objectives of the sustainable waste management strategy, encompassing waste reduction targets, resource efficiency, and sustainable waste management practices.
Learning materials (e.g. exercises, data sets)	• Readings (course material, external resources) • Videos (course material, external resources) • Lectures (PPT Presentations - online face-to-face lessons and e-learning) • Self-evaluation (test, exercises) • Case studies • Discussion Forum • Group discussion (classroom)

Language/s of instruction (oral and written material)	English will be official. Lectures will be translated to Macedonian, Greek, Slovenian and Polish languages .
Pre-requisites	● Basic knowledge of sustainability, good practices in WM and legal strategy of waste management in the country. ● Elementary knowledge in current waste management practices and obligations of local self-government according to National Legislation. ● Professional experience in waste management within municipality as waste specialist.
Method/s for teaching and learnings	Uniqueness of this program is that it is tailor-made, developed on the principles of VET training, using methods and techniques that help developing new knowledge and skills. E-learning methodology with virtual platform. The teaching/learning methods in each course will be organized within three phases: 1. Pre-course - participants will be prepared for the module topics by e-learning (readings, and videos); 2. Course - where participants will engage with the trainer and their peers in a workshop with variety of interactive training methods; 3. Post-course - participants will apply their new knowledge and skills by e-learning (individual assignments and forums) and additional professional literature for knowledge expansion (optional). Thus, the course will employ the following methods: - e-learning (readings, video, ppt., forum, problem-based learning, self-assessment); - individual work (reflection – case study assessments); - group work (exercises, paper assignments, discussions, questions & answers, case-work);
Method/s of assessment	● Self-evaluation exercises ● Delivery of individual case study ● Delivery of basic plan for SWM ● Participation in discussion forum ● Multiple choice selection / Quizzes
Method for evaluation of course (by students, peer review etc.)	Evaluation lists and feedback from participants, peer review

LECTURERS OF MODULE 4

Ms. Tanja Dimitrova Filkoska
holds MSc in Chemical Sciences. She

brings over nine years of experience in environmental protection, circular economy, and sustainable waste management. Her focus on promoting environmental sustainability and implementing circular economy principles is supported by her extensive experience in managing projects that follow current National and EU environmental legislation. These projects include Environmental Protection Reports, EIA Studies, ESARs, ESIAs, Waste Management Plans and Programs, and proposals in environmental protection.

Tanja's expertise also includes working on innovative projects that transform industrial waste into secondary raw materials, particularly in the construction industry, highlighting her proficiency in advancing sustainable practices through practical applications and strategic consultancy. Her role as a key expert in designing forward-thinking curriculum content for waste management courses is enhanced by her contributions to promoting circular economy and sustainable practices. Tanja is also experienced at stakeholder engagement, collaborating effectively with government agencies, industry partners, and community groups to foster support and participation in sustainable waste management initiatives. Her extensive knowledge of environmental regulations and practical experience in waste management make her a valuable resource for developing comprehensive course materials.

Ms. Elena Nikolovska holds MSc degree in technical sciences, Environmental Engineering. She has a strong background in management, consultancy and reporting in the area of environmental pollution and protection, with more than 18 years of experience. She has practical experience in prevention of waste and wastewater pollution, proper waste management, and reporting to the competent authority for environmental protection the environmental pollution measurements.

She has also experience as trainer in VET and adult and higher education institutions, with great experience in developing curricula, managing and coordinating educational projects, curriculum development and implementation of trainings in the field of VET and adult education.

The topics that she worked on are: waste management, water management in the context of circular economy, environmental assessment, environmental protection, sustainable development etc. She implemented many Erasmus + projects in the field of environmental management-eco skills in waste management and sustainability. Her expertise includes preparation of more than 200 projects in accordance with current National and EU legislation in the area of environmental pollution, such as: Environmental Protection Reports, EIA Studies, ESARs, ESIAs, Applications for A and B IPPC licenses, Waste and Wastewater Management Plans and Programs, preparation of project proposals in the area of environmental protection, etc. She has published several research papers in international conferences as proceedings.

