Sustainable solid WAste management and Policies

DELIVERABLE 6.4 SUSTAINABILITY AND EXPLOITATION PLAN

Project Acronym	**SWAP**
Work Package	Work Package 6: Project dissemination and sustainability
Deliverable	Task 6.4: Sustainability and exploitation plan
Deliverable Lead	MJU
Type	Report
Dissemination Level	Confidential
Contractual delivery date	
Actual submission date	31/10/2023
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Versions

Version	Date	Main Author	Summary of updates
V 1.0	31st October 2023	Mujalin Pholchan	Deliverable Task 6.4

Abstract

This WP's primary objective is to raise awareness about the project's existence, key messages, and activities among various stakeholder groups, including public authorities at local, regional, and national levels, private companies, international organizations, NGOs, entrepreneurs, and citizens. Additionally, we intend to share project outcomes with the same target groups and higher national and European authorities. All project partners will contribute to promoting and disseminating project information through their institutional channels and networks. The dissemination efforts aim to provide comprehensive project details, such as its goals, geographic scope, duration, activities, and partner involvement, while also supporting the utilization of project outcomes beyond its duration. This includes expanding Training Hubs to new areas of application and developing future governance models and policies for the sustainable management of solid waste in the region.

. The sustainability of the project will be translated into a "sustainability plan," which will ensure the project's endurance and the persistence of its outcomes beyond the conclusion of the funding period. The higher education institutions (HEIs) from the EU program countries will leverage their extensive experience in identifying and engaging beneficiaries to enhance the effectiveness of exploitation and dissemination activities. This plan will outline the needs and strategies for expanding or sustaining SWAP activities and outcomes after the project's conclusion. The Training Hubs and the Open Online Learning Management System are considered crucial infrastructure elements for achieving this objective. Furthermore, the SWAP website will remain operational even after the project concludes, as it will be hosted on the server platform of Maejo university. The major and non-confidential deliverables and results will be accessible on this website. To continuously enhance the web portal, the website's traffic and engagement will be closely monitored, and any necessary promotional activities will be identified and implemented.

This report provides a comprehensive sustainability plan, encompassing all the strategies, actions, practices, business models, and the identified stakeholders related to

sustainability. The planning of sustainable initiatives was guided by an initial dissemination roadmap. The distinct elements within the sustainability strategy entailed the creation of curricula and courses, Technical and Vocational Education and Training (TVET) courses, short or non-degree courses, establishment of training hubs, the implementation of an online learning management system, Business Model Canvas (BMC), website and social media presence, activities to enhance awareness, and networking efforts.

Keywords

Sustainability and exploitation plan

Disclaimer

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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1. Deliverable of Task 6.4: Sustainability and Exploitation Plan

1.1 Introduction

The Sustainable solid Waste management and Policies (SWAP) project comprises 11 organizations from eight different countries, including four EU countries and four Asian countries. Among the EU partners, TUHH - Technische Universität Hamburg (Hamburg University of Technology (TUHH), Germany; I.F.O.A. - Istituto Formazione Operatori Aziendali, Italy; POLIBA - Politecnico Di Bari, Italy and EUROTraining Educational Organization, Greece possess significant experience in implementing solid waste management and contributing expertise in curricula development, learning design, high-impact research and training for the trainers. The Asian universities involved in this project are HUAF – Hue University of Agriculture and Forestry and TUAF – Thai Nguyen University of Agriculture and Forestry from Vietnam; RUA - Royal University of Agriculture, UHST - University of Heng Samrin Thbongkhmum, and COMPOSTED - Cambodian Education and Waste Management Organisation from Cambodia; CMU - Chiang Mai University and MJU - Maejo University, Maejo University from Thailand. These Asian partners are public and private universities that play essential roles in supplying qualified human resources for solid waste management in their respective countries and contexts. The potential for local sustainability exists, dependent on the adoption of appropriate technology within specific agro-ecological and developing contexts. Therefore, education on waste management plays a pivotal role in preparing professionals, researchers, and extension staff to contribute effectively to sustainable development.

