



Deliverable name: Replication Guidance Package	
Deliverable number	D5.5
Official Date	31 May 2026
Submission Date	29 May 2026
Responsible partner	ICLEI
Authors	Felix Schumacher (ICLEI), Chiara Coluccia (ICLEI)
Version	v1.0
Work package no.	5
Work package leader	ICLEI
Dissemination level (PU/SEN)	SEN



List of Abbreviations and Acronyms

Abbreviation	Definition
AITEX	Textile and Cosmetic Industry Research Association
BOFA	Bornholms Affaldsselskab
BOKU	University of Natural Resources and Life Sciences
ICLEI	International Council for Local Environmental Initiatives
I-US	Industrial-Urban Symbiosis
NTUA	National Technical University Athens
SAT	Self-Assessment Tool



1. Abstract

This deliverable presents the SYMSITES replication guidance package, developed within the Horizon Europe-funded SYMSITES project (2022–2026), which promotes Industrial-Urban Symbiosis (I-US) approaches for sustainable waste and wastewater management across European regions. Through four pilot EcoSites in Austria, Denmark, Greece, and Spain, the project tested innovative solutions for valorizing industrial by-products, urban waste, and wastewater in diverse socio-economic and environmental contexts. Building on these experiences, the deliverable focuses on supporting the replication and upscaling of successful practices beyond the project sites. It provides an overview of key replication-oriented materials and tools tailored to different stakeholder groups, including municipalities, utility companies, industry actors, researchers, and multipliers. Central outputs include a self-assessment tool, virtual EcoSite tours, a detailed process guide for replication, and a replication webinar. Together, these resources aim to facilitate knowledge transfer, improve accessibility to project results, and support the wider adoption of circular and symbiotic resource management solutions across Europe.

2. Executive Summary

The SYMSITES Project (2022–2026) is a four-year project funded by the European Union under the Horizon Europe Programme, dedicated to transforming how European regions manage and reuse their waste and wastewater. Rooted in the principles of Industrial-Urban Symbiosis (I-US), SYMSITES aims to foster local and regional collaborations between citizens, municipalities, and enterprises, enabling a more sustainable and circular use of resources. At the heart of the project lies the valorization of underutilized materials and energy, including industrial by-products, end-of-life urban waste, and wastewater, by converting them into valuable inputs for other industrial processes. In its four pilot sites, the ‘EcoSites’, SYMSITES tested and validated developed solutions. The EcoSites (Tullnerfeld, Austria; Bornholm, Denmark; West Achaia, Greece; Alcoi, Spain;) all represent a unique and distinct socio-economic and environmental setting across diverse regional contexts: 1) Austria, focusing on industrial wastewater and flotation-sludge integration; 2) Denmark, optimizing co-treatment systems under highly automated conditions; 3) Greece, integrating decentralized organic waste and wastewater streams in semi-urban settings; 4) Spain, managing complex residual streams such as the organic fraction of municipal solid waste and urban and industrial wastewater in advanced membrane-based treatment.

While the developments in the project certainly play a crucial role, for the purpose of upscaling successes and general learnings from the project, SYMSITES strongly emphasizes replication of solutions through a number of formats and project outputs for others to take up. While the work in the EcoSites may be taking place in a dedicated and specific setting, the model of interlinking complex systems of different resources can be applicable in many other settings as well and thus this deliverable focuses on some key guidance for replication.

This replication guidance package outlines an easy way to access key results of the project that are aimed at replication for various target groups. These include, for example, utility companies such as waste and wastewater managers, municipalities, industry actors, multipliers or researchers. At the same time, there is a level of specificity to the results that leads to not every material necessarily being relevant for each target group. Thus, both the materials themselves as well as easy access to them are being accounted for. This report functions as an overview of the key replication materials by describing each of them and their function. Additional materials produced by the project that can also be relevant will also be mentioned, however the report mainly focuses on four key outputs. Chapter three outlines the self-assessment tool, which functions as an entry point to the various materials and provides the best easy-to-access overview. In chapter four, recorded virtual tours are highlighted. These are short explanatory videos of the four EcoSites. This is followed by the process guide outline in chapter five which is a detailed description of the potential replication of the project offers. Chapter six highlights a replication webinar conducted by the project before final remarks and conclusions are brought together in chapter seven.