MODULE 5 : Methods of waste disposal and processing

Title of the module	**Methods of waste disposal and processing**
Type	Class and e-learning
Workload for learner (hours)	hours (13 HOURS / ECTS) 5 contact hours – lectures & live sessions
Trainer	Anna Gkriniari, Maya Dimitriadou
Institution(s	CRE THI DEV
Content/short description; duration; training/learning method	Sustainable waste management is a holistic approach aimed at minimizing the environmental, social, and financial impacts of waste throughout the lifecycle of a product. In contrast to the traditional linear economy, which emphasizes a "take-make-dispose" model, sustainable waste management

focuses on keeping materials in use for as long as possible and reducing waste at every stage of a product's lifecycle.

Products should be designed for longevity, reparability and recyclability. This includes using materials that are easy to recycle and designing for modularity to facilitate repairs and upgrades. Implementing manufacturing processes that minimize waste, use resources efficiently, and reduce emissions. This can involve adopting clean technologies and circular economy principles.

Establishing robust systems for collecting, sorting, and processing recyclable materials. This includes promoting the reuse of products and components.

An effective and sustainable waste management system is integral to addressing the challenges of modern consumption. By adopting a lifecycle approach, we can reduce the negative impacts of waste from production to disposal. This involves integrating waste collection, resource recovery, treatment, and safe disposal methods. Emphasizing sustainable practices throughout the product lifecycle, from design to end-of-life management, ensures that materials remain in use for as long as possible, thereby minimizing the environmental footprint and promoting a circular economy. Through coordinated efforts and innovative solutions, sustainable waste management can lead to a more sustainable and resilient future.

Topics	Duration	Method
Municipal solid waste management: Current practices, opportunities and challenges. Understanding of sustainability principles, such as ecological balance, resource conservation Integration of knowledge about innovation processes and strategies. This includes fostering a mindset of creativity, problem-solving, and adaptability. Interconnectedness between sustainability and innovation.	3,5	Readings 1.5 hour Lectures 1 hours Videos 0.5 hours Self-assessment 0.5 hours
Introduction to Municipal waste management systems: Collection and Processing services.	4,5	Readings 1.5 hour Lectures 2 hours Videos 0.5 hours

	Collection of waste in the enterprise. Hazardous waste management. Storage of waste in the enterprise. Preparing waste for further management.		Self-assessment 0.5 hours
	Cost efficiency of municipal solid waste collection and processing services Methods to evaluate the cost efficiency of municipalities in the collection and processing of multiple household waste fractions, Evaluations of differences in the operating environments of municipalities (e.g., factors such as demography and median income of the municipality population)	3,5	Readings 1.5 hour Lectures 1.5 hours Self-assessment 0.5 hours
	Presentation of best practices of waste collections and processing in different various cities	2	Lectures 0,5 hours Videos 1, 5 hours
Learning outcomes	**Verification criteria**		
Municipal solid waste management: current practices, opportunities and challenges	✓ Demonstrate a clear understanding on Sustainability, through waste management. ✓ Identify Interconnectedness between sustainability and innovation. ✓ Foster a mindset of creativity, problem-solving, and adaptability. ✓ Gasp the current waste management challenges. ✓ Outline the most recent opportunities in effective waste management.		
Introduction to Municipal waste management systems	✓ Collect principles/basic info about the collection and processing. ✓ Analyze data and present it as a basis for decisions. ✓ Conduct an analysis of a the recent most modern methods of collection and implementation. ✓ Identify the recent methods of waste collection. ✓ Specialize in hazardous waste and their special treatments, and understand the importance of these nowadays.		

