

ACHIEVING SUSTAINABILITY IN CAPACITY BUILDING PROJECTS: SHARING EDUCATIONAL PRODUCTS AND TOOLS IN THE SWAP PROJECT

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ABSTRACT: Asia has experienced a significant increase in population and consumption, leading to a rise of waste generation. However, the ability of socio-economic systems in the region to effectively manage and dispose of this waste remains insufficient. The Erasmus+ Project “SWAP” (Sustainable solid WASTE management and Policies) aims to build capacity in higher education and technical and vocational training in the field of solid waste management in Vietnam, Thailand, and Cambodia. This workshop abstract provides an in-depth exploration of the current state of education on solid waste management in these countries, the challenges they face, the structure, the objectives, and the main results of the SWAP-project.

Keywords: Sustainable Solid Waste Management, Policies, Southeast Asia, Capacity Building, Higher Education, TVET Courses, Teaching Material, Training Hubs, Vietnam, Thailand, Cambodia, Massive Open Online Courses

1. INTRODUCTION

Asia is one of the largest waste producers globally, with Southeast Asia projected to witness a substantial increase in waste generation from 468 million tons in 2016 to 602 million tons expected by 2030 and 712 million tons expected by 2050, respectively (Kaza et al., 2018). Despite this alarming trend, the readiness of countries such as Vietnam, Thailand and Cambodia to address the waste management challenge is low, particularly in terms of awareness, education, and training capabilities in sustainable solid waste management. Capacity building for both the formal and informal waste management sectors is thus an urgent priority in this region. Higher Education Institutes (HEIs) in many Southeast Asian countries lack comprehensive degree courses on solid waste management and policies, leading to a gap in knowledge and skills required by the labor market. Additionally, the informal sector employs a significant percentage of workers in Southeast Asia, and their involvement in waste management necessitates targeted training. The SWAP project aims to strengthen the capacity of the project partners in Vietnam, Thailand and Cambodia in solid waste management by focusing on higher education, vocational training, and educating informal workers. This work provides insights into the current state of education on solid waste management in the target countries, highlights the challenges in municipal solid waste management, and outlines the objectives, methodological approach and expected results of the SWAP project.

2. Sustainability in Capacity building Project

The SWAP Project aims to integrate the most developed innovations and technologies in Europe within realities outside the continent, with a focus on South East Asian countries. The topic of the project focuses on urban waste management, which crosses geographical boundaries and draws attention to the need for international and global collaboration and integration. SWAP, funded by the European Union as part of a Capacity Building project, aims to work in this direction by strengthening the institutional, organisational, technical and human capacities of a specific country or geographical area. These projects aim to support the development and self-reliance of partner nations through a range of interventions that may include training, knowledge transfer, exchange of best practices and technical support. The countries of South East Asia have experienced a rapid rate of economic development and urbanisation, which has highlighted the difficulty for waste management players to respond adequately to the new reality. They are faced with inadequate human resources, weak financial and administrative capacities, and a lack of funding at the regional level. There are therefore political, legal, socio-cultural, educational, environmental and economic difficulties, as well as the actual availability of resources. The SWAP project aims, therefore, to increase the participation of all stakeholders in the solid waste management process on the one hand and, on the other, to foster appropriate behaviour also on the part of civil society through training and education.

The project highlights some activities whose results will already be visible at the end of the project funding; on the other hand, there are long-term impacts that can only be achieved if supported by highly sustainable activities, actions, product, even at the end of the SWAP project. Project sustainability refers precisely to a project's ability to maintain its objectives, results and benefits in the long term, after the official end of the funding or implementation period. In other words, when it can continue to function effectively and continuously after the end of the initial funding. Several aspects positively influence this, including the social and economic impact on affected communities and society at large and the involvement of stakeholders, including local governments, civil society organisations, businesses, communities and citizens.

The sustainability of project results is not always easy to predict and describe, but it is certainly necessary that activities are structured in such a way that exploitation and sustainability of results begin as early as possible, even during the realisation of the project results themselves. It is essential to analyse the potential target groups, stakeholders and channels for achieving the project results, with particular attention to the quality of the results, including the introduction of procedures and responsibilities for quality management; the adaptability of the results to the specific circumstances of the countries and organisations involved; and a structured way of communicating and disseminating the results: the effective transmission of information on activities, objectives achieved and benefits obtained not only during, but also after the end of the project are essential to maximise the impact and ensure that the results achieved can be utilised in the long term.