SWAP unites EU and Asian universities and organizations to facilitate the transfer of knowledge and advancements from European Higher Education Institutes (HEIs) to each Asian HEI. It contributes to the enhancement of tertiary-level capacity and provides assistance for training initiatives designed for marginalized informal waste workers. This also enhances entrepreneurship and boosts the employability of university graduates specializing in sustainable solid waste management, thereby facilitating the development of policies that promote high-quality educational resources and tools. Thus, newly developed academic

courses at master and bachelor level, T-VET courses, open Online LMS, Training Hubs and sector-related business models and educational policies for the informal sector are the main achievement of this SWAP project.

1.2 Dissemination goals and road map

The communication goals of work package (WP) 6 align with the overall aims of Sustainable solid Waste management and Policies (SWAP). Dissemination includes the promotion of the project's existence, key messages, public events, and activities to all target groups - public authorities (at the local, regional, and national levels), private capacity building in the field of higher education, companies, international organisation, NGOs, entrepreneurs, and citizens. The dissemination plan includes four pillars: aims and outputs, target audiences, dissemination actions, and tools. The initial communication and dissemination plan as set out in Deliverable Task 6.1 includes detailed information on the strategy that led to the creation of communication tools to reach out to the identified and appropriate target audiences using the most efficient channels available. The intended audiences encompass the youth, public authorities at the local, regional, and national levels, institutions of higher education, businesses, international organizations, non-governmental organizations (NGOs), entrepreneurs, and the general populace. Additionally, the development of communication plans and activities designed to address unforeseen circumstances, such as the challenges posed by the COVID-19 pandemic, is suggested and effectively managed. The underlying principle behind the communication strategy is to formulate an approach that maximizes the awareness of the SWAP project and its accomplishments among the specified target groups while enhancing their comprehension of the significance of sustainable solid waste management. Figure 1 illustrates the project's dissemination plan for the period from 2021 to 2024.

The project dissemination milestones were divided into 3 phases from the year 2021-2024. Phase 1 (year 2021-2022) aims to establish and initiate activities for SWAP promotion. Phase 2 (year 2022-2023) focuses on the process, project and activity improvement, people development, and better communication. Phase 3 (year 2023-2024) aims ensure the project's

sustainability, implementation of activities such as training hubs, future governance models and policies for sustainable management of solid waste in the region),and building and expansion of network and collaborations.