	✓ Identify all basics about the ways, places and methods of storage of waste. ✓ Determine the effective introduction of the trainees to the preparation of wastes for more specialized more demanding managing. ✓ Identify the implementation of the most updated processing methods.
Cost efficiency of municipal solid waste collection and processing services	✓ Identify the technical and respective economical parameters that are necessary for the definition of the cost analysis of collection and processes, for various municipality types ✓ Define the most accurate methods of evaluation. ✓ Develop the skill to conduct a whole cost analysis -efficiency plan for a case study municipality. ✓ Adjust/extend this plan to different types of municipalities (size, demography, type of waste etc.). ✓ Assess the municipality's cost plan using various evaluation methods.
Presentation of best practices of waste collections and processing in various different municipalities	✓ Identify different methods and models collection and process of each best practice presented in correlation to the characteristics of the specific municipality. ✓ Develop the skill to choose the right method/process depending on the municipalities characteristics and the waste. ✓ Classify an approximate cost analysis of implemented waste management plans. ✓ Search for updated best practices worldwide.
Learning materials (e.g. exercises, data sets)	● Readings (course material, references) ● Videos (external resources) ● PPT Presentations (e classes) ● Fats quizzes ● Self-evaluation (test, debate)
Language/s of instruction (oral and written material)	English
Pre-requisites	● Basic knowledge in current waste management practices and obligations of ● Basic knowledge of current National legislation ● Experience in waste management within municipality as waste specialist;
Method/s for teaching and learnings	The teaching methods applied will be : 1. Pre-course - participants will be prepared for the module topics by e-learning (readings, and videos); 2. Course - where participants will attend the main e presentation 3. Post-course – self-evaluation, optional assignment and readings
Method/s of assessment	● Quiz at the end of each part ● Self-evaluation test ● Delivery of individual case study (optional) ● Participation in discussion

LECTURERS OF MODULE 5

Dr ANNA GKRINIARI studied Chemical/Process Engineering in NTUA, Athens, specializing in Applied Thermodynamics, within her Diploma thesis (NTUA, 1996). She has a PhD in application of Concentrated Solar Enegry in materials science/surface coating technology (NTUA, 2O14)

She is author and co author of 6 published works in scientifique journals and 11 published works/oral and poster presentations within her participation in national and international scientifique conferences.

Within her PhD she gained experience in academic administration topics, related to assisting the design, introduction and implementation of new educational programs.

From October 2014 – July 2016, she was a researcher at the Laboratory of Laser Aided Additive and Subtractive Manufacturing-MODELLING OF LASER TREATMENT, in Dr Narendra Dahotre's team, AT University of North Texas, expandind and enhanching, her international academic experience. Within her PhD she specialized in Concentrated Solar Energy. She worked for 5 years (during summer) in different projects at Plataforma Solar d'ALMERIA (s.Spain) and FOUR SOLAIRE, Odeillo, S. France. Stemming from that project experience she has also published scientifique works at journals like SOLAR ENERGY AND SOLAR CELLS, and many presentations at related scientifique conferences

Maya Dimitriadou holds a BSc in Biology from Kapodistrian University of Athens. She has worked in ELKEDE, Technology & Design Centre for 20 years. During this period, she participated in many projects for Quality Assurance in various industries. She has been Quality Manager (1994-2011) and Head (2001-2011) of the Accredited Testing Laboratory of ELKEDE and she participated in the development and implementation of its Quality System.

Since 2012 she has been a member of CRE.THI.DEV, where she has and is working for many European and nationally funded projects being responsible mainly but not exclusively, for Quality Assurance issues. She has also been Project Manager and researcher in the ERASMUS+ project for waste prevention under the title 'Local Authorities Waste Prevention Training – LAWPreT' in which, among others, a library with circular economy articles and best practices has been developed.

2. VALIDATION AND CERTIFICATION OF LEARNING for Specialists in Waste Management

Within the ENCOURAGE project, the partnerships tried to develop elements of validation and certification of competencies of specialist in Waste Management sector as one of the most important segments of modern industrial society.

Validation and certification of non-formal and informal learning is a crucial challenge of lifelong learning and a priority for national and European vocational education and training policies in all sectors, including the waste management sector.

A huge impact was put on the development of the validation and certification elements for developed learning outcomes qualifications. Waste management is a sector in which there is a particularly urgent need for a sectoral qualification framework in the light of current developments towards the European market.

