



SWAP

Sustainable solid WASTE management and Policies

Solid Waste Management in Southeast Asia: What does the industry expect?

Project Acronym	SWAP
Work Package	WP1
Deliverable	D 1.2
Deliverable Lead	P6 - TUAF
Type	Report
Dissemination Level	Public
Contractual delivery date	M4 (15/03/2021 – 14/04/2021)
Actual submission date	14/04/2021
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ABSTRACT

The increasing growth of the waste volumes, and composition has been one of the prominent challenges for Southeast Asian countries. Hence, improving solid waste treatments through capacity building for graduates at higher education and vocational institutions is of necessity. The aim of this report is to summarize the outcomes of the preparatory activities foreseen for tasks 1.3 (stakeholders' specific expectations from graduates' knowledge and skills) and 1.6 (mapping existing University-Enterprises collaborations) of the Work Package 1. To collect data for the University-Enterprises collaborations and stakeholders' expectations from graduate, questionnaires were sent to University partners and stakeholders via emails. The results of the survey showed that at University partners, the collaboration between universities and stakeholders have been established and obtained several results in research and building capacity for staff and students. Most of established agreement types are personal and non-written contacts. To promote the collaboration, Universities need to be more proactive, active through matching the common needs of stakeholders and building long-term strategies for collaboration.

The survey also reveals that stakeholders have medium and high satisfaction of quality of curriculum and student's skill and performance. However, it is expected that more practical training and application of technology should be trained in the solid waste management courses. Also, skills such as lifelong learning, applicability, problem solving and 21st century skills (critical thinking, IT, Communication, Creativity, Teamwork) are also highly suggested for graduates.

KEYWORDS

Solid Waste Management, Southeast Asia, stakeholders, expectations, graduates, universities, enterprises, collaboration

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Co-funded by the
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ACKNOWLEDGEMENT

This document is a deliverable of the SWAP project. This project is co-funded by the Erasmus+ Programme of the European Union under the call for proposals EAC/A02/2019 and carries the project n° 618723-EPP-1-2020-1-DE-EPPKA2-CBHE-JP.



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Abbreviations

CMU: Chiang Mai University
 HUAF: Hue University of Agriculture and Forestry
 MJU: Maejo University
 MOA: memorandum of agreement
 MOU: memorandum of understanding
 RUA: Royal University of Agriculture
 R&D: Research and Development
 USHT: University of Heng Samren Thboun Khmum
 TUAF: Thai Nguyen University of Agriculture and Forestry



1 Introduction

ASEAN countries have a combined population of approximately 674 million people in 2021, which account for 8.5% of the world's population (worldmeters, n.d). The increasing population generates a great pressure on the Municipal Solid Waste (MSW) management in the region. The rapid growth of volumes of waste, and a complex waste composition with new and emerging waste streams is one of the prominent challenges. ASEAN countries have put efforts towards waste management, but, are challenged by various technology, infrastructure, financing, policy, and stakeholder participation issues. These challenges, on the other hand, could be opportunities, if ASEAN countries shift from understanding the 'waste' as 'resource.' With a view to increase capacity for employees in the solid waste management sector, the Sustainable solid WASTE Management and Policies (SWAP) project conducted a survey to Universities and stakeholders in Cambodia, Thailand and Vietnam to explore the existing collaboration in training and research on solid waste management and expectations of the industry to graduates to improve the training quality on this field at higher education and vocational institutions.

The aim of this report is to summarize the outcomes of the preparatory activities foreseen for tasks 1.3 and 1.6 of the Work Package 1. More in detail, the aim of task 1.3 was to inquire private stakeholders for their specific expectations from graduates' knowledge and skills. Task 1.6 aimed at mapping existing University-Enterprises collaborations and assessing current skills gaps.

2 Methods

One questionnaire combining the objectives of tasks 1.3 and 1.6 was created (see Annex 1). To map the collaborations between Universities and stakeholders, we sent the survey to partners in Southeast Asian countries including Chiang Mai University (CMU), Maejo University (MJU) in Thailand, Royal University of Agriculture (RUA), University of Heng Samren Thboun Khmum (UHST) in Cambodia, Thai Nguyen University of Agriculture and Forestry (TNUAF) and Hue University of Agriculture and Forestry (HUAUF) in Vietnam. The questionnaire was also sent via email to stakeholders working in solid waste management in those countries to elaborate the picture of collaboration and get their feedback on what they expect on graduates when they join in the solid waste industry.

Survey was conducted from 10 March to 5th May 2021. The outputs of this analysis would inform the needs of improvement of the existing curricula in the Universities to meet the industrial requirement in the field of solid waste management. Data was synthesized and analyzed in an Excel sheet.



3 Results

The survey for Universities received 5 responses from University Partners (CMU, MJU, RUA, USTH, HUAF and TUAF). The total of stakeholders' responses are 25, in which stakeholders were sent by CMU is 4, MJU is 6, RUA is 5, HUAF is 5 and TUAF is 5.

