

# DELIVERABLES 2.1 Report of Selected Educational Products

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# ABSTRACT

As a part of Work Package 2 (WP2), the deliverable 2.1 report has been done to provide information on the curriculum developed, bringing together the best educational products, at Bachelor's and Master's levels, in the field of sustainable solid waste management, with the aim of filling the gaps identified in the Asian partner countries.

Following the completion of the WP1, the consortium was able to develop the best educational products and create the structure of the modules on sustainable solid waste management and policies, through the successful cases in EU Higher Education Institutions (HEIs). They were able to identify their industrial gaps and develop educational products to cultivate experts able to provide solutions and effectively close the identify gaps.

The present report describes the lecture selection process and contains a complete list with detailed description of all selected academic modules in terms of optimal didactical approach, prerequisites, learning contents, and learning outcomes.

# **KEYWORDS**

Academic modules, syllabus, Bachelor's Degree, Master's Degree, practical course, problembased learning

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### ABBREVIATIONS

CMU: Chiang Mai University HEIs: Higher Education Institutions HUAF: Hue University of Agriculture and Forestry MBT: Mechanical-Biological-Treatment MJU: Maejo University MFA: Material Flow Analysis LCA: Life Cycle Assessment POLIBA: Polytechnic University of Bari RUA: Royal University of Agriculture TUAF: Thai Nguyen University of Agriculture and Forestry USHT: University of Heng Samrin Thbongkhmum WEEE: Waste Electrical and Electronic Equipment WtE: Waste-to-Energy

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# SELECTED MATERIAL PROCEDURE

Based on the results of the deliverable D1.1 from the WP1, and following a conducted survey of Universities and Stakeholders in the Asian partner countries (Cambodia, Thailand, Vietnam), by Thai Nguyen University of Agriculture and Forestry (TUAF), it was pointed out that there is lack of cooperation between Universities and Stakeholders and there are not many specific and well-developed programmes/curricula/ courses and research projects in the sector of solid waste management.

The Sustainable Solid WAste Management and Policies (SWAP) project aims to increase the capacity for employees by improving the quality of training in this field in higher education and vocational institutions.

To achieve this goal, it aspired to design and develop new modules or upgrade existing modules, at Bachelor and Master Level. Creating modules requires a lot of work, time and must be carefully planned to cover all the topics and provide appropriate information to students.

The educational products developed are ccountry-specific, taking into consideration the local specificities of each University involved and the relevant regulatory framework.

During the workshop in Vietnam and Cambodia, the structure of these educational products and the level of expertise was defined in close cooperation among the Asian and European partners, taking into accounts the needs and gaps identified through the results of the survey. Using the method of brainstorming, a productive discussion was initiated, with exchange of expertise and best practices. Consequently, the structure of the modules was created, with the aid of partners' exprerience and educational background.

Considering the need for Universities to be more proactive and the Stakeholders' proposals, that more practical training and application of technology is needed, as well as providing knowledge about the life cycle and processes of waste treatments, they led to the creation of the syllabus. The consortium decided to plan four modules, which should be rich and conlolidate, including a wide range of relevant topics, helping to give an overview of the subject initially and more dedicated topics. To this end, it is also important to exchange knowhow, practical examples and best practices for the development of new modules or new curricula on sustainable solid waste management and policies.

The curriculum was planned to implement in students at Bachelor' Degree and Master's degree, aiming to improve students' skills on waste management and circular economy, in order to create a strong connection between the university students and the industrial sector, and enable them distribute their knowledge in the working field.

Following the Annex with the four modules, in order to illustrate their structure and learn more information about the content.

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### ANNEX

MODULE TITLE	Introduction to Sustainable Solid Waste Management and Circular Economy	MODULE LEVEL/ECTS	BACHELOR 3 ECTS
MODULE DESCRIPTION	This module, designed for the Bachelor's level, attempts to build the basic knowledge on solid waste management and circular economy, with the lectures focusing on definitions and key terms. It is included several lectures with a wide range of topics.		
LECTURER	POLIBA, TUHH, EUROTRAINING, CMU, MJU, HUAF, TUAF, RUA, UHST, COMPED		
PRE- REQUISITES	NO		
DURATION	Lecture time in total: 45 Hours		
TOTAL STUDENT STUDY	90 hours study time		
DIDACTICAL APPROACH	In person or remotely with the support of power point presentations		
AIMS	The aim of this module is to acquire the knowledge of the basic definitions.		
LEARNING CONTENTS	<ol> <li>Introduction Waste Management and Circular Economy</li> <li>Waste types, streams, characterisation and waste analysis</li> <li>Waste collection, transportation and transfer: collection of mixed waste or of source separated waste, collection logistics, transfer stations; machine park planning.</li> <li>Overview on recyclable waste treatment technologies</li> <li>Biomass (Types, characterization, concepts and technologies)</li> <li>Residual waste treatment and recovery</li> <li>Landfill (Introduction, elements and operation)</li> <li>Landfill (After care)</li> <li>Economic aspects in waste management (costs of collection, equipments, social costs)</li> <li>Waste associated regulations - also Country-specific</li> <li>Environment, safety and health in solid waste management, occupational health</li> </ol>		
LEARNING OUTCOMES	After the completion of the module, stud meaning of the Waste Management and types, and streams and be aware of the V Asian Country. In addition, they should be	ents should be fa Circular Econom Vaste associate r e aware of the in	amiliar with the y, Biomass, Waste regulations in each npacts of solid waste
	management on the environment and he	alth.	