3. SWAP AND PROJECT RESULTS WITH A VIEW TO SUSTAINABILITY

The SWAP project openly addresses the capacity building of partners based in Cambodia, Thailand and Vietnam. Specifically Maejo University (MJU) and Chiang Mai University (CMU) in Thailand; Hue University of Agriculture and Forestry (HUAF) and Thai Nguyen University Of Agriculture and Forestry (TUAF) in Vietnam; Royal University of Agriculture (RUA), University of Heng Samrin Thbongkhmum (UHST) and Cambodian Education and Waste Management Organisation (COMPOSTED).

Two main regional thematic priorities are pursued:

1. university-business cooperation, entrepreneurship and graduate employability;
2. design, implementation and monitoring of policy reforms.

SWAP aims to improve knowledge, skills and abilities in the field of solid waste management through:

- the development of modern teaching and learning technologies and tools, including specific methods needed to address the needs of specific target groups in South-East Asia;
- providing governance models to modernise, increase and sustain the quality of higher education institutions.

The specific objectives to be pursued in the course of the project are several:

- To develop new training and teaching programmes that address the issue of sustainable solid waste management and integrate technical education with training sessions for business start-ups in the field of solid waste management.
- Implement inclusive measures and policies for the informal sector, especially by involving this target group in safer and healthier work practices and introducing them to newly developed TVET products.
- Set up training centres that can also be used after the end of the project.
- Create TVET products focused on sustainable solid waste management as part of the activities of the new "Training Centres for Sustainable Solid Waste Management and Policies".
- Create synergies and sustainable links with private sector stakeholders to meet their needs for specialised personnel in post-consumer materials management, training and to improve the employability of graduates.
- Support ongoing cooperation, exchange of know-how and good practices between EU and South-East Asian HEIs in the region.
- To disseminate project results and sustainability concepts in the field of solid waste management to the general public and society, also involving school students and their families in the dissemination process.

Throughout the project, several project results are expected, and they form the basis for the continuation of the activity, fostering both its sustainability and scalability to other territories in the countries involved in the activity. Below are two of the project products that will support the sustainability of the project after EU funding ends.

3.1 Academic and Training modules

Rapid urbanisation and social change are not always followed at the same speed by the ability to respond adequately to the needs these changes bring. According to the International Labour Organisation, "they will not be effective at creating green jobs where labour regulations discourage small business development and where the labour force skills or education achievements are inadequate nor conducive for developing a competitive sector"(Sakamoto et al., 2018).

The level of education has a substantial influence on the development of people's skills and the actual impact certain changes can have in the long run. This makes training and educational development at all levels essential factors that contribute to improving skills and employability, as well as raising awareness and addressing occupational health and safety and environmental protection provisions. On the one hand, the modernisation of educational products for students is essential, which is seen as key to improving the attractiveness of graduates in the labour market: this process is needed not only at the university level but also in regional training institutions, which offer training at different educational levels for professionals. The active involvement of private sector stakeholders in the definition of training products according to their specific needs will play a key role. On the other hand, by developing relevant training courses for representatives of the informal sector, the project aims at an active inclusion of this target group, which is particularly in need of increased awareness of working conditions and occupational health. Capacity-building of this target group will thus also contribute to reducing the huge gender gap that exists in this field. In addition, this group of socially vulnerable individuals and families will improve their skills, stimulate the search for formal employment, thus improving their status and contributing to social

cohesion.

During the first two years of the project, education and training materials were produced by the European partners, then evaluated together with the Asian partners and uploaded onto the training platform so that teachers and students of the above-mentioned partners can use the developed material.

