



SYMSITES

ECOSITES implementation for industrial-urban symbiosis through social and technological solutions

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Abstract

This deliverable reports the establishment and early development of the social spin-off Go-SYM in Svaneke, Bornholm, as part of the SYMSITES project. The spin-off functions as a local innovation platform for fostering socially anchored circular practices and supporting the implementation of I-US.

Activities carried out include:

- Co-creation processes with local stakeholders (citizens, associations, schools, businesses);
- Development of educational tools (e.g., a board game and modular teaching units) for embedding circular economy concepts in schools and youth education;
- Pilot implementation of small-scale urban symbioses using bio-waste, reusable materials, and local food resources;
- Establishment of a flexible governance model for the spin-off supported by BOFA's four-step design methodology.

The deliverable also presents a structured **replication guide** to enable other EcoSites to adopt similar socially embedded approaches to urban symbiosis. Despite limited participation in formal stakeholder events, the project has achieved deep engagement among key local actors, who have become central drivers of resource-sharing activities and social innovation.

Deliverable 5.1 contributes to the overarching goal of SYMSITES by combining technological solutions with citizen engagement, demonstrating how local, community-based ecosystems can drive sustainable transformation in rural and small-town settings across Europe.

List of Abbreviations and acronyms

Abbreviation	Meaning
I-US	Industrial-urban symbiosis
BOFA	Bornholms Affaldsbehandling
Go-SYM	Social spin-off initiative
Behave Green	Consultants assigned to the task
WASTEMAN	EU project BOFA has participated in



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1. Executive Summary

This deliverable documents the establishment and early development of the social spin-off Go-SYM in the town of Svaneke, Bornholm, as part of the SYMSITES project. The spin-off serves as a platform for socially anchored circular innovation, supporting the local implementation of I-US through citizen engagement, educational initiatives, and cross-sectoral collaboration.

Key components of the deliverable include:

Local Engagement and Social Innovation: Involvement of community actors such as the citizen association Svaneke Venner, local sports clubs, schools, businesses, daycare institutions, and private individuals in bio-waste separation and resource-sharing activities.

Educational Initiatives: Development of a board game on resource symbiosis for lower secondary education, and a practice-based teaching module for upper secondary students in collaboration with Campus Bornholm, including teacher training and digital material banks

Symbiosis Prototyping: Concrete local symbiosis examples, such as bio-waste collection from cafés and reuse of glass bottles for local juice production, tested using BOFA's 4-step design manual for circular change developed under WASTEMAN.

Replication Guide: A practical 7-step guide developed to support the replication of social spin-offs in other European EcoSites, including tools for mapping, prototyping, capacity building, and evaluation.

Methodological Foundations: Use of design thinking, participatory processes, mission-oriented innovation, and quadruple helix collaboration to structure local innovation ecosystems.

The document concludes that while citizen participation in formal events was limited, those who engaged contributed significantly and persistently. The spin-off approach has proven to be a scalable and flexible model for socially rooted circular economy interventions and offers a transferable methodology to other small towns and EcoSites across Europe.

2. Objectives

The overall objective of Deliverable 5.1 is to initiate and document the development of a social spin-off structure that enables local communities to engage with and contribute to the goals of I-US within the SYMSITES project. The deliverable focuses on the town of Svaneke on the island of Bornholm, where the spin-off initiative Go-SYM has been piloted in collaboration with local stakeholders.

The specific objectives of this deliverable are:

To establish Go-SYM as a community-based platform that supports local engagement, resource sharing, and innovation activities linked to circular economy and symbiotic resource flows.



To develop and test participatory methods and educational tools that strengthen awareness, learning, and action among citizens, students, teachers, and small businesses – including the creation of a symbiosis-themed board game and modular teaching materials.

To pilot real-life micro-symbioses and social innovation activities in the local context of Svaneke, demonstrating how environmental and social value can be created simultaneously through cross-sector collaboration.

To apply BOFA's four-step design framework as a structured method for identifying, co-developing and evaluating social symbiosis initiatives in a small-town context.