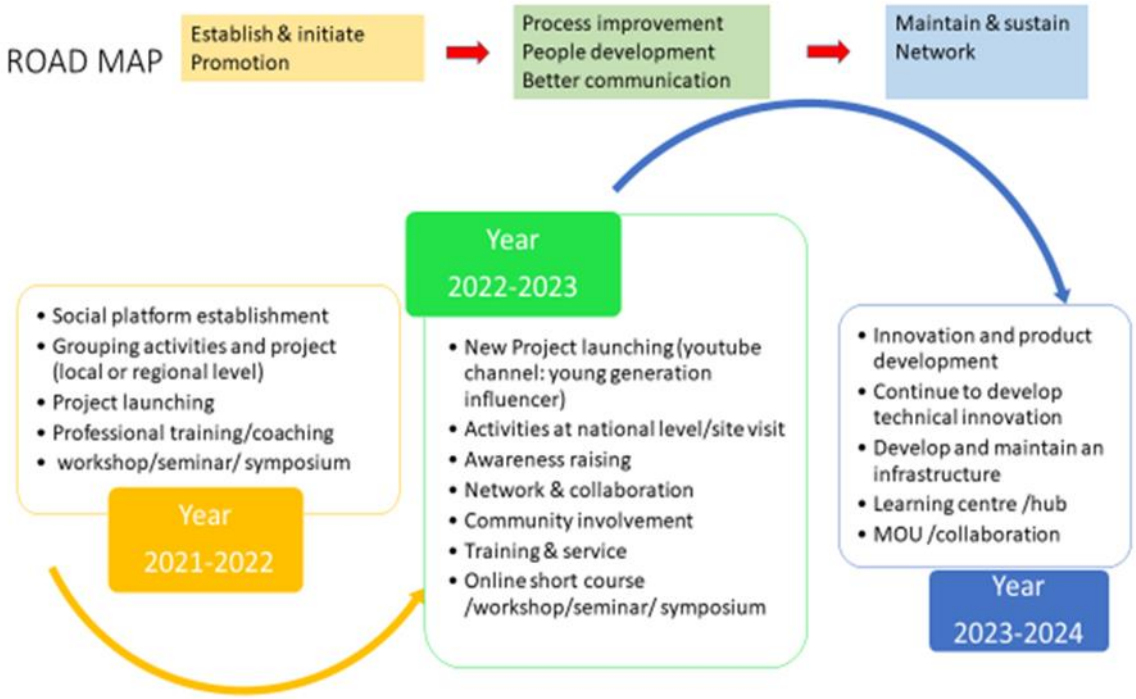


Figure 1: Dissemination Road Map from year 2021-2024

1.3 Target activities of the sustainability and exploitation Plan

During 3 years, all partners developed and implemented academic courses at master level , bachelor level and T-VET level, launched the open online learning management system (HOOU), started the training hubs inauguration related business models and educational policies for the informal sector, organized the public events, raising awareness activities and project dissemination on official website and social platforms. For project sustainability, it is a challenge for each university to maintain and continue these activities. The main target of the exploitation strategy will be:

1) Continuation and further development of the SWAP curriculum and its principal outputs

2) The expansion and development of the established collaboration among European and Asian Higher Education Institutions (HEIs), as well as the engagement of other stakeholders throughout the project

3) Expanding cooperation between HEIs and relevant solid waste and informal workers bussinessess.

4) The exploitation strategy aims to realize the aforementioned objectives within the project's geographic scope and extending beyond it.

The Scope of the exploitation plan includes the project outcomes earmarked for utilization, the specific stakeholders designated for each result, the methodologies for exploiting and ensuring sustainability, as well as gab analysis between these outcomes, the demands and criteria of the stakeholders, and the strategies for realization. To achieve this, each partner outlines their individual exploitation plans to take advantage of the knowledge from project and tangible outcomes. This involves identifying the project's core strengths that can be transformed into a competitive edge and adopting a proactive stance by pinpointing the most appealing avenues for exploitation while also preparing to seize these opportunities. The target groups of the sustainability and exploitation plan are teaching staff, students, trainees, farmers, citizens, local authorities, municipalities, governments, private companies, informal workers and industries. Also, the Level of dissemination are from Department/Faculty, Institution, local, regional, national and international as shown from the picture below.

Academic comminities	Citizens	Business	Cities
•Researchers •Acedemics •Teaching staff •Innovation centre and services	•Community •Young generation	•Industry •Agencies •Private and public organisation/NGOs	•Asian partners •European partners •Stakeholder / policy maker

1.4 Results and achievement of the sustainability of the project

1.4.1 Study program and accreditation

Asian universities developed and implemented the curriculum with educational products for university graduates (master and bachelor levels), vocational trainees and informal workers. These curriculums were all accredited by university authority and continue to be used for teaching students in the field related to solid waste management and improve graduates 'employability. Academic Staff were trained and will be upskill for further update. The curricula, however, continue for update and improvement every 5 years and 3 years for bachelor's degrees and master's degrees, respectively. To understand their needs and preferences for making continuous improvements, feedback from current perspective students and also other stakeholders are gathered. Implementation of SWAP curricula are 1) introduction to sustainable solid waste management and circular economy, 2) secondary raw materials life cycle - A circular economy for resources, 3) technical aspects of waste management and 4) advanced waste management aspects in a circular economy, as shown in picture below. Another strategy for sustainability is to implement an internship program for students within government, private, NGOs, community organizations or other Asian and EU partners university. We already had a student's exchange with CMU – TUHH and going to extend the MoU between MJU-RUA in 2024. These internships will be demonstrated through the signing of a Memorandum of Understanding (MoU) between the university or study program and the respective institution. This is a crucial element in addressing real sustainable solid waste management challenges.