3.1 Mapping the collaboration between Universities and Stakeholders

3.1.1 Universities' responses

Table 1 shows that currently the collaborations established between University Partners and stakeholders are still limited and mainly refer to personal contacts (17) or non-written contacts (4). Only few MOA (3) or MOU (1) were signed between two sides. More collaboration was established with private sector than with the state sector. Notably, most of the established types of collaborations are lifelong learning and collaboration in R&D. In RUA, HUAF and TUAF, the collaborations are also for curriculum development and delivery, commercialization of R&D results and entrepreneurship. No collaboration for governance has been established.



Table 1. Information of collaboration.

University Partners	Types of agreement	No.	Sector	Name of stakeholder		Type of collaboration							
						Curriculum development and delivery	Lifelong learning	Student mobility	Academic mobility	Commercialization of R&D results	Collaboration in R&D	Entrepreneurship	Governance
CMU	MoU	1	Private sector	Ban Integrated Waste Management Center	Tan		X						
	Non-written contracts	2	State sector	Regional Environmental Office 1			X				X		
			Private sector	KKP Recycle Company			X			X	X		
	Personal contacts	1	State sector	Suthep Sub-district, Mueang District, Chiang Mai, Thailand			X						
MJU	Personal contacts	5	Other	Rattana Junkhum			X				X		
				Jun Singhalea			X				X		
				Utairat Singhaleaw			X				X		
				Duengduan Maijundang			X				X		

[illegible]



Among the surveyed universities, University of Heng Samren Thboun Khmum (UHST) has no answer for the collaboration since the University is newly established (2016) and have not had any collaboration with stakeholders in this specific field.

The survey also showed that most of University partners expect knowledge exchange/ innovation (83%) with stakeholders when establish the collaboration. Besides, securing labour supply/ enhancing employability, building contacts, entrepreneurial skills/attitudes and staff retention/upskilling are also other main motivations (67%) of universities to set up collaboration with stakeholders. Improving pedagogy, institutional modernisation and attract students are less concerned in the collaboration purpose with only 33%.

Table 2. Purposes of collaboration.

Univer sity Partne rs	Secure labour supply/ enhance employab ility	Knowle dge exchang e/ innovati on	Build contac ts	Entreprene urial skills/attitud es	Pedagogi c developm ent	Raise profile/ brand	Staff retenti on/ upskilli ng	Institutio nal moderniz- ation	Attract students
CMU	x	x	x		x	x	x		
MJU		x		x					
RUA	x	x	x	x			x	x	
HUAF	x	x	x	x			x	x	x
TUAF	x	x	x	x	x	x	x		x

The collaboration with stakeholders in solid waste management has achieved positive results. 125 students at RUA, HUAF and TUAF had opportunities to be trained in the enterprises and state agencies. 35 researchers were exchanged between university and the stakeholders, 17 join research projects were conducted and 9 programmes/curricula developed. Particularly, at TUAF, members of stakeholders joined in the board of university and vice versa.



Table 3. Results of collaboration.

Univers ity Partners	Number of programmes /curricula developed in cooperation with the stakeholder	Number of researcher exchanges between university and the stakeholders	Number of student trained in the stakehold ers	Number of value of collabor ative research projects	Number of joint publicati ons	Number of entreprene rship courses to students and researcher s in university	Number of business/gov ernment actors on the board of university	Number of academic s on the boards of firm
CMU				2				
MJU	5	2		2				
RUA			10	1	3	2		
HUAF		3	15	2				
TUAF	4	30	100	10	8	4	5	2

Universities also shared many challenges in collaboration as well as plans to develop collaboration with stakeholders. Of which, challenges in understanding and meeting the expectation of two sides was mentioned by CMU, RUA, USHT and HUAF. While Universities look for opportunities in training, enterprises are interested in benefits. Besides, challenges in financial, human resources and technical limitation also were stated by partners. Policies that support the collaboration should also be improved. To strengthen and promote collaboration with stakeholders in solid waste management in the future, some suggestions have been made such as increasing the dialogue with different stakeholders to achieve final goals (HUAF), clarify roles, elements of collaboration such as purpose, objective, timeline, resource constraints (USHT). Establishing a center to provide consultant service for stakeholders was also proposed to extend collaboration (RUA, MJU).



Table 4. Challenges and plans for expanding collaboration.