To generate transferrable insights and tools that can be shared with other EcoSites and stakeholders across Europe, supporting replication and adaptation of the Go-SYM model to diverse local contexts.

Through these objectives, Deliverable 5.1 contributes to the broader ambition of SYMSITES to combine technical innovation with socially anchored circular transformation – ensuring that local communities play an active role in shaping resilient and regenerative urban-industrial ecosystems.

3. The Value of Symbioses

Symbioses between businesses, public institutions, and citizens are not merely technical or environmental mechanisms they represent a strategy for sustainable local development. Industrial and Urban Symbioses (I-US) are based on principles of resource efficiency, mutual value exchange, and shared solutions, where waste and by-products from one actor become resources for another.

Symbioses create measurable value on three levels:

1. **Environmental value** – reduction of waste and CO₂, circular use of resources, recycling and reuse of materials, minimized transport and energy consumption.
2. **Economic value** – reduced costs for raw materials and waste management, new business opportunities, and local job creation.
3. **Social value** – strengthened local identity, involvement of citizens and associations, knowledge sharing, and local innovation.

The social dimension is often overlooked in traditional symbiosis projects. However, as highlighted by Gasparin et al. (2021) and Emily Kelsey (2022), social innovations have the potential to anchor sustainability initiatives within local communities and foster lasting change through networks, learning, and shared engagement.

In the SYMSITES project, this insight has been translated into practice through the development of social spin-offs that support technological solutions while simultaneously mobilizing local civic engagement.

3.1 The Value for Svaneke

For a small town like Svaneke, with approximately 1,100 inhabitants, symbiosis projects carry particular relevance. Svaneke is characterized by strong local cohesion, a vibrant volunteer culture, and a tradition of citizen-driven



development. This creates fertile ground for experimenting with symbioses where businesses, associations, and citizens act as active co-creators.

Through the establishment of the Go-SYM spin-off, concrete value has been created in Svaneke:

- **Environmentally**, local loops for bio-waste, glass, fruit, and energy have been developed. For example, food waste from cafés is used in a biogas plant, and wine bottles from restaurants are reused for local fruit juice production.
- **Socially**, the project has involved children, youth, daycare providers, schools, sports clubs, and elderly residents in a collective learning process about waste sorting and green literacy with a focus on ensuring continuity in learning across life stages and institutions.
- **Economically**, local businesses such as Spröt, Vinøst, and Siemsens Gaard have actively contributed and gained new network opportunities and local value creation.

The project approach is based on the understanding that social engagement does not necessarily arise from large, formal meetings, but often flourishes through trust, relationships, and tangible actions. Svaneke's compact scale allows for fast prototyping and adaptation based on community response. At the same time, the town functions as a living laboratory, where experiences with social symbiosis can be documented and transferred to other small towns across Europe.

Thus, the value for Svaneke lies not only in specific resource transformations, but in the formation of a local innovation ecosystem where co-creation, ownership, and experimentation are central driving forces. These experiences provide a foundation for long-term anchoring and the continued development of sustainable solutions within the community.

3.2 Local Engagement and Citizen Participation

The establishment of the Go-SYM social spin-off in Svaneke has from the outset been guided by a fundamental understanding: those technological solutions only generate lasting value when they are developed and rooted in close collaboration with the people they are meant to serve. Therefore, citizen engagement, local organization, and social innovation methods have been central components of Task 5.1.

Svaneke is characterized by strong social cohesion and a high level of local participation. The town's size and tradition of joint community projects create optimal conditions for testing and anchoring I-US in practice not only as a technical concept, but as a shared vision and a new form of social infrastructure.

Svaneke as a Local Context for Go-SYM and the EcoSite

Svaneke is a small Danish town located on the eastern coast of Bornholm. The urban area spans approximately 1.2 km² and forms part of a wider local community including surrounding rural areas.