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 TIME	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	1. Introduction Waste Management and Circular Economy 2. Waste types, streams, characterisation and waste analysis 3. Waste collection, transportation and transfer: collection of mixed waste or of source separated waste, collection logistics, transfer stations; machine park planning. 4. Overview on recyclable waste treatment technologies 5. Biomass (Types, characterization, concepts and technologies) 6. Residual waste treatment and recovery 7. Landfill (Introduction, elements and operation) 8. Landfill (After care) 9. Economic aspects in waste management (costs of collection, equipments, social costs...) 10. Waste associated regulations - also Country-specific 11. Environment, safety and health in solid waste management, occupational health		
LEARNING OUTCOMES	After the completion of the module, students should be familiar with the meaning of the Waste Management and Circular Economy, Biomass, Waste types, and streams and be aware of the Waste associate regulations in each Asian Country. In addition, they should be aware of the impacts of solid waste management on the environment and health.		

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	1. Treatment of Organic Waste (composting and anerobic) 2. Management of agricultural waste and crop residues 3. Mechanical-Biological-Treatment (MBT) 4. Waste-to-Energy (WtE) 5. Basics Packaging waste (plastics, glass, paper, metal) 6. Waste Electrical and Electronic Equipment (WEEE) 7. Tools for a Circular Economy - Introduction to LCA and MFA tools 8. Practical exercise - WEEE dismantling 9. Practical exercise - Plastic waste upcycling		
LEARNING OUTCOMES	By the end of the module, students should be familiar with the meaning of organic waste, waste-to-energy, WEEE and the management of agricultural waste and crop residues. Students will be provided with some WEEEs. WEEE dismantling will be practiced to determine components and weights of each WEEE. Value of recycled materials and, using LCA approach, environmental effects, including carbon footprint, of each WEEE will be assessed. Furthermore, they will learn and practice how to sort different types of plastic from the mixed plastic waste.		

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, 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 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 familiar to the subject with meaning of the lectures acquiring more specific knowledge in the field.		
LEARNING CONTENTS	1. Waste Management practices in the region and treatment - recap bachelor 2. Packaging Waste (plastics, glass, paper, metal) 3. Urban mining (construction and demolition waste, WEEE) 4. Industrial and Hazardous Waste 5. Technology of Thermal waste treatment and Emission control - how to design 6. Biological Treatment plant design (anaerobic digestion and composting) – Problem based learning à students will be presented with initial data (composition and characteristics of the waste, available infrastructure, etc.) and will need to design a biowaste treatment facility in groups. Supervision of the teachers throughout the semester.		
LEARNING OUTCOMES	After the completion of the module, students should develop their skills on the Solid Waste Management by reflecting the problems in the reality, because during the course they will have the opportunity to participate in problem-based learning experience, so they will be able to implement their knowledge in the industry.		

MODULE TITLE	Advanced Waste Management Aspects in a Circular Economy	MODULE LEVEL/ECTS	MASTER 3 ECTS
MODULE DESCRIPTION	The third module is designed for the Master's level, 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 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 familiar to the subject with meaning of the lectures acquiring more specific knowledge in the field.		
LEARNING CONTENTS	1. International Regulations, Treaties and Goals (SDG) in Circular Economy 2. Logistics (concept, strategies, business models, operating and costs) 3. Policies and tools for the Circular Economy (landfill tax, waste hierarchy, EPR, recycling targets and incentives) 4. International waste management 5. Regulations and Framework conditions in the region 6. Problem-based learning: group work to calculate and design logistics for collection and treatment of municipal solid waste generated by a city in the region.		
LEARNING OUTCOMES	After the completion of the module, students should develop their skills on the Solid Waste Management by reflecting the problems in the reality, because during the course they will have the opportunity to participate in problem-based learning experience, so they will be able to implement their knowledge in the academic level.		