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MODULE TITLE	Secondary raw materials life cycle – A Circular Economy for resources recovery	MODULE LEVEL/ECTS	BACHELOR 3 ECTS
MODULE DESCRIPTION	The second module designed for the Bachelor's level, aims to build the basic knowledge on the circular economy, with the lectures focusing on key terms and practical exercises. It is included several lectures with a wide range of topics.		
LECTURER	POLIBA, TUHH, EUROTRAINING, CMU, MJU, HUAF, TUAF, RUA, UHST, COMPED		
PRE- REQUISITES	NO		
DURATION	Lecture time in total: 45 Hours		
TOTAL STUDENT STUDY TIME	90 hours study time		
DIDACTICAL APPROACH	In person or remotely with the support of power point presentations and practical courses.		
AIMS	The aim of this module is to acquire the knowledge of the basic key terms in circular economy.		
LEARNING CONTENTS	<ol> <li>Treatment of Organic Waste (composting and anerobic)</li> <li>Management of agricultural waste and crop residues</li> <li>Mechanical-Biological-Treatment (MBT)</li> <li>Waste-to-Energy (WtE)</li> <li>Basics Packaging waste (plastics, glass, paper, metal)</li> <li>Waste Electrical and Electronic Equipment (WEEE)</li> <li>Tools for a Circular Economy - Introduction to LCA and MFA tools</li> <li>Practical exercise - WEEE dismantling</li> <li>Practical exercise - Plastic waste uncycling</li> </ol>		
LEARNING OUTCOMES	By the end of the module, students s of organic waste, waste-to-energy, W agricultural waste and crop residues. some WEEEs. WEEE dismantling will components and weights of each WE and, using LCA approach, environme footprint, of each WEEE will be asses and practice how to sort different typ plastic waste.	hould be familia VEEE and the ma Students will be be practiced to o EEE. Value of rec ntal effects, inclused. Furthermon pes of plastic fro	r with the meaning magement of provided with determine cycled materials uding carbon re, they will learn m the mixed

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MODULE TITLE	Technical Aspects of Waste Management (with Problem-based learning approach)	MODULE LEVEL/ECTS	MASTER 3 ECTS
MODULE DESCRIPTION	The third module is designed for the Master's level, attempting to provide knowledge on the technical aspects of waste management, with the lectures focusing on more specific topics and a problem-based learning lecture.		
LECTURER	POLIBA, TUHH, EUROTRAINING, CMI UHST, COMPED	J, MJU, HUAF, T	UAF, RUA,
PRE- REQUISITES	The basic knowledge of the Solid Waste Management		
DURATION	Lecture time in total: 45 Hours		
TOTAL STUDENT STUDY TIME	90 hours study time		
DIDACTICAL APPROACH	In person or remotely with the support of power point presentations and the problem-based learning method.		
AIMS	The aim of this module is to getting the meaning of the lectures acquiring meaning of the lectures acquiring meaning field.	familiar to the su ore specific knov	bject with vledge in the
LEARNING CONTENTS	<ol> <li>Waste Management practice - recap bachelor</li> <li>Packaging Waste (plastics, gl 3. Urban mining (construction 4. Industrial and Hazardous Wast 5. Technology of Thermal wast control - how to design</li> <li>Biological Treatment plant d and composting) – Problem be presented with initial dat characteristics of the waste, and will need to design a bio groups. Supervision of the tec semester.</li> </ol>	es in the region a lass, paper, meta and demolition v aste e treatment and esign (anaerobic based learning à a (composition a available infrast waste treatmen eachers througho	Ind treatment I) vaste, WEEE) Emission digestion students will ind ructure, etc.) t facility in but the
LEARNING OUTCOMES	After the completion of the module, skills on the Solid Waste Manageme in the reality, because during the con opportunity to participate in probler so they will be able to implement the	students should nt by reflecting t urse they will hav n-based learning eir knowledge in	develop their he problems ve the gexperience, the industry.

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		MODULE	MASTER
MODULE TITLE	Advanced Waste Management	LEVEL/ECTS	3 ECTS
	Aspects in a Circular Economy		
MODULE DESCRIPTION	The third module is designed for the	Master's level, a	attempting to
	provide knowledge on the advanced waste management aspects		
	in a Circular Economy, with the lectures focusing on more specific		
	topics and a problem-based learning lecture.		
LECTURER	POLIBA, TUHH, EUROTRAINING, CMU, MJU, HUAF, TUAF, RUA,		
	UHST, COMPED		
PRE- REQUISITES	The basic knowledge of the Solid Waste Management		
DURATION	Lecture time in total: 45 Hours		
TOTAL STUDENT STUDY	90 hours study time		
TIME			
DIDACTICAL APPROACH	In person or remotely with the support of power point		
	presentations and the problem-based learning method.		
AIMS	The aim of this module is to getting f	amiliar to the su	bject with
	meaning of the lectures acquiring mo	ore specific know	vledge in the
	field.		
LEARNING CONTENTS	1. International Regulations, Tr	eaties and Goals	; (SDG) in
	Circular Economy		
	<ol><li>Logistics (concept, strategies</li></ol>	, business mode	ls, operating
	and costs)		
	3. Policies and tools for the Circular Economy (landfill tax,		
	waste hierarchy, EPR, recycli	ng targets and ir	ncentives)
	4. International waste management		
	5. Regulations and Framework conditions in the region		
	6. Problem-based learning: gro	up work to calcu	late and
	design logistics for collection	and treatment	of municipal
	solid waste generated by a c	ity in the region.	
LEARNING OUTCOMES	After the completion of the module,	students should	develop their
	skills on the Solid Waste Managemer	nt by reflecting t	he problems
	in the reality, because during the course they will have the		
	opportunity to participate in problen	n-based learning	experience,
	so they will be able to implement the	eir knowledge in	the academic
	level.		

*Source:* <u>https://www.yumpu.com/en/document/read/35997589/course-outline-template-strathmore-</u> <u>university</u>

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