The town is characterized by a compact urban layout, a high concentration of heritage architecture, and a strong sense of community. Svaneke serves as a local hub for schooling, childcare, leisure activities, and small businesses. It is home to a lower secondary school, childcare institutions, sports and cultural associations, and a range of SMEs within sectors such as food, crafts, retail, and tourism.

In recent years, Svaneke has established itself as an experimental platform for circular development, with a focus on resource transformation, waste sorting, local energy production, and social innovation processes. In the SYMSITES

project, the town serves as a test site for both technical solutions (EcoSite) and the development of a social spin-off (Go-SYM), engaging local actors citizens, businesses, and institutions in co-creating and testing elements of I-US

Its small scale, clearly defined geography, and dense social networks make Svaneke particularly well suited as a pilot area for local symbiosis development, where system changes can be closely monitored and adapted within a concrete community setting.

Key Stakeholders and Their Involvement

A broad range of local actors have been involved in the development of Go-SYM, each contributing with different roles and motivations:

- **Svaneke Venner** (the town's civic association), which has acted as an organizational bridge between the project team and local residents. The group has helped recruit participants, coordinate activities, and provide input to project direction.
- **Individual citizens**, including both engaged families and senior residents, have taken part in meetings, contributed ideas, and actively engaged in waste sorting and resource initiatives.
- **SIK (Svaneke Sports Club)** has opened its facilities to the project and helped communicate its purpose to parents and children.
- **Local businesses and shops** have provided access to resources and waste fractions, contributed to pilot projects, and participated in planning future circular business models.
- **Private individuals with relevant skills**, such as artisans, artists, and designers with an interest in reuse and upcycling, have contributed knowledge and manual support to local resource experiments.

These groups share a common interest in creating local value environmentally, socially, and economically through new symbiotic initiatives and circular business models.

Methods of Outreach and Mobilization

Engagement has been achieved through a combination of digital and analog outreach strategies, tailored to Svaneke's specific context:

- **Social media**, especially local Facebook groups and pages, has been a powerful tool for spreading awareness and inviting participation.
- **Physical noticeboards in local shops**, especially in the town's supermarket (Brugsen), have reached residents less active online.
- **Door-to-door flyers and printed invitations** have been used at key points, for instance to promote town hall meetings or dialogue events.
- **Direct dialogue**, through personal networks and targeted contact, has been especially important in reaching individuals with specific resources or competencies relevant to concrete activities.

This multi-channel approach has enabled the project to activate both established networks and new community groups, which has been crucial for the legitimacy and sustainability of Go-SYM.



Social Capital and Local Culture as Leverage

The project builds on Svaneke's unique reservoir of social capital a local culture defined by trust, engagement, and a readiness to act. This has been strategically mobilized through methods that promote participation and co-creation, including:

- **Open meetings and workshops**, where both skeptical and enthusiastic voices have been welcomed and respected
- **Use of everyday narratives and examples**, to make complex systems like I-US more tangible and relatable
- **Involvement of local champions and facilitators**, who act as communicators and co-developers
- **Visibility of the project in public space**, including signage, small-scale pilots, and informal social events

This approach has helped seed a growing local movement around SYMSITES, in which symbiosis is not merely seen as a technical or institutional strategy, but as a **shared social practice** and a collective experiment in sustainable community development.

3.3 Local Symbiosis Activities and Early Implementations

A concrete example of untapped potential in the local resource loop is the initiative to collect surplus fruit from private gardens and public trees for fermentation and distillation at Wild Distillery in Åkirkeby. The plan involves harvesting, sorting, and transporting excess fruit from the Svaneke area to the distillery, where it can be processed into spirits with a clear local origin.

This idea illustrates a key dimension of urban symbiosis: that even small-scale resources and by-products often discarded or left unused can be given added value through strategic partnerships and inclusion in new production chains. The planned fruit distillation demonstrates how biogenic resources from households and public green spaces can be locally refined to create both economic and cultural value.

Although the collected volumes of fruit were insufficient this time, the process revealed a genuine willingness and interest among local actors to engage in new forms of collaboration and circular resource use. These experiences provide a foundation for continued planning and possible future partnerships with Wild Distillery and similar players.