Target number of student enrollment for Bachelor and Master's degree as follows:

No	Partner	Target number of student				
		2022*	2023	2024	2025	2026
1	HUAF	75	75	75	75	75
2	TUAF	20	20	20	20	20
3	CMU	80	80	80	80	80
4	MJU	40	40	40	40	40
5	RUA	50	50	50	50	50
6	UHST	30	30	30	30	30

*year for course / curriculum implementation

1.4.2 T-VET courses

The 2 T-VET (Vocational Education and Training) courses per Asian partners, total 12 T-VET courses were developed and implemented. The T-VET courses will be stored on HOOU Platforms in both national language and english to attract broader audiens. In 2022 and 2023, One T-VET course of each Asian partners organized and attracted more than 90 professionals from graduates, alumni, local industrial bussinesses/farmers per round.

To address the sustainability aspects of the T-VET courses, including strategies for ensuring their continuity and long-term impact, the collaboration with industry partners to provide employment opportunities for graduates should be considered. The integration of entrepreneurship and business development skills to promote self-employment is also a key factor in sustaining and improving the T-VET course. The number of trainees is also one of the key successes of T-VET course. Good collaboration and capacity building for local training institutions and linkages with relevant government policies can secure ongoing support and achieve the number of participants. Sustaining connections with past participants and gathering data also contributes to maintaining ongoing interactions and encouraging future attendance.

1.5 Exploitation strategy

1.5.1 Maintain the number of student enrolment

Maintaining and increasing student enrolment is an ongoing effort that requires adaptability and responsiveness to changing educational and market dynamics. Universities must continuously assess their strategies and adjust as needed to attract and retain students effectively. It involves a combination of strategies that focus on academic excellence, campus culture, marketing, and student support. Here are some key approaches to consider:

- *Academic Excellence:* Offer high-quality academic programs that meet current market demands and provide engaging and effective teaching with opportunities for research and practical experience regarding waste management. Implement academic advising and mentoring programs to support student success.

- *Diverse Program Offerings:* Offer a diverse range of programs and majors to attract students with varied interests in waste management. This can be done by getting students feedback on the current curriculum and regularly updating it. The expanding program offers to stay relevant in a changing job market.

- *Affordability and Scholarships:* Provide financial aid, scholarships, and tuition assistance to make education more accessible.

- *Effective Marketing and Outreach*: Develop a strong online and offline marketing strategy and engage in community outreach and partnerships with local schools, colleges, and community organizations.

- *International Recruitment or internship:* This will attract international students through targeted recruitment efforts by providing support services for international students, including language programs and cultural integration.

1.5.2 Maintain research and technology advances.

Maintaining research and technology advancement involves several key steps and strategies. This can sustain all knowledge and professional development of lecturers and staff, gain new collaboration, and build more researchers in the waste management area. The sustainability strategy is;

- *Continuous Learning and Training:* Researchers and technology professionals need to stay updated on the latest developments in their respective fields. Attending conferences, workshops, and seminars can provide opportunities for learning and networking.

- *Collaboration and Networking:* Collaborate with peers, experts, and institutions in your field. Exchange knowledge, share research findings, and engage in joint projects to foster innovation.

- *Invest in Research and Development (R&D):* Allocate resources and funding for R&D

efforts. This can include hiring skilled researchers, acquiring state-of-the-art equipment, and supporting experimentation.

- *Regularly Review and Update Strategies*: Reevaluate your research and technology strategies periodically to ensure they align with the latest trends and emerging opportunities.
- *Collaborate with external partners*, including startups, other research institutions, and industry partners. Open innovation can provide fresh perspectives and ideas.
- *Government and Industry Support*: Seek support from government grants, industry partnerships, and funding sources to facilitate the continuation of research and technology projects.
- *Encourage a culture of intellectual curiosity and innovation within your organization regarding waste management.* Create an environment where employees are motivated to explore new ideas and take risks.
- *Market Research:* Regularly conduct market research to understand the demand for new technologies and identify potential commercialization opportunities.