Name	Challenges in collaboration	Plans for expanding collaboration with stakeholders
CMU	<p>The university needs to really know and makes sure that it can deliver what the stakeholders are expecting from the collaboration. Some stakeholders, especially the private sectors, want to achieve the goal within the short period of time. This can be very challenging for the university as the systems and rules of most university, particularly the state university, do not support the quick-win scenario.</p> <p>There are still some technical and, quite often, financial limitations regarding solid waste management in Thailand. These two factors can be a huge constraint for the collaboration between universities and stakeholders.</p>	<p>As energy and environment has become one of the areas that Chiang Mai University emphasizes for both research and academic service aspects, collaboration with stakeholders in the solid waste management will be very high in the agenda. CMU will continue to support the collaboration with the promising stakeholders as it has been doing for some time.</p>
MJU	<p>Stakeholder expectation towards training and workshop or research development; Communication between university and Stakeholder</p>	<p>- University is planning to develop research and service hub to the surrounding communities in order to develop sustainable development in communities including solid waste management</p>
RUA	<p>There are a few challenges that need to be addressed. First, the scope of work is beyond curricular activities, requiring the faculty staff to visit farms or factories very often. Secondly, working with commercial farms and factories is not easy because they are interested in making a profit more than collaboration to enhance knowledge. Thirdly, it is difficult to connect with biogas suppliers to install biogas systems since there are not many available locally</p>	<p>The faculty plans to run a centre to provide consultant service by extending collaboration with pig farms and cassava starch factories in Cambodia to install biogas systems for effective waste management. Besides that, the collaboration will be extended to the General Directorate of Animal Health and Production and other NGOs that are willing to work on waste management.</p> <p>As the faculty we are very happy to collaborate with stakeholders related to the waste management in order the students to have chance to learn and</p>



gain more experiences on the real practice in the waste management.

USHT	<p>Divergent version and interest: different objective, interest, ideology cause tension cross sector and stakeholders. The vision of some stakeholder that do not much empathize with education.</p> <ul style="list-style-type: none"> - Insufficient funding and personal: lack of funding source and small size of facilitation team make it impossible for team to work more in education field. - Inadequate planning and project management also help back like lack of continuity of programs and projects, lack of funding and personnel, and differences in time frames across sectors were perceived as severe challenges for carrying out place-based sustainability projects. - Inadequate organization among stakeholders: a lack of clarity regarding objectives and responsibilities, to unbalanced participation and leadership, and to a lack of credibility among stakeholders. - Problems of communication and lack of information were present from the initial phase of delimiting common objectives and goals, to the stage of dissemination of results such as communication was challenged by manifold factors, including a lack of understanding of the local social and ecological. - Challenges reflecting structural conditions 	<p>Determine all key stakeholders.</p> <ul style="list-style-type: none"> - Establish clear role - Identify the basic element: purpose, objective, timeline, resource constraints ... - Develop concept: start by establishing the basic, identify any content activities, start developing that content. <p>Getting organized: establishing a strategic planning task force, committing the resources necessary to support the process, and communicating the importance of the planning effort.</p> <ul style="list-style-type: none"> - Data gathering and engagement: face-to-face interaction, discussion, and dialogue with stakeholders all play a role during this stage of the planning task force's work. - Making sense of the issues: based on the information gathered, the task force identifies several major strategic themes and develops a concept paper for each one. - Vision conference: highly interactive, one-day meeting brings together stakeholders to discuss the concept papers.
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	refer to socio-political, economic and territorial conditions in solid waste take place.	- Goals conference: with input from key stakeholders, the planning task force creates a set of goals for each of the strategic themes explored during the vision conference.
	lack of understanding stakeholders' action/behavior that have a role in the waste management process - lack of technician for analyze to the factors influencing the performance of waste management - Lack of communication with stakeholder - the lack of understanding over a diversity of factors that affect the different stages of waste management and linkages necessary to enable the entire handling system functioning.	Create strategy planning of solid waste management for university - Building capacity for staffs and lectures that relate solid wash management - Made the projects and curriculum that related to solid wash management for attractive to stockholders - Increase collaboration with community and made more activities about clean and wash management - Expand understanding the conception of stakeholders' action/behavior that have a role in the waste management process
HUAF	– It requires research or training products with high applicability – It takes a lot of time to understand each other – Finance limitation	– Improving close collaboration between stakeholders and university/faculty/individual – Always exchanging ideas with different stakeholders to achieve final goals
TUAF	– Lack of financial sources; – Human resources between the two parties; – State policies do not fully support	– Continue to strengthen and expand cooperation with stakeholders; – Strengthening the capacity of officials and researchers of the two parties; – To look for the financial sources from others sides.



3.1.2 Stakeholders' responses

Responses from stakeholders also confirmed that the collaboration currently between Universities and Stakeholders are still limited in quantity and most of collaboration were established by personal and non-written contacts. According to the stakeholders, results achieved the collaboration also mainly in Programmes/curricula/courses developed and research projects (Table 5).



Table 5. Stakeholders' responses on collaboration between Universities and stakeholders.