This example also highlights the importance of logistics and coordination in local symbiosis systems. Moving forward, Go-SYM will play a key role in identifying and facilitating such opportunities, including securing the necessary volume, timing, and quality of perishable raw materials like fruit.

3.4 Start-up Phase, Organization, and Capacity-Building Needs in Go-SYM

The establishment of Go-SYM has so far followed an initiating and experimental approach, with a focus on testing, learning, and building relationships rather than setting up a formal organizational structure from the beginning. The work has primarily been driven by a single resource person from BOFA, who has been responsible for outreach, coordination, and the content development of the social spin-off.

This one-person effort has been crucial for generating momentum, but also reflects the current status of Go-SYM as being in a start-up and exploratory phase. No formal steering body, board, or fixed structure has yet been established. Instead, a network of contacts, collaborators, and contributors has emerged, which could form the foundation for future organizational development.



It has been necessary to work with flexible and informal forms of collaboration, adapted to the local context and the available resources. Experience shows that this has not hindered progress on the contrary, it has allowed room for experimentation and agile adjustments.

However, it is clear that a more formalized structure will be needed in the next phase to ensure:

- Long-term anchoring and shared ownership among local actors
- Clear division of tasks and responsibilities to reduce dependency on individuals
- Capacity to scale activities, apply for funding, and enter into broader collaborations
- Transferability and replication to other SYMSITES partners and similar contexts

It is expected that establishing a local Go-SYM working group or board will be the next step, inviting selected citizens, association representatives, and businesses to participate in development, decision-making, and priority-setting.

BOFA's experience of managing the initial phase alone has yielded valuable insights into what works in practice and where additional support and resources are needed. At the same time, it has become clear that there is a strong willingness among local stakeholders to engage, and this is precisely the energy that Go-SYM must now gather, structure, and support going forward.

3.5 Challenges and Insights from the Early Phase

The establishment of Go-SYM and the implementation of socially anchored symbiosis initiatives in Svaneke have as expected not been without challenges. Task 5.1 is currently in a phase focused on laying foundations, testing experiments, and forming partnerships. This reality has presented a number of practical, organizational, and strategic challenges, which have generated valuable insights for the project's next steps.

Limited Human Resources and Organizational Capacity

One of the most prominent challenges has been the limited capacity to manage and develop the social spin-off. The work of engaging citizens, mapping resources, coordinating activities, and documenting progress has largely been carried out by a single individual from BOFA. As a result, project momentum has relied heavily on personal initiative and network activation rather than on an established organization with dedicated resources.

This situation has clarified the need to:

- Strengthen internal capacity within the project team on social innovation
- Explore options for local co-organization and delegation of responsibilities
- Establish sustainable structures that are not dependent on individuals

Diversity of Actors and Differing Motivations

Another challenge has been navigating the complexity of the local stakeholder landscape, where different groups have different expectations, resources, and understandings of what the project is about. While some view participation as an opportunity for sustainable business development, others see it as a community initiative or simply a new waste management scheme. This has required careful attention to communication, translation, and trust-building.

In particular, efforts to engage local businesses have shown a need for:



- Clear incentives and concrete examples of added value
- Flexible collaboration formats and practical solutions
- Patience and ongoing dialogue

The Paradox of Voluntarism

A third challenge has been the ambiguous nature of voluntarism. On one hand, the project has relied on voluntary participation from citizens, associations, and businesses. On the other hand, a certain degree of stability and commitment is needed if the systems are to function effectively and scale over time.

This paradox has raised important questions:

- How can engagement be sustained over time without risking burnout?
- When should tasks shift from voluntary to institutional responsibility?
- What forms of support and recognition motivate different types of actors?

Communicating Complexity in a Local Context

It has also been challenging to communicate the complex concept of I-US in a language and with examples that resonate with residents in Svaneke. Terms like "urban symbiosis," "resource optimization," and "biotechnological solutions" can sound abstract or distant especially in a context where participation is voluntary and grounded in everyday life.