3. Self-Assessment Tool

The Self-Assessment Tool (SAT) is a guiding tool for the various SYMSITES knowledge outputs including but not limited to what is part of the replication guidance package. The purpose is to help create a legacy for the project even beyond its lifetime. Thus, it is crucial for ensuring replication uptake that certain materials are being produced to help the target group and users to work with them independently. A self-assessment tool can be such a tool and it is therefore part of the SYMSITES replication guidance package. In the scope of SYMSITES the idea is clear and simple. With the numerous outputs described in this report but also additional useful resources such as games and training materials being produced, not everything is going to be relevant for each user but the user being unfamiliar with the project might not know this in more detail at first. While some users may be interested in very specific technical solutions, others might want to use materials that are very easily digestible without having to dig too deep at first. The SAT helps in understanding what is relevant based on both content and format.

From a starting point in the SAT, users are asked key questions such as “Are you looking for scientific evidence on SYMSITES technologies?” or “Are you interested in learning about SYMSITES EcoSites or replication possibilities?” By using these simple guidance questions in addition with logos and short explanations, users get all the information needed to understand what type of material they’re looking at. Through QR codes (for printed versions, e.g. used during the H4C final event in May 2026 to disseminate the results) and direct hyperlinks (to be used in the online version), the usability is maximized. Figure 1 shows the full SAT.

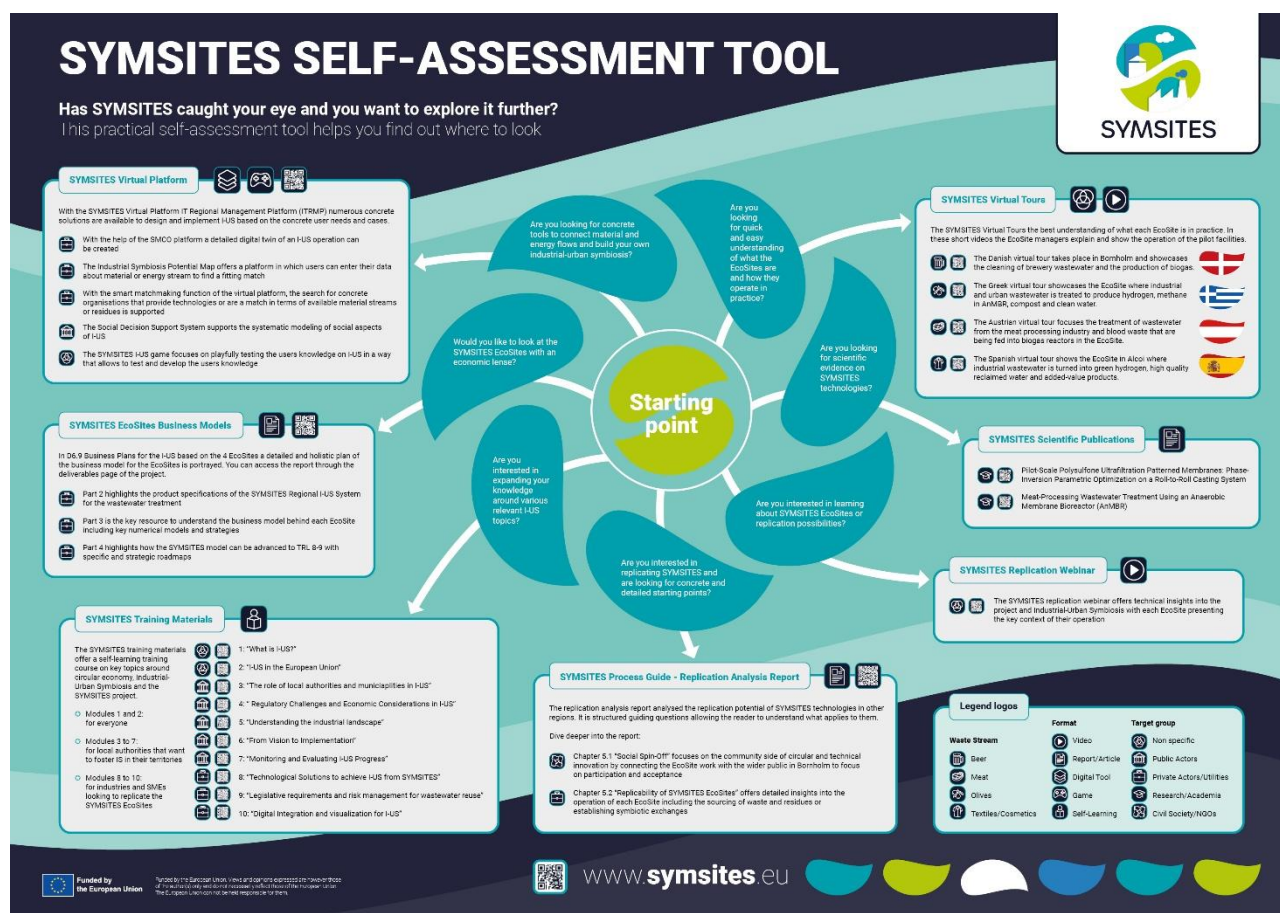


Figure 1 SYMSITES Self Assessment Tool (produced by ICLEI Europe)