Lecture module Bachelor level

<u>Introduction to Sustainable Solid Waste Management and Circular Economy</u>		<u>Secondary raw materials life cycle – A Circular Economy for resources recovery</u>	
Title	Lecture Time (hours)	Title	Lecture Time (hours)
Introduction Waste Management and Circular Economy (important for VN: Eco-industrial parks, see report in the literature folder*)	2	Treatment of Organic Waste (composting and anaerobic)	2
Waste types, streams, characterisation and waste analysis	7	Management of agricultural waste and crop residues	6
Waste collection, transportation and transfer: collection of mixed waste or of source separated waste, collection logistics, transfer stations; machine park planning.	4	Mechanical-Biological-Treatment (MBT)	4
Overview on recyclable waste treatment technologies	3	Waste-to-Energy (WtE)	6
Biomass (Types, characterization, concepts and technologies)	5	Basics Packaging waste (plastics, glass, paper, metal)	4
Residual waste treatment and recovery	5	Waste Electrical and Electronic Equipment (WEEE)	2
Landfill (Introduction, elements and operation)	4	Tools for a Circular Economy - Introduction to LCA and MFA tools	8
Landfill (After care)	2	Practical exercise - WEEE dismantling	6
Economic aspects in waste management (costs of collection, equipments, social costs..)	3	Practical exercise - Plastic waste upcycling	7
Waste associated regulations - also Country-specific	3		45
Environment, safety and health in solid waste management, occupational health	7		
Total	45		

Figure 1 Lecture module Bachelor level

Lecture module Master level

<u>Technical Aspects of Waste Management (with Problem-based learning approach)</u>		<u>Advanced Waste Management Aspects in a Circular Economy</u>	
Title	Lecture Time (hours)	Title	Lecture Time (hours)
Waste Management practices in the region and treatment - recap bachelor	2	International Regulations, Treaties and Goals (SDG) in Circular Economy	4
Packaging Waste (plastics, glass, paper, metal)	4	Logistics (concept, strategies, business models, operating and costs)	8
Urban mining (construction and demolition waste, WEEE)	4	Policies and tools for the Circular Economy (landfill tax, waste hierarchy, EPR, recycling targets and incentives)	4
Industrial and Hazardous Waste	5	International waste management	4
Technology of Thermal waste treatment and Emission control - how to design	5	Regulations and Framework conditions in the region	5
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.	25	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.	20
	45		45

Figure 2 Lecture module Master level

Lecture TVET

Basic		Advanced	
Title	Lecture Time (hours)	Title	Lecture Time (hours)
Introduction to waste management and circular economy	2	Stakeholder engagement	2
Integrated solid waste management (based of 3R approach); types of waste and municipal waste composition; management and treatment technologies and infrastructures	4	Bio-waste tratment operation	3
Laws, regulations, policies	2	Recycling E-Waste	3
Employment and entrepreneurship opportunities in the SWM sector	2		8
SW characterization and sorting	4		
Health and safety at the workplace	4		
	18		

Figure 3 Lecture TVET

All training material is uploaded onto the HOOU platform (Fig.4). The use of an online training platform offers several advantages in terms of the future sustainability of a project, especially concerning the economic aspects of the project, thus ensuring possible continuity. The accessibility and reach offered by the online platform make it possible to reach a wider and more diverse audience, thereby increasing the flexibility and adaptability of the training material developed. Furthermore, this tool makes it possible to update content and include new material.

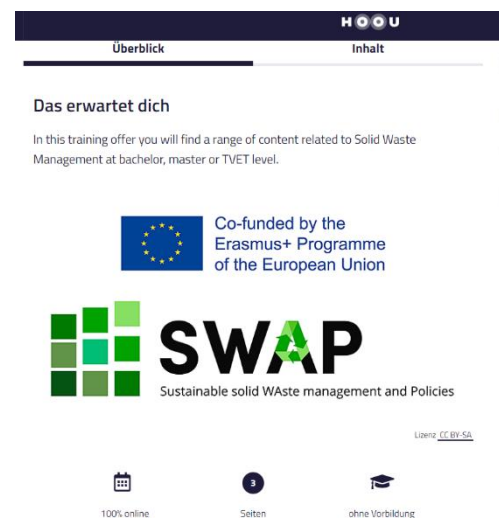


Figure 4 HOOU Platform

3.2 Training Hub

Not only education and training but also the capacity to build relationships between stakeholders is a key point for the future sustainability of the project.