This realization has led to a conscious communication strategy that prioritizes:

- Making abstract ideas tangible through small, relatable examples
- Using visual and narrative formats (e.g., storytelling and illustrations)
- Emphasizing local values such as community, nature, self-sufficiency, and pride

Few but Deeply Committed Participants

Although participation at stakeholder events has been low, the individuals and actors who did engage have shown a high level of commitment and persistence. These citizens and businesses have moved from interest to concrete action, taking on roles as resource contributors, co-developers, and pioneers in the local symbiosis initiatives.

Examples include:

- Citizens and businesses who, following the meetings, voluntarily introduced bio-waste sorting in their households or shops
- Participants who contributed local knowledge and networks, which proved critical in identifying new partners and material flows
- Actors who offered physical resources such as containers, transportation, or leftover materials for inclusion in early value chains

These experiences underscore that the number of participants is not always the most important factor in the early stages rather, the quality of relationships and level of trust is key. Early, highly engaged participants often become local role models and co-creators of the project's continued development. Their presence has brought energy, legitimacy, and tangible results that can now be used to strengthen outreach and inspire broader involvement.



One of the most important lessons learned is that even limited participation can be a strategic starting point and that the first steps toward social anchoring often occur within small, close-knit circles marked by strong relational capital.

3.6 Next Steps and Future Activities

The initial experience of establishing the Go-SYM social spin-off in Svaneke has laid a valuable foundation of relationships, pilot activities, and insights that will serve as a springboard for the next phase. While the project has faced limited resources and low participation at some events, it has also demonstrated that real, local partnerships can be formed around concrete resource flows and symbiosis activities. These early results now need to be scaled into more structured, anchored, and community-driven initiatives.

The next steps for Go-SYM will focus on four main areas:

1. Establishing a More Formal Structure for Go-SYM

To ensure continuity and relieve the burden of coordination from a single individual, Go-SYM will transition into a more stable organizational format. This may take the form of:

- A voluntary working group or advisory forum with representatives from the local community, associations, and businesses
- A dedicated local coordinator supported by BOFA but operating with its own mandate and network
- Collaboration with existing community organizations (e.g., Svaneke's Venner or SIK) to host and support spin-off activities

The goal is to create continuity, local ownership, and shared decision-making capacity for the work ahead.

2. Testing New Participation Formats

The limited turnout at traditional information meetings has led to a desire to experiment with new, more accessible participation methods tailored to local rhythms and residents' preferences.

Upcoming formats may include:

- Pop-up events in the town square, at the supermarket, or during local sports events
- Themed "symbiosis coffee meetings" with small groups discussing topics such as bio-waste, energy loops, or upcycling
- Mini-workshops for children and youth that also engage parents and families
- "Micro-actions" where citizens are invited to try simple sustainability actions at home or in clubs, and share their experiences

This approach will foster more informal, curiosity-driven engagement.



3. Expanding Partnerships and Value Chains

Existing partnerships with businesses like Spröt, Vinøst, and Siemensens Gaard will serve as a starting point for identifying and activating new local resources and by-products. In the coming phase, Go-SYM will:

- Map new resources and potential links in tourism, construction, and agriculture
- Broaden collaboration with schools, daycare institutions, and youth education to integrate circular practices into daily life
- Resume dialogue with Wild Distillery and similar actors to explore renewed opportunities for fruit-based distillation

These activities will also be more tightly linked to the EcoSite technologies and the new material streams they generate (e.g., biochar, fertilizer products, treated water for reuse).

4. Communication and Local Storytelling

A key element in broadening participation and legitimacy is making visible the stories that already exist both technical outcomes and the human relationships behind them. Efforts will include:

- Local storytelling that highlights achieved results e.g., reused wine bottles, food waste reduction, sorting practices
- Development of visual materials and short videos featuring local voices
- Signage and info spots in public spaces that illustrate where and how symbiosis happens
- Educational content for schools and early childhood settings that creates a narrative link between play, learning, and action

5. New Emerging Initiatives: Go-SYM at the Plantation

A new initiative currently under consideration is the establishment of a spin-off project under Go-SYM based at the Plantagen site in Svaneke an area with potential to serve as an experimental learning and demonstration hub for regenerative and circular practices.