University Partners	Name of stakeholder	Type of organization	University-Enterprise collaboration	Type of agreements	Number of agreements	Name of partners	Results of collaboration					
							Programmes/curricula/courses developed	Research projects	Staffs retention/upskilling by collaborated universities	Number of business/government actors on the board of university	Implementing project	Entrepreneurship courses for universities
CMU	Ban Tan Integrated Waste Management Center	Private economic state	Yes	MOUs	1	Energy Technology for Environment Research Center (ETE), CMU		1 (ongoing research)			1 (Biogas Network Project)	
			Yes	MOA	1	CMU		1 (ongoing research)				
	Regional Environmental Office	State management	Yes	Non-written contracts	1	CMU		1 (ongoing research)				
	KKP Recycle Company	Private economic state	Yes	Non-written contracts	1	CMU		1				
	Suthep Sub-district Municipality	State management	Yes	Personal contacts	1	Energy Research and Development Institute, CMU			1 (by attending the seminar)			
MJU	Rattana Junkhum	non-profit organization	Yes				2	1				
	Jun Singhaleaw	non-profit organization	Yes				2	1				
	Utairat Singhaleaw	non-profit organization	Yes				2	1				
	Duengduan Maijundang	non-profit organization	Yes				1	1				



	Prem Prugtayanon Panomtein	Private company	Yes					1		
		Government	Yes			1	1			
RUA	NGO Forum on Cambodia	non-profit organization	No							
	Cambodian Rural Development Team (CRDT)	non-profit organization	No							
	Community Sanitation and Recycling Organization (CSARO)	non-profit organization	Yes	MOUs	3				3	
			Yes	Non-written contracts	1					
	Smartbin Cambodia	Private company	No							
	Thean Sengcheng	Private company	No							
TUAF	Hanoi Urban Environment Company	Joint stock	No							
	EJC Joint Stock Company	Private company	Yes	MOA	2	TUAF		15	4	3
			Yes	Non-written contracts	1	International School, Thai Nguyen University				
	ECO Environmental Company	and joint stock	Yes	Personal contacts	2	TUAF, Bac Giang University of Agriculture and Forestry				



	Environment and Urban Works Joint Stock DIVACO Company	Joint stock Private company	Yes			
			Yes	MOA	3	Hanoi University of Technology, Nguyen Tat Thanh University, TUAF
			Yes	Non-written contracts	3	Vinh University, University of Environment and Natural Resources, Van Lang University
HUAF	Quang Nam province Urban Environment Joint Stock Company	State-owned company	Yes	Non-written contracts	2	Danang University of Science and Technology, University of Agriculture and Forestry
	ESOTECH Technology Joint Stock Company	Private company	Yes	Non-written contracts	2	Ha Noi University of Science and Technology, HUAF
	Hue EB Environment Energy Company Co., Ltd	Private company	Yes	Non-written contracts	1	Hue Institute of Environment and Natural Resources
			Yes	Personal contacts	1	Hue University of Science
	Dong ha Urban environment and public	State-owned company	Yes	Non-written contracts	2	Institute of Environment and Science, Ha Noi



works Joint Stock Company					University of Science and Technology	
		Yes	Personal contacts	1	HUAF	
Hue Urban environment and public works State Company	State- owned company	Yes	MOU	1	Hue Institute of Environment and Natural Resources	
		Yes	Personal contacts	1	Hue University of Science and Technology	3



Most of stakeholders in Thailand agreed that having collaboration with universities is useful for the research and development to reduce solid waste management into the environment, also increasing the good image for the university. However, to develop the collaboration, universities should be taking a lead role to mobilize and coordinate multi-stakeholders to collaborate in joint study (stakeholders from Cambodia) and be proactive, creative in finding the link between stakeholders and Universities in training, research and employability for students (stakeholders from Vietnam, Cambodia). Also, it is suggested that there should be a waste management course at the university level where the students graduate with their skills and knowledge on waste management (stakeholders from Cambodia).

Table 6. Stakeholders' comments for promoting collaboration.

University Partner	Solutions to promote collaboration	Comments for future development
CMU	Having collaboration with universities is useful for the research and development to find the suitable and environmentally friendly way for solid waste management. The solution obtained is appropriate for the site, economical and tackles the root cause of the problem. Moreover, it can also create the added value from solid waste management and sustainability.	The outcome of the collaboration should be applicable to the business and create the management methods that are involved by several sectors. The ultimate goal is to achieve the sustainable and compatible ways of solid waste management for Chiang Mai and proximity.
	The advantage is to have a chance for exchanging idea and perspective of environmental technology and management.	The outcome should suit mission of involved parties. In case of that for the Regional Environmental Office 1, the outcome is to achieve the suitable technology and design for the solid waste management of small municipalities and districts.
	It is useful to have collaborations with universities as it helps to promote the recycle activities for recyclable components. Involved sectors can have more income from wastes. This activity also helps to reduce the total amount of CMU's solid waste, build the good image for the university and be a good exemplar to the student.	The PR and information dissemination of the collaboration activities should be promoted and done appropriately. For example, the recycle activity should be distributed to university staff and students in the forms that are easy to understand and applicable, e.g. via the social media. This will help to raise people awareness and the benefit of solid waste recycle to the involved



parties resulting from the correct
practice of solid waste management

The advantage is to have the hands-on experience in observing facilities and operations of the Biomass Management Centre of Chiang Mai University with the potential to create further collaboration. However, the process of having further collaboration is still not materialized.