3.1 ROLE OF VALIDATION IN ENSURING SKILLS AND KNOWLEDGE

Validation is a kind of quality control, the purpose of which is to establish that all aspects of making a decision concerning the award of a qualification are carried out systematically, consistently, and transparently. The major requirement of the recognition principle is that qualifications awarded in different ways or in different places or under different systems should be seen as equivalent. The process of validation is informed by the specific standards urged. It publishes the details that must be noted and decisions that must be made, in order to confirm that all candidates for a qualification have demonstrated that they possess and are able to apply the required skills and knowledge. In any event, if candidates for qualifications carry out different learning processes requiring different means for the peripheral documentation, the same circular validation procedures are nonetheless to be applied. The only requirement is that the source of verification of the peripheral documentation must be the same, and that the

same criteria set out for the demonstrated competences are achieved. If validation of competences is carried out effectively and transparently, the outcome will be a validated qualification.

3.2 VALIDATION SYSTEMS FOR WASTE MANAGEMENT SPECIALISTS IN MODERN ENVIRONMENTAL PRACTICES

One important criterion for waste management specialists has to be their awareness of environmental problems; this awareness should extend to the causes that produce the problems and the means that could resolve them. It is tragic that much of today's environmental pollution can be traced directly to the man made products of a rapidly advancing technology. Innumerable potentially lethal materials now represent the lasting legacy of these technological achievements.

The proper control and ultimate elimination of this legacy demand of existing waste management systems the skills and the knowledge needed to minimise the impact of industrial and municipal wastes on the earth's limited resources.

Some kinds of specialists may work in waste management. For example, city planners, most administrators, lawyers, economists, and industrialists must be aware of the impact of waste disposal problems when making decisions. Industrial waste problems have long been an integral part of industrial engineering. Public health specialists and public works engineers lay the foundation for perceiving potential pollution sources in domestic waste streams.

Therefore, getting some insight into the stepping of the waste tree of the typified professional expert is an educational exercise but achieving familiarity without any reasonable criterion in sight tends to make the lesson pointless and the learning experience difficult and frustrating. The question remains how such a criterion can be formulated, at least provisionally. What contains the subject of waste management in order that it may be taught to anyone, at any educational level, who must know how to use this knowledge in disciplines such as those mentioned?

3.3.IMPORTANCE OF CERTIFICATION IN WASTE MANAGEMENT

In the professional domain, the issue of certification goes along with the issue of competence, which appears once the profile of professionals is made clear, when the qualifications required for a certain profile are set. Certification imposed itself as a way to recognize this professional competence, when a national or international entity checks the competence of candidates and issues a diploma to those who meet the requirements of competence.

In waste management, this situation also arises. Unfortunately, and since this professional domain lacks a global formal qualification in Europe, we can say there is still no accredited formal body that can produce these certificates. As the universities of Europe believe in the process they established in the Bologna Agreements, university courses produce degrees that are, nowadays, well recognized all over the world. These degrees are the only official mechanism that recognizes third level qualifications. For example, it is not possible to carry out third-level studies without having a final certificate of secondary education or other national secondary education level.

3.4 COMPARATIVE ANALYSIS ON VALIDATION AND CERTIFICATION ELEMENTS

A standardized research methodology to partner countries was conducted, focusing on a comparative analysis of existing policies, tasks and competence standards and other related

documents with validation and certification elements. Within this effort, a glossary of terms was established (IO2) based on the:

- Recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning
- Recommendation of the European Parliament and of the Council of 18 June 2009 on the establishment of the European Credit System for Vocational Education and Training (ECVET)
- Council Recommendation of 20 December 2012 on the validation of non-formal and informal learning (2012/C 398/01)
- ISO/IEC 17024:2012 - Conformity assessment — General requirements for bodies operating certification of persons.

The uniform methodology was used for the study in all partners' countries that focuses on a comparative analysis of selected documents that describe, among others, models, schemes of the certification and validation of profiles, job training, qualifications, competence standards which may be a reference point for building the description of the professional competence standard for the WM sector. In the frame of the methodology there were described the following elements:

- Purpose of research - the aim was the analysis of intentionally selected documents describing, among others, models, diagrams of certification and validation for the WM industry in the partners' countries reading five modules:

1. Waste management.
2. Recycling.
3. Circular economy.
4. Profitability of effective waste management.
5. Methods of waste disposal and processing.