By following these strategies and maintaining a proactive and adaptable approach, organizations and researchers can effectively sustain research and technology advancement and remain at the forefront of waste management issue. These knowledge can help update and improve our SWAP courses.

1.5.3 Broadening audience of VET courses and maintain training hubs

There will be permanent collaboration with stakeholders; public authorities (at the local, regional, and national levels), private capacity building in the field of higher education, companies, international organisations, NGOs, entrepreneurs, citizens and farmers so that activities can continue to occur with a focus on institutions that have collaborated. Gradually,

the cooperation institutions will continue to be improved. Asian HEI partners will organize 'ASIAN Training' using VET courses developed by all partners, especially on topics related to solid waste management on regional and global issues in order to strengthen the collaboration and continuous improvement after the end of the SWAP Project. This can be collaborated with the EU partners.

1.5.4 Strengthen Regional and International Networking

The primary objective of our substantial international networking efforts is to amplify and facilitate mobility among the university's students and staff, promote equal access to opportunities, elevate educational standards, fortify institutional bonds, and broaden the consortium of partner universities through MoU agreement. The enhancement of practical collaboration with local solid waste businesses, recycling companies, domestic enterprises, SMEs, or informal workers and extend the international training or exchange program. Moreover, the established collaboration between universities will be filled with activities starting with student exchange activities, research collaboration and staff mobility programs (inbound and outbound).

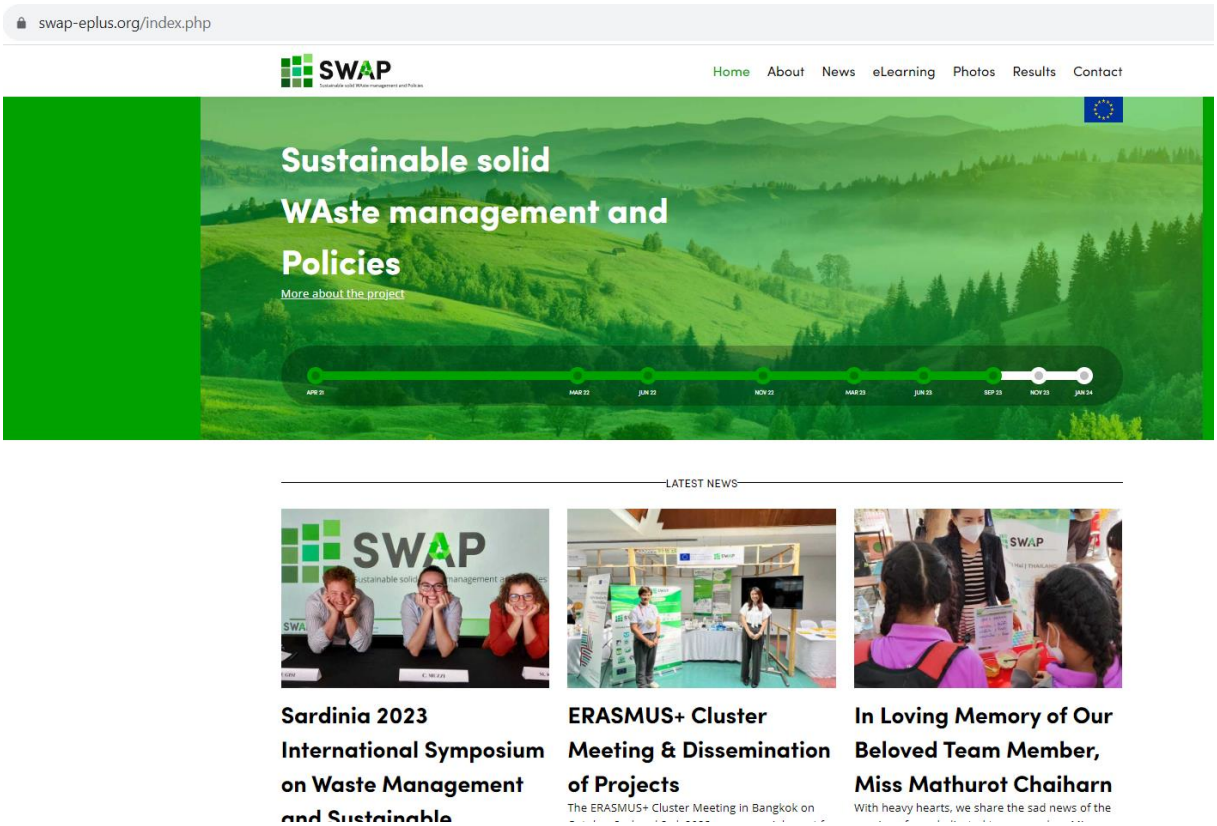
1.5.5 Maintain project branding and public relations.