The collaboration should aim to enable each sub-district to have the proper solid waste management (theoretically and practically). One possible way is for CMU to accept organic waste from some sub-districts in its proximity to process at the Biomass Management Centre.

MJU	Promote more activities/public relations and staff to do projects with local communities	Inventor development; Entrepreneurship
RUA	The university should be taking a lead role to mobilize / coordination multi-stakeholders to join study / think tank and use the result of research for influencing change in policy development and effective monitor the implementation	Develop curriculum on waste management with linking to other industry needs in terms of waste management sector. Also, TVET should be improved and provided more quality and continuing education at the local level.
	As the university curriculum is very busy, I don't think we can integrate the waste management topic into their curriculum, what we can do is to organize workshop at any specific time (may be once or twice a year) by personal contact with University Director.	



Personally, I would suggest to have waste management course at the university level where the students graduate with their skills and knowledge on waste management i.e. BSc or MSc in Engineering on waste management. Then, the university offered job opportunities through promoting collaboration with local or international NGOs, private companies working in the area of waste management.

The university should offer curriculum related to waste management at the university level. As people know that most of the work done by the local and international NGOs, private company and other consulting team in this area. We would also need the strong collaboration with the university graduate to have commitment working on waste management. Currently, we do not have more people working on the waste sector, particularly the university.

Opportunity in joining research projects shall be properly providing to private sectors; Join training and workshop.

TUAF

Collaboration with Universities help private companies can recruit staffs and also contribute to train students who have practical knowledge and skills; - Organize more meetings, conferences between Universities and Enterprises; - Sharing research results to Enterprises apply in practice.

Currently, the need for the collaboration has not been clearly recognized from the company. The Universities must be creative and active in how to develop the collaboration; Companies are often very busy and lack of staffs to train for students to do internship/practice in the company.



HUAF	<p>There are lots of advantages in collaboration between university and enterprise since it meet the needs of too sides and support for training and labor market needs, update new knowledge and transfer of research from the laboratory to reality.</p> <p>However, to make the collaboration work it requires a lot of time and financial resources.</p>	<p>There should be a short, medium and long term cooperation plan between the university and private sector.</p> <p>Develop internship program for students.</p> <p>Share research in solid waste management.</p> <p>More research is needed on solid waste management and treatment.</p> <p>Generate revenue for the two sides to cooperate in research and development, training.</p> <p>Need more topics and projects to support in-depth research on solid waste management.</p>
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3.2 Stakeholder expectation on graduates' knowledge and skills

The questions number 1 to 9 are the opinion of stakeholder about the curriculum related to solid waste management, while questions number 10-14 are the opinion of stakeholder related to student performances and skills. Red highlights from each column are the lowest score obtained from each partner. The overall result reveals that the satisfaction of quality of curriculum and student's skill and performance are medium)for CMU)3.43(and TUAF)3.41(and high)for MJU)3.68(and RUA)3.81()Table 7(. However, the finding shows that the stakeholders agree that curriculum on solid waste management program has relevant theory or practical activities for employability, meets the need of industry/ company/community. The curriculum also covers some contemporary topics/global issues/community issues/emerging global and national trends in waste management/environment and sustainability. However, some points are still missing and needs to be fulfilled. In terms of student's skill and performance, it was found that majority of lowest score have been found from all partners. This means that graduates' knowledge and skills need to be improved. Important skills such as lifelong learning, applicability, problem solving and 21st century skills)critical thinking, IT, Communication, Creativity, Teamwork(are required. There are some comments regarding to courses and vocational training for future development)Table 8(and suggestion for student skill development.



Table 7. Satisfaction of stakeholder towards academic and non-academic level of preparation of graduates that should be employed in the sector of solid waste management.