The SAT is placed on the SYMSITES website under the replicate section and can be accessed directly through this link: https://symsites.eu/wp-content/uploads/2026/05/SYMSITES_SAT_Replicate-Symsites_compressed.pdf

4. Recorded Virtual Tours

The recorded virtual tours are a key element of the replication guidance package. The virtual tours of the four Ecosites in Greece, Spain, Denmark and Austria seek to showcase how in each of these sites SYMSITES's symbiotic processes are applied in practice. These virtual tours are aimed at the members of SYMSITES' network of waste associations, as well as other waste management/utility companies interested in learning from, and replicating the work done in the context of this project. At the same time, the virtual tours can also function as a first point of contact to the SYMSITES project for others as the format is accessible and easy to digest. Thus, while the target group of the tours is defined, it's by no means an exclusive format.

The key elements of the virtual tour are the main pieces of equipment that are used on-site for waste treatment/valorization. For each of the identified pieces, it highlights the main features, how it works and what role it plays in the process. Through interviews with experts working at the EcoSites and additional footage, these elements are placed in a broader context, highlighting key processes, innovation, and the (economic, social and environmental) benefits and challenges connected to the specific processes at each Ecosite. While the virtual tours were recorded at different development stages of the EcoSites throughout the project lifetime, they still manage to address and showcase the key functions of the EcoSites while also showing the coherent SYMSITES EcoSite model across the different use cases to give the users a better understanding of the different shapes the EcoSites can take.

The EcoSite Virtual Tours are available under the following links on YouTube:

Danish: <https://www.youtube.com/watch?v=Ac6IT603YxY&pp=ygUl3l3tc2l0ZXM%3D>





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SYMSITES Danish Ecosite



SYMSITES Denmark Ecosite video



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Figure 1 Danish Virtual Tour Screenshot

Spanish: <https://www.youtube.com/watch?v=btdCulJ2oNQ&pp=ygUlc3ltc2l0ZXNM%3D>





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SYMSITES

Spanish Ecosite



Spanish EcoSite Presentation



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Figure 2 Spanish Virtual Tour Screenshot

Greek: https://www.youtube.com/watch?v=6tLxrQ_pxFA&pp=ygUl3lfc2l0ZXM%3D





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SYMSITES Greek Ecosite



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Figure 3 Greek Virtual Tour Screenshot

Austrian: <https://www.youtube.com/watch?v=7iuRfgrpOg0&pp=ygUlc3ltc2l0ZXNM%3D>



SYMSITES

Austrian Ecosite

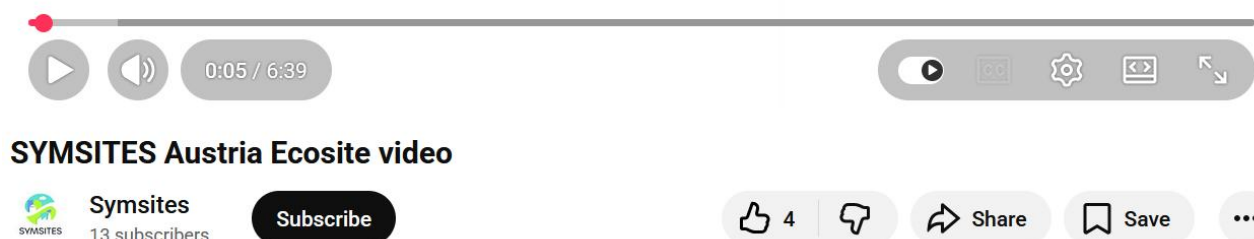


Figure 4 Austrian Virtual Tour Screenshot

Playlist: https://www.youtube.com/watch?v=btdCulJ2oNQ&list=PLqpQaLySZ2lhXGrDqT_3W18ylzg2ZThkf