The importance of project branding lies in its ability to create recognition and it is a strategic tool that can significantly contribute to the success, sustainability, and positive influence of a project. Since 2021, the SWAP project has developed effective branding through logos, project dissemination activities and PR via the official website and social media platforms such as Instagram and Facebook. This helps a project stand out, build credibility, and become recognized in a broaden field. It allows stakeholders to easily identify and remember the project, which is crucial for building its reputation and success. This branding provides a platform to communicate the project's core values, goals, and mission. It can effectively convey the project's purpose and the positive impact it aims to achieve the goal of solid waste management. From the name "SWAP", it can easily link to waste management and attract stakeholders and encourages engagement and support from the target audience. It can motivate people to get involved and participate in project activities. This can help the

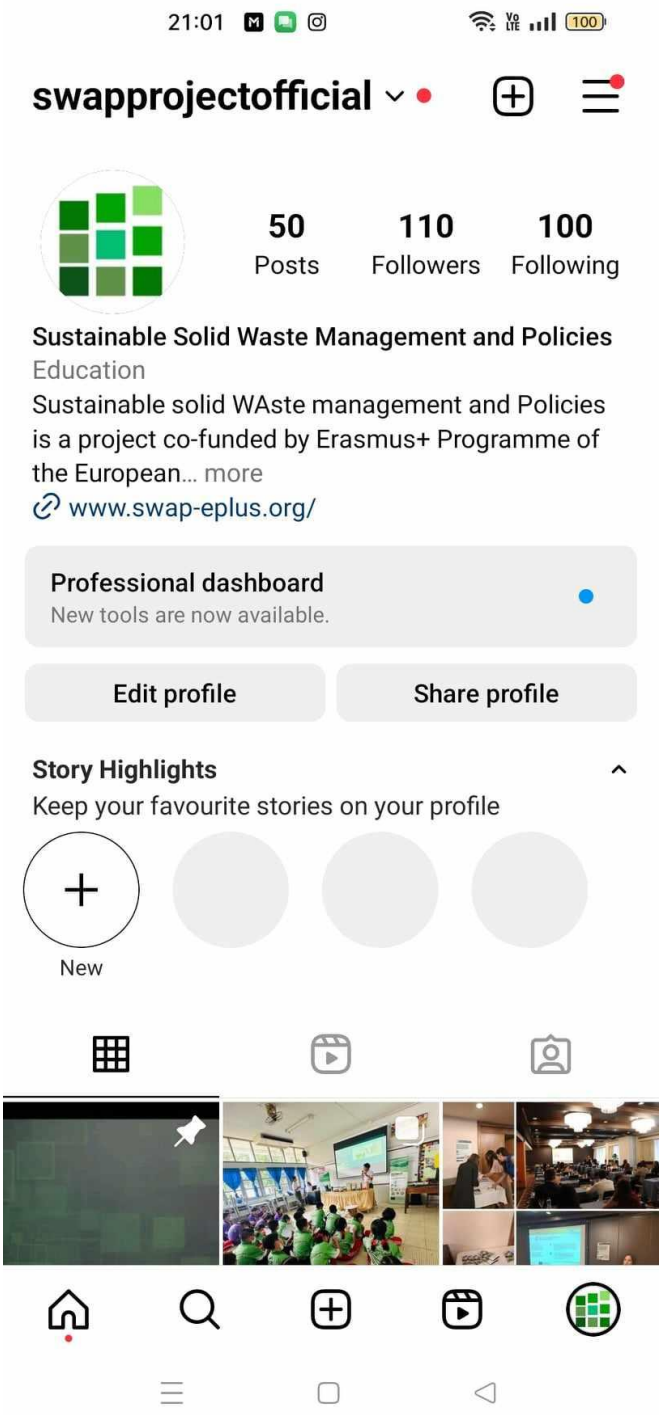
project to sustain Long-Term Impact and maintain visibility and relevance over time, allowing it to continue making a positive impact.