Note: Scale: 1-strongly disagree, 2-disagree, 3-Neither agree nor Disagree, 4-Agree, 5-Strongly agree

0-1.5 least 1.5-2.5 less 1.51-3.50 medium 3.51- 4.5 high 4.51-5.0 highest

No	Statements	CMU	MJU	RUA and COMPED	TUAF	HUAF
1	A curriculum on solid waste management program is relevant for employability	3.5 Medium	3.71 High	4.6 Highest	3.0 Medium	4.2 High
2	The contents of the curriculum meet the need of industry/company/community and help in building efficiency and effectiveness of organization	3.5 Medium	4.0 High	4.6 Highest	3.2 Medium	3.2 Medium
3	The institute curriculum has application based courses that meets the need industry/company/community in terms of knowledge, skills, attitude and innovation	3.3 Medium	3.8 High	3.6 High	3.2 Medium	4.4 High
4	The institute curriculum has enrich content which fulfils the expectation of industry/company/community	3.5 Medium	3.71 High	4.0 High	2.8 Medium	4.2 High
5	The institute curriculum has practical training or activities	3.3 Medium	3.8 High	3.3 Medium	3.4 Medium	4.8 Highest
6	The curriculum adequately covers contemporary topics/global	3.8 High	3.8 High	3.6 High	3.0 Medium	3.6 High



	issues/community issues/emerging global and national trends in waste management/environment and sustainability					
7	The institute curriculum helps in building environmental awareness and motives to students	3.2 Medium	3.71 High	4.0 High	3.4 Medium	4.6 Highest
8	The institute curriculum bridges the gap between industry/community and academic	3.2 Medium	3.57 High	3.6 High	3.4 Medium	4.2 High
9	The curriculum alignment with global universities ensures that international best practices	3.5 Medium	3.43 Medium	4.3 High	3.4 Medium	4.4 High
10	Graduates' knowledge and skills reflect exactly what is needed in the sector	3.2 Medium	3.57 High	4.0 High	3.4 Medium	3.4 Medium
11	Graduates has the ability to retain knowledge long term and lifelong learning	3.8 High	3.8 High	3.3 Medium	3.6 High	3.2 Medium
12	Graduates has the ability to perceive relations between old knowledge and new and applicability	3.5 Medium	3.43 Medium	3.3 Medium	4 High	3.2 Medium
13	Graduates has the ability to apply one's knowledge to solve problem	3.2 Medium	3.71 High	3.6 High	4 High	3.8 High
14	Graduates has 21 st century skills)critical thinking, IT,	3.5 Medium	3.29 Medium	3.6 High	4 High	4 High



	Communication, Creativity, Teamwork(
Overall score		3.43	3.68	3.81	3.41	3.94
Scale		Medium	High	High	Medium	High

Table 8. Comments for future development on courses and training.

Partners	Suggestions for Courses and vocational training
CMU	<p>-Solid waste management subject that emphasizes on the integration of all related sectors. The students need to be able to analyze and prioritize problems in order to identify the root cause and solution for the problems. One of the main obstacles at the moment is that each related sector still works only within its responsibility. There is the strong need for the “person” who can link all requirements of pertinent sectors so that the new solution or perception could be created.</p> <p>- If attendees are policy makers or senior level, Economics is necessary. The waste management policies e.g. recycling schemes, circular economy through EPR program)Extended producer responsibilities(are enormously relevant to public, the decision maker, policy maker, NGOs, and others shall understand the impact on the economics.</p> <p>-If attendees are junior or operation level, trend in waste management e.g. circular economy, EPR, shall be taken into consideration.</p> <ul style="list-style-type: none"> - recycling technologies)towards circular economy(, treatment & disposal technologies, and public policies. - Community psychology in order to be able to analyze and interpret the real requirement of people in the community. - Practical from case studies -people awareness and community participation - innovative waste management technology - waste separation for up-cycling/recycling of MSW/waste free society - life cycle of solid waste/basic knowledge of Waste compositions and waste categories - student should be trained to be able to separate the household waste and categories the waste at source - visit commercial waste separation plant and waste management company would benefit to the student. - Waste transformation such as waste to energy



MJU	<ul style="list-style-type: none"> - E-waste management and safety/ technology and control/case studies from neighboring countries /international scale - Hazardous waste management /technology and control/ case studies from neighboring countries /international scale - Waste recovery/technology and control - Practical training on recycle - Circular economy and case studies - Entrepreneur related to value-added product from waste - Inventor development
RUA and COMPED	<ul style="list-style-type: none"> - knowledge on waste management in global context as well as local context including challenges, what are the causes; impacts; existing law and regulation relating to waste management; types of waste, its flows and management up to final disposal as well as other principles such as 3Rs or waste separation at sources; and waste recycling, esp. organic waste and plastic waste. - climate change and how waste manage can contribute to GHG emission reduction with the introduction of GHG emission calculation or estimation. - Case studies locally or from neighboring countries with success or failure stories. - Real practice and relevant qualification standards - Continue to upgrade the current program to meets the technology. - Internship to the student. - Negative impact of unmanaged waste to social and environment - Basic knowledge on waste management like how to separate waste by type)example: organic waste, plastic bag, plastic bottle, glass bottle, aluminum can, etc,..(and what recycling activity that we can do with each type. - Waste recovery
TUAF	<ul style="list-style-type: none"> - technology and skills in solid waste treatment - Practical skills - Waste management and engineering / focus on training. -Technology courses and designing waste system with more practical .
HUAF	<ul style="list-style-type: none"> -Knowledge on environment and global sustainable development; new technologies in solid waste and wastewater process -Global and national tendency on solid waste management - Municipal waste separation - Technologies on solid waste management to meet the social demands - Municipal solid waste collection and treatment



4 Conclusion

The survey showed that the collaboration between universities and stakeholders have been established and achieved some positive results in training, research as well as building capacity for staff and students. However, most of current collaboration are personal and non-written contacts which less commitment and long-term collaboration strategies. Therefore, it is necessary for Universities to be proactive, active and take the main role in promoting the collaboration through matching the common needs between sides and build long-term strategies for collaboration.