5. Process Guide

In order to fulfill the nature of a process guide (i.e. a step-by-step tool) a replication analysis report was delivered and designed in a way to function as this process guide. While the self-assessment tool described in chapter 2 is the high-level entry point, the process guide dives deeper. The Replication Analysis Report provides a comprehensive evaluation of the replication potential of SYMSITES technologies and practices. It outlines which components are ready for broader implementation and highlights the social, technical, economic, and regulatory factors critical for successful transfer while following a number of guiding questions aimed at reflecting and understanding the respective insights better. Within the report, some key findings include:

- High replication potential for biogas systems and flotation units, with proven efficiency and stability.
- Social innovation models, such as Bornholm's Go-SYM, demonstrate effective community engagement strategies adaptable to small towns and rural areas.
- Technical replication readiness is uneven; while biogas production is mature, membrane technologies require further optimization due to energy consumption, fouling risks, and cost uncertainties.
- Operational success factors include robust pre-treatment, automation, quality monitoring, and stakeholder collaboration.



- Barriers to replication involve legal limitations, logistical challenges, and demand-supply mismatches for reclaimed resources.

The report also outlines the importance of enabling conditions for replication, such as proximity of industrial actors, quality and consistency of waste inputs, regulatory support, and strong local governance. The findings emphasize that successful replication requires not just transferring technology, but adapting it to the social, economic, and environmental context of each region. Ultimately, the report lays the groundwork for the SYMSITES replication package: a practical guide to scaling I-US systems.

The Replication Analysis Report is available here:

<https://symsites.eu/wp-content/uploads/2025/06/D5.4-Replication-Analysis-Report.pdf>

6. Replication webinar & promotion

While the other materials developed in the replication guidance package are aimed to be used by the target audience directly and independently, the replication webinar functioned as a chance for the audience to interact with the project. It was implemented on January 29th, 2026, from 9:00-10:30 CET and reached a peak of around 30 participants while around 50 were registered. A recording of the webinar is available [here](#) (with 58 views by time of submission of this report). The replication webinar aimed to bring together local authorities and their public and private utility companies handling waste and wastewater as well as representatives from related industries needed to create symbiotic flows. A secondary target group included academia and civil society actors who may be engaged in related R&D activities or who have a vested interest in local and just economic development enabled by I-US. The specific objectives of this replication webinar included:

- Present SYMSITES implementation experience, outputs and outcomes mainly from the four EcoSites as speakers;
- Outline and discuss challenges and opportunities of replication pathways for SYMSITES outputs and outcomes as well as I-US in general;
- Connect and exchange with a group of interested stakeholders, also with view to future collaborations on the topic of I-US.

To achieve these goals by firstly setting the scene both on I-US and the SYMSITES project outline presented by Nikolai Jacobi (ICLEI) and Emma Pérez (AITECH) respectively. This was followed by two blocks of two EcoSites presentations starting with a first block on water and wastewater reuse. Jose Antonio Magdalena (Fovasa) opened the EcoSites presentations block by presenting the Spanish EcoSite in the context of water scarcity. This was followed by Wolfgang Gabauer (BOKU) presenting the Austrian EcoSite in the context of scaling biogas technologies in the context of wastewater reuse. Then, the second block of EcoSite presentations shifted the focus towards the input materials for the EcoSites by covering the broad topic of material sourcing. Daniel Knudsen (BOFA) kicked this block off by presenting the Danish EcoSite and the importance of waste separation, especially in the context of the island setting in Bornholm. This was followed by the closing presentation conducted Prof Gerasimos Lyberatos (NTUA) who presented the Greek EcoSite including topics such as seasonality, the use of different waste and the importance of stakeholder engagement.

7. Conclusions

The replication guidance package offers a broad spectrum of outputs available for different materials and target groups. While some of these are meant as guidance materials and entry points (SAT) others offer quite specific insights about project developments ready to be replicated (Virtual Tours & Replication webinar), while the process guide offers both. The replication guidance package groups these outputs and provides further sorting and clarification about what is available. Besides the practical aspects for potential replicators of SYMSITES solutions, the replication guidance package





also shows the scope of SYMSITES in the way it works towards the uptake of the developed solutions and thus also making a strong case here, especially when further outputs are being taken into consideration. This can, for example, include the virtual game developed in the project as well as the SYMSITES training materials, both two different approaches and methodologies that aim towards sharing knowledge developed in the project. Overall, while solutions and especially EcoSites remain relatively niche in their context and application, some of the challenges they're addressing are quite replicable and those interested are given a broad spectrum of tools to do so as this report shows.