Preliminary ideas include:

- **Social learning and practice communities**, where children, youth, and adults can engage in hands-on activities like soil improvement, composting, permaculture, and food production
- **Regenerative agriculture**, focused on soil health, biodiversity, carbon sequestration, and nature-based solutions
- **Tiny houses and circular living**, offering temporary housing, learning residencies, or “green fellowships” for students and social entrepreneurs

While still in early planning stages, this idea reflects a desire to ground Go-SYM in concrete physical places and explore new ways of living, where learning, production, and community are integrated.

A future spin-off at the Plantation could also function as a site-specific platform for demonstration, communication, and development closely linked with SYMSITES’ technological components (e.g., reuse of treated water, biochar, fertilizers) and anchored in local identity and low-tech, nature-connected practices.



These communication formats are intended to support the formation of a shared identity around Svaneke as a “symbiosis village.”

3.7 Sub-Conclusion – Lessons from the Social Implementation Phase

The work of establishing Go-SYM as a social spin-off under the SYMSITES project in Svaneke has, during its initial phase, yielded a number of important insights and experiences. These both confirm the relevance of the chosen approach and highlight necessary adjustments for future development.

Firstly, the project has demonstrated that Svaneke possesses substantial social capital and a strong local willingness to engage provided that format and context align with people’s everyday lives and values. The actors who have become involved from the civic association and the sports club to schools, local businesses, and community champions have not only shown interest, but in many cases taken concrete action by delivering resources, sorting waste, and sharing knowledge and networks. This strong local anchoring and mutual trust has enabled real cross-sector collaboration, even with modest funding and limited formal structure.

Secondly, the process has faced structural challenges, including low turnout at larger events, limited human resources, and the need for continuous adaptation of formats and communication. It has required flexibility, patience, and a recognition that social innovation is, to a large extent, a process of learning and relationship-building. The experience suggests that engagement should not be measured by the number of participants alone, but by the depth and quality of the relationships established and that the few who engage early often play a key role in shaping the project’s direction and legitimacy.

Thirdly, the project has opened new avenues that go beyond the original project scope. This includes the idea of a new spin-off at the Plantation in Svaneke, focusing on regenerative agriculture, social learning, and tiny houses. Such initiatives show that Go-SYM has the potential to serve as a broader platform for social innovation not only facilitating waste sorting and resource connections, but also enabling new ways of thinking about lifestyle, community, and sustainability, aligned with SYMSITES’ vision of I-US as both a technical and social transformation.

In summary, Chapter 3 shows that the foundation for Go-SYM has been laid through concrete actions, local partnerships, and valuable learning processes. The next phase will require this foundation to be strengthened through increased organization, strategic capacity-building, and the development of participation formats that can reach new target groups and help scale the early successes.

4.0 Green Education in Lower Secondary School: From Waste to Responsibility

A key focus area in the Go-SYM project’s work with environmental education has been the involvement of lower secondary school students, a group undergoing a critical phase of academic and personal development and thus with significant potential to act as future change agents.

In collaboration with Svaneke School and selected teachers, a dialogue was initiated to integrate the project’s core themes into everyday teaching and learning. The aim is to provide students with a deeper understanding of the biological, societal, and technological processes that underlie waste, resource management, and symbiosis while also encouraging them to take responsibility and action in their own local environment.