Stakeholders also reveals their medium and high satisfaction of quality of curriculum and student's skill and performance. However, more practical training and application of technology should be added in the solid waste management courses. Learning life cycle and processes of waste treatment also be proposed by stakeholders. Also, graduates are required to improve more skills such as lifelong learning, applicability, problem solving and 21st century skills)critical thinking, IT, Communication, Creativity, Teamwork(.

References

Jain, Amit (2017). Summary report: Waste Management In Asean Countries. United Nations Environment Programme
Worldmeters, n.d. Southeast Asian population in 2021. Accessed on 14 May 2021, available at <https://www.worldometers.info/>



Annexes

Questionnaire for mapping current University-Enterprises collaborations (For universities)

I. GENERAL INFORMATION OF THE RESPONDENT AND THE UNIVERSITY

1. **Gender:** Male ☐ Female ☐

2. **Position:**

International Affair /Academic Affair staff

Faculty manager

Researcher

Lecturer

3. **Name of University:**

4. **Year of established:**

5. **Type of University:**

State University ☐

Private University ☐

6. **Number of students:**

7. **Number of lecturers and staffs:**

8. **Do your University have a waste management course/program?**

Yes ☐

No ☐

9. **Name of training programs have waste management course**

Bachelor: _____ Number of students _____

Master: _____ Number of students _____

Doctoral: _____ Number of students _____

Others: _____ Number of students _____

10. **Number of staff are teaching/researching in waste management:**

II. UNIVERSITY-ENTERPRISE COLLABORATION

1. **Do your University have collaboration with enterprise, state bodies, local NGOs (stakeholders) in waste management?**



Yes ☐

No ☐

2. If yes, what is the purpose of collaboration

Secure labour supply/ enhance employability ☐

Knowledge exchange/innovation ☐

Build contacts ☐

Entrepreneurial skills/attitudes ☐

Pedagogic development ☐

Raise profile/brand ☐

Staff retention/upskilling ☐

Institutional modernisation ☐

Attract students ☐

3. Please list active agreements with waste management stakeholders that the university/ you established in solid waste management

Collaborated stakeholder 1 (repeat questions to add as many stakeholders as respondents want)

- Name of stakeholder:

- Sector:

Private sector ☐

State sector ☐

Other ☐

- Address:

- Type of agreement:

MoUs ☐

MOA ☐

Non-written contracts ☐



Personal contacts

☐

- Year of agreement:

- Type of cooperation

Curriculum development and delivery ☐

Lifelong learning (developing additional skills, knowledge or attitudes) ☐

Student mobility ☐

Academic mobility ☐

Commercialization of R&D results ☐

Collaboration in R&D ☐

Entrepreneur-ship ☐

Governance ☐

Collaborated stakeholder 2

- Name of stakeholder:

- Sector:

Private sector ☐

State sector ☐

Other ☐

- Address:

- Type of agreement:

MoUs ☐

MOA ☐

Non-written contracts ☐

Personal contacts ☐

- Year of agreement:

- Type of cooperation

Curriculum development and delivery ☐



- Lifelong learning (developing additional skills, knowledge or attitudes) ☐
- Student mobility ☐
- Academic mobility ☐
- Commercialization of R&D results ☐
- Collaboration in R&D ☐
- Entrepreneur-ship ☐
- Governance ☐

Collaborated stakeholder 3

- Name of stakeholder:

- Sector:

Private sector ☐

State sector ☐

Other ☐

- Address:

- Type of agreement:

MoUs ☐

MOA ☐

Non-written contracts ☐

Personal contacts ☐

- Year of agreement:

- Type of cooperation

Curriculum development and delivery ☐

Lifelong learning (developing additional skills, knowledge or attitudes) ☐

Student mobility ☐

Academic mobility ☐



- Commercialization of R&D results ☐
- Collaboration in R&D ☐
- Entrepreneur-ship ☐
- Governance ☐

Collaborated stakeholder 4

- Name of stakeholder:

- Sector:

Private sector ☐

State sector ☐

Other ☐

- Address:

- Type of agreement:

MoUs ☐

MOA ☐

Non-written contracts ☐

Personal contacts ☐

- Year of agreement:

- Type of cooperation

Curriculum development and delivery ☐

Lifelong learning (developing additional skills, knowledge or attitudes) ☐

Student mobility ☐

Academic mobility ☐

Commercialization of R&D results ☐

Collaboration in R&D ☐

Entrepreneur-ship ☐

Governance ☐



Please repeat questions to add as many stakeholders as you want

4. Please list results obtained from collaboration with stakeholders:

Number of programmes/curricula developed in cooperation with the stakeholders: _____

Number of researcher exchanges between university and the stakeholders: _____

Number of student trained in the stakeholders: _____

Patent applications with the stakeholders: _____

Number and value of collaborative research projects: _____

Number of joint publications: _____

Number of joint inventions: _____

Number of entrepreneurship courses to students and researchers in university: _____

Number of business/government actors on the board of university: _____

Number of academics on the boards of firms: _____

Others:

5. Challenges in collaboration with stakeholders

6. Plans of the university/faculty/individual in expanding collaboration with stakeholders



Questionnaire related to T1.3 and T1.6

The Sustainable Solid Waste Management and Policies (SWAP) project is a building capacity project on solid waste management for the Asian countries with the collaboration with European countries under the fund of Erasmus+ Programme. In order to develop the activities during the project; including training, curriculums and collaborations, we would like to ask your opinions about stakeholder expectation on graduates' knowledge and skills and also lists of active agreements (MoUs, non-written contracts, personal contacts) between waste management stakeholders and Education Institutions. Your responses will be anonymous. If there are items you do not feel comfortable answering, please skip them. We would much appreciate your participation in completing the survey below. Thank you for your cooperation.

Part 1: General information

1. Name of Respondent/company (stakeholder).....
2. Position
☐ CEO ☐ Project manager ☐ Production manager
☐ Quality control, safety, environmental manager ☐ Head of department
☐ Head of community ☐ Other (please specify).....
3. Type of organization
☐ Government ☐ State-owned company ☐ Private company ☐ Public company
☐ non-profit organization ☐ local community ☐ Other (please specify)...

Part 2: Enterprise-Universities existing collaboration

1. Do your organization has collaboration with Universities in terms of solid waste management?
☐ Yes ☐ No
2. Type of cooperation established for solid waste management
Curriculum development and delivery ☐
Lifelong learning (upskills, knowledge or attitudes, training) ☐
Student mobility/ cooperative education ☐
Academic mobility ☐
Commercialization of R&D results ☐
Research and development ☐
Entrepreneurship ☐
Governance ☐



Others (please specify)



3. Please share in detail number of agreements with University that your organization established in terms of solid waste management

Types of agreements	Number of agreements by types	Name of partners
MOUs		
MOA		
Non-written contracts		
Personal contacts		

4. Please list results obtained from collaboration with Universities (no 3):

Types of collaborations	Number
Programmes/curricula /courses developed	
Staffs retention/upskilling by collaborated universities	
Patent applications	
Research projects	
Joint publications	
Inventions	
Business/government actors on the board of university	
Academics on the boards of firms	
Others	

5. What are solutions to promote collaboration between stakeholders and universities?

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Part 3: Satisfaction of stakeholder towards academic and non-academic level of preparation of graduates that should be employed in the sector of Solid waste management.

Please check on the scale with the appropriate response

Scale: 1-strongly disagree, 2-disagree, 3-Neither agree nor Disagree, 4-agree, 5-Strongly agree

no	Statements	1	2	3	4	5
1	A curriculum on solid waste management program is relevant for employability					
2	The contents of the curriculum meets the need of industry/ company/community and help in building efficiency and effectiveness of organization					
3	The institute curriculum has application based courses that meets the need industry/ company/community in terms of knowledge, skills, attitude and innovation					
4	The institute curriculum has enrich content which fulfils the expectation of industry/ company/community					
5	The institute curriculum has practical training or activities					
6	The curriculum adequately covers contemporary topics/global issues/community issues/emerging global and national trends in waste management/environment and sustainability					
7	The institute curriculum helps in building environmental awareness and motives to students					
8	The institute curriculum bridges the gap between industry/community and academic					
9	The curriculum alignment with global universities ensures that international best practices					
10	Graduates knowledge and skills reflect exactly what is needed in the sector					
11	Graduates has the ability to retain knowledge long term and life long learning					
12	Graduates has the ability to perceive relations between old knowledge and new and applicability					
13	Graduates has the ability to apply one's knowledge to solve problem					
14	Graduates has 21 st century skills (critical thinking, IT, Communication, Creativity, Teamwork)					



Part 4: Comments for future development

1. Area of improvement for curriculum development: what do you think should be taught at University level and at vocational training level that is now not taught?

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2. Area of improvement for graduates' skills, performances and achievements: what do you think graduates should learn more/better and what know-how do you expect them to have after they finish their studies?

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