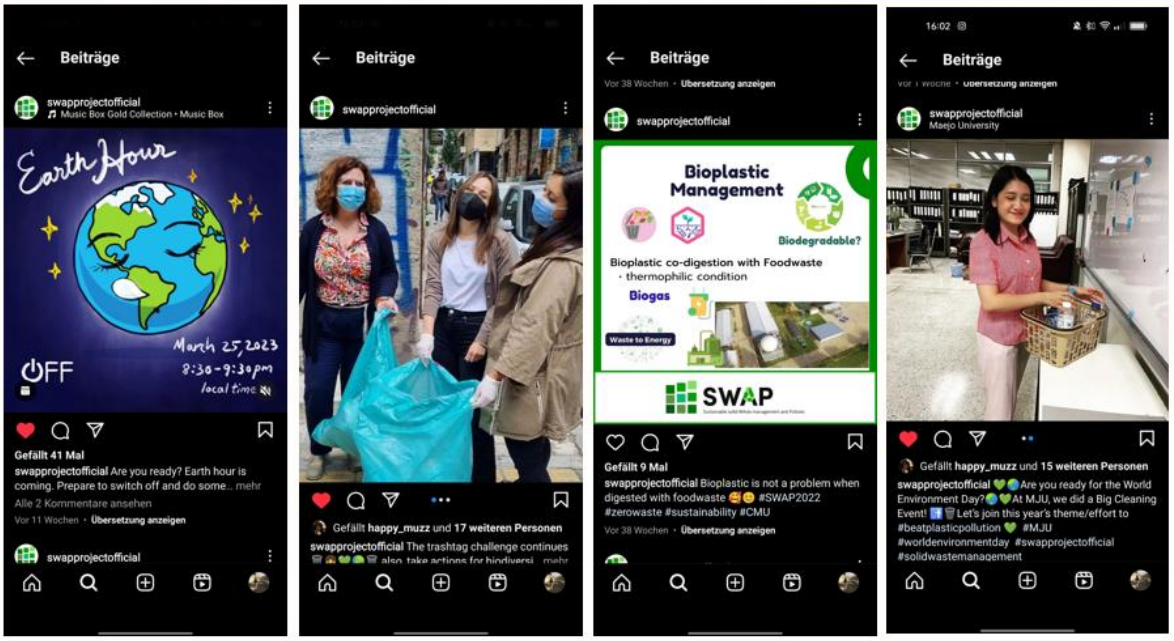
1.5.6 Website and social platforms maintenance

The SWAP project website *https://swap_eplus.org* have developed and launched since 2021. This website is well-designed for user-friendly navigation. All information relevant to SWAP project such as partners, objectives and goals, events and activities were updated onto the website. Each communication target; easy to find, clearly identified and easy for content updates. Social media platforms such as Facebook and Instagram is also the famous channels to widely gain more interest from young generation, easily access and target broader audiences. It can also be part of the teaching activities related to solid waste management curricular. After project closure, the website as well as other social media platforms will be continued to be regularly maintained and updated. Maejo university will be the host for website and social media platforms.



Facebook page





Instagram