Themes and Learning Content

The educational approach has focused on connecting theory with hands-on, engaging activities rooted in daily life. Examples of thematic content include:

- **Waste as a resource** – What happens to our bio-waste, and how is it turned into energy or fertilizer?
- **Circular economy in the local community** – How do by-products from the wine bar, hotel, and school cafeteria connect in a local loop?
- **Climate impact and CO₂ accounting** – How can local waste sorting and symbiotic solutions help reduce the carbon footprint?
- **Design and upcycling** – How can we create value from waste? (e.g., through design, art, or prototyping)

Many of these themes have been linked to existing subjects such as biology, physics/chemistry, social science, and crafts & design enabling interdisciplinary projects and collaborative learning formats.

Hands-On Participation and Local Responsibility

The pedagogical focus has been not only on informing students but on providing practical avenues for action, including:

- Site visits and assignments at the EcoSite and local waste streams
- Collection and tracking of bio-waste from home and school, followed by reflection
- Creation of student-led campaigns and posters on recycling and reuse
- Interviews with local businesses and presentations to decision-makers

In several cases, students' ideas and perspectives have been incorporated directly into Go-SYM's development work such as proposals for sorting systems or improvements to public information materials.

Long-Term Impact and Competence Development

Green education in lower secondary school is not just about isolated activities it is about equipping young people with the tools to understand and act on complex sustainability challenges. This includes individual-level insights (lifestyle, consumption, personal choices), societal-level awareness (policy, production), and the ability to think in systems.

By involving students in the Go-SYM project, they experience:

- That they are part of the solution and can make a real impact
- That sustainability is not abstract or moralistic, but grounded in community, values, and collaboration
- That as young people, they possess both competence and a voice in the green transition

This work will be further developed in the future through extended learning modules, collaboration with upper secondary education, and alignment with national curricula and climate goals.



4.1 A Learning Game as a Tool for Green Education and Local Symbiosis Awareness

As part of efforts to embed the concept of urban and industrial symbiosis among youth on Bornholm, BOFA in collaboration with the consultancy firm Behave Green has developed an educational board game aimed at lower secondary school students (grades 7–9). The game introduces students to local resource flows and symbiosis opportunities on Bornholm through an engaging and competitive experience.

Purpose and Learning Objectives

The game aims to make the complex concept of "resource symbiosis" tangible and relatable to young people within their own context. By simulating real-world examples such as how a bakery can use by-products from a brewery students learn to recognize the value of waste and the potential in local collaboration.

The game has two main goals:

- To strengthen students' understanding of circular economy and local resource utilization
- To equip them with a tool for thinking in practical solutions within their own community

Structure and Game Mechanics

The game is played in teams on a board representing Bornholm. Each group moves around to different local businesses, collecting waste products and attempting to match them with the resource needs of other businesses to create symbiotic partnerships.

- The point system rewards symbioses most highly, while deliveries to the recycling station score fewer points thus highlighting the importance of the waste hierarchy
- The competitive element keeps students engaged and encourages strategy, trade, and cooperation between teams
- Resource and business cards visualize local actors and material flows, supporting understanding of how waste can be turned into value
- The game is accompanied by a brief introduction to resource symbiosis and a teacher's guide with follow-up questions and teaching suggestions

Testing and Further Development

The game has been tested internally within the development team and later with a group of students in Svaneke. Feedback from both rounds was used to adjust gameplay balance, clarify the cards, and optimize educational elements. Students expressed great curiosity and engagement, especially appreciating the competitive aspects and local context.

Opportunities for Replication and Use Elsewhere

The game is designed for easy replication in other geographic contexts. It is modular and flexible, making it adaptable to other towns, islands, or regions.



To replicate the game in a new context, the following steps are recommended:

- Map out local businesses, waste streams, and potential symbiosis opportunities
- Create tailored business cards, resource cards, and a game board layout
- Visually edit the game components to reflect the local geography and actors

All components should ideally be compiled into editable formats so that partner countries or municipalities can easily copy and adapt the materials. A short replication guide is recommended as an appendix.

Educational Value and Impact

The board game is not just a teaching tool it is a practical model for combining systems thinking, local ownership, and green education in a playful format that fosters reflection and dialogue among youth. It strengthens students' understanding of local resource cycles and highlights their own role as future resource actors.