- The subject of research - there is a need for transparency of qualifications and diplomas in the waste management sector, regardless of the country or vocational training and educational system in which they were acquired. The subject of comparative studies covered the structure and substantive content of the description of the elements for certification and validation for the waste management sector.

- Research problems - *What are the links between validation of non formal informal learning and national qualifications systems in partners' countries? How are the rules for validating of non formal and informal learning developed in order to enhance the comparability and transparency of methods and approaches to validation in partner countries for the waste sector? What kind of elements are used for validation of non formal and informal learning for main three qualifications in partners' countries?*

- Target groups - employees working in the waste sector in the municipalities; employees working in the waste sector in decision makers; local self-government units; public enterprises in charge of waste management; students/teachers/trainers form VET

schools/sectors who are involved in green economy that has been a curricula at some VET schools.

- Methods, techniques and research tools - in order to verify formulated research problems there was prepared the method of desk research to identify and analyse selected documents describing, among others, elements of validation and certification for the WM sector which are a reference point for building the description of the standard of professional competence for the waste management specialist. The expert method was used in formulating conclusions and recommendations. During the conducted studies it was used the experts service - specialists in creating descriptions of competency requirements and specialists - experts from waste management sector.

- Organization and area of research - the research in Cyprus, Poland, Greece, The Republic of North Macedonia and Slovenia. It was carried out between July and December 2022 with the participation of external experts and stakeholders from partners' institutions. On the basis of the national reports, there were developed a common analysis with the similarities and differences in describing the requirements elements for validation and certification for the waste management sector only in the ENCOURAGE project.

3.5 TOOLS AND METHODOLOGY

There were prepared research tools and methods to describe manpower forecasting work for a given country (or region) by borrowing historical and current manpower data from partners' countries (or regions).
It turned out that the partners' countries have followed similar growth paths and that is why they are at the same level and composition of certification and validation elements and they have similar occupational and educational structures.

Elements of validation and certification were based on concrete competence requirements, which serve as clearly defined and agreed reference points (Cedefop, 2009) for building curricula and for assessing the gained competences. The requirements were based on the available in each partners' country such as occupational standards, profile of a person providing training; competence/ qualification standards, description of learning outcomes (knowledge, skills and competences). Therefore, for each of these modules, verification criteria were assigned to each different part of the module, and horizontally for all different methods of teaching employed which were determined based on data and feedback gathered from respective national reports, within IO2 project result „Competence profile for Waste management specialist"

In more specific the methodology developed and applied was based on the verification criteria and respective requirements set in IO2 which were, followinghly adjusted to the framework of procedures of the certification (by leading international accreditation organizations) of the competences of personnel, within the framework of the ISO/IEC 17024 standard, which refers to the personnel certification process, worldwide.

The methodology was focused on the procedures for community certification of the competences of personnel based on the requirements of the ISO/IEC 17024 standard which was designed to harmonise the personnel certification process worldwide.

3.6 ENSURING COMPETENCY AND PROFESSIONALISM IN ENCOURAGE PROJECT

The contemporary concept of a specialist and emphasis on professional competence, resulting in ensured reliability, safety, and accountability of actions, are gaining more and more importance in the area of protection and management of the environment. The professions specializing in environmental protection are charged with significant responsibilities in terms of nature, safe living conditions, and sustainable development of society. Waste management is one of the crucial areas where mistakes and unpredictability must be avoided, and all risks need to be minimized. Various specialists are directly engaged in waste management, and others deal with this area in the broader context of environmental protection, quality of human living conditions, ecological safety of economic development, etc.

It is possible to say that none of the existing certification systems in the area of waste management is a generally recognized and absolutely satisfactory solution meeting current requirements and expectations. The presence of a number of such systems all over the world shows that a need exists for well-established and transparent procedures of certifying specialists both on a national and international scale. In the modern world, the trans-border movement of waste and participation of enterprises in international economic cooperation are pretty common phenomena. This requires interaction of specialists who have clearly formulated levels of competence and professional qualities that ensure the high quality of their actions. In continued education theory, the provision of specialized courses in professional development and adult training is also positively viewed with qualified, certified teachers.