SWAP aims at the improvement of knowledge, competences and skills in the field of solid waste management by developing modern teaching and learning technologies and tools, including specific methods required to address the needs of specific target groups in Southeast Asia. This priority is addressed by establishing regional “Training Hubs for Sustainable Solid Waste Management and Policies”, physical places where training can occur, services can be delivered, and the labour market can meet and cooperate, in a true multi-stakeholder environment, well beyond the project duration. This section explores the creation of 6 Training Hubs, 2 per partner country in Asia.

Training Hubs have been designed by conveying indications and experience coming from the EU partners (e.g. quality standards, management procedures, etc.) and needs/requirements driven by local contexts in Vietnam, Cambodia and Thailand.

SWAP's objectives include the construction of 6 Training Hubs, 2 for each partner country in Asia. The Training hubs were designed during the first two years of the project, taking into account the contributions and experience of the European partners, e.g. regarding quality standards, management procedures, etc. The Asian partners, supported by the European partners, made several strategic choices, concerning e.g.

- the scope of each hub
- the structure, role and responsibilities of the actors participating in the governance bodies
- the resources needed: human, local, financial sustainability, etc.

Following this planning phase, made with a view to the future sustainability of the project, the partners continued to further detail their hubs, refining, for instance, the number and type of programmes to be implemented, the forecast of the number of participants and - above all - the sources of funding. Currently, all hubs are taking their first steps.

In all countries, each university has chosen the main area for the corresponding hub, based on its specialisations and expertise and local, regional or national development needs and priorities. In particular:

Country	University	Training Hub domain
Cambodia	RUA – Royal University of Agriculture	Municipal Solid Waste Management
	UHST – University of Heng Samrin Thbongkhmum	Waste management through segregation and recycling
Thailand	CMU - Chiang Mai University	Plastic waste segregation and circular-based utilization
	MJU - Maejo University	Agricultural waste utilization
Vietnam	HUAF - Hue University of Agriculture and Forestry	Solid Waste Management
	TUAF - Thai Nguyen University of Agriculture and Forestry	Municipal Solid Waste Management

Figura 5 Training Hub domain

To support the functioning of governance teams in Training Hubs, guidelines were provided to facilitate the start-up and management of Training Hubs: the document thus refers to existing EU quality tools and suggests methods and tools for effective team management, problem and conflict resolution, etc.

It thus aims to support the creation and operation of local training hubs in Thailand, Cambodia and Vietnam by providing some guidelines and references for their governance and management. It does not claim to provide all the solutions, nor to indicate the only possible way forward, rather it intends to provide suggestions, based on the experience of the European project partners. However, the Asian partners should adapt these suggestions to their specific political, economic and social context, and to the networks that are already established on their territory.

The Training Hub, operating for the last 6-8 months of the project to assess pros and cons, will continue to function after the end of the project and will be supported by the partners' resources after the project. At the end of the project, a final report, drafted by the governance teams of the hubs and the European partners' experts, will review what has been done, with the aim of building guidelines for subsequent annual reports, as good practice for regular monitoring and reviews. The report will contain a sustainability plan for the hub itself: the main hub strategy, the main services and activities provided, and finally a financial projection for the next five years.

4. RESULTS AND DISCUSSION

The project has achieved important results over the years. First of all, the creation of lasting partnerships, both between the partners involved and with local stakeholders. On the one hand, the creation of such partnerships guarantees broad territorial coverage and a diversified involvement of expertise. Moreover, they will foster the possibility of future exchanges, even after the end of project

funding, thus supporting the possibility of continuing capacity building and exchange actions also in a non-formal way. Another point of interest, particularly developed during the project, was the capacity to disseminate and communicate the project's messages, involving local schools, their students and thus the local communities themselves, thus fostering awareness of the issue among citizens and future university and vocational education and training students. A further result of the project was the creation of educational and training modules that will not only be able to respond to a training and educational need but will also foster the creation of a future talent pool among the students, with useful knowledge for the local area, able to guide and maintain the project's activities over time.

5. CONCLUSION

Over the project years, the partnership is working to ensure the quality of the products and their real impact in the short, medium and long term. It is essential, however, to recognise that sustainability beyond the initial funding phase remains a challenge. Lack of continued funding could jeopardise the continuity of the activities and initiatives that have been launched. A proactive and forward-looking approach will therefore be required to keep the partnerships established alive and to mobilise local resources, to invest in training and strategic planning.

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