4.2 Continuing Education and Teaching Program at Campus Bornholm

As a natural extension of Go-SYM's focus on green education in lower secondary school, a new strategic initiative has been launched: a teaching and training program in collaboration with Campus Bornholm and the consultancy Behave Green. The goal is twofold: to provide upper secondary students with a practical, locally grounded understanding of sustainability and resource symbiosis and to upskill teachers so they can integrate green transition topics into their future teaching.

A Locally Anchored, Practice-Oriented Education Project

The project has two main objectives:

- To strengthen the understanding of sustainability and circular economy among upper secondary students by using local case studies from Bornholm. Students should not only learn about global challenges but also relate them to specific actors and solutions in their own community such as BOFA, the biogas plant in Åkirkeby, or the port of Rønne.
- To upskill teachers in social science, economics, and technology by providing them with new knowledge, inspiration, and pedagogical tools for teaching sustainability. This takes place through workshops, co-development of materials, and joint evaluations, where teachers actively co-create and test the course modules.

The project builds on existing initiatives and experiences at Campus Bornholm, draws on BOFA's earlier development of educational materials for primary schools (through SYMSITES), and incorporates Behave Green's expertise in learning design with a focus on circular economy and impact.

Content and Structure

The teaching program targets approximately 120 students from HHX, HTX, and STX across relevant subject areas (e.g., Social Science B/A, Marketing, Business Economics, and Technology). Six teachers actively participate in the co-development phase.



The program is structured around four thematic modules:

1. **International policy context** – UN Sustainable Development Goals and the EU's Green Deal
2. **National green transition** – Carbon taxes, legislation, and green regulation in Denmark
3. **Consumer behavior and methodology** – Students conduct their own analyses and reflections on sustainable consumption
4. **Local case studies from Bornholm** – BOFA, local businesses, and circular symbioses are translated into classroom teaching, excursions, and project work

A digital resource bank is also being developed, containing presentations, assignments, case studies, and local contacts. This will be reused locally and shared nationally through webinars and educational networks.

Goals and Expected Outcomes

The project aims to foster both academic and civic development:

- Students gain a clearer understanding of their role in the green transition and are inspired to pursue green education and career paths
- Teachers receive practical tools and inspiration to integrate sustainability into their teaching both now and in the future
- Bornholm's role as a test platform for circular solutions is made visible to the younger generation
- Educational materials are anchored through daily teaching practice and digital accessibility and are widely shared with other institutions

The project will be evaluated both quantitatively and qualitatively by Behave Green and Campus Bornholm through surveys, interviews, and iterative adjustments.

Long-Term Anchoring and Scalability

What makes this initiative unique is its link between local solutions and global challenges, allowing students to understand what the Sustainable Development Goals “look like” on Bornholm. Involving teachers in the development process ensures a high level of ownership and long-term applicability well beyond the project's timeframe.

The collaboration between Campus Bornholm and BOFA is being anchored as part of a long-term shared strategy to integrate sustainability and resource literacy throughout the education system from early childhood education to secondary and continuing education. This runs parallel to Go-SYM's ongoing efforts with primary schools, businesses, and civil society, thereby reinforcing the integrated perspective central to SYMSITES' social innovation mission.

4.3 Sub-Conclusion – Social Innovation and Spin-Off as an Anchoring Strategy

Chapter 4 has shown how the establishment and further development of the Go-SYM social spin-off in Svaneke has become a cornerstone of SYMSITES' efforts in social anchoring. Through initiatives in green education, educational programs, and local co-creation, a range of activities have emerged that not only communicate the technical content of the project but translate it into meaningful practice for citizens, young people, and educators.



Go-SYM is, at its core, a social experiment: an attempt to bridge the systemic and the local, the technical and the everyday. It serves as a dynamic contact point where actors from many sectors from school pupils and teachers to businesses and civil society meet around a shared ambition: to transition Bornholm toward a circular and socially grounded future.

The green education initiatives, including the resource symbiosis board game for lower secondary students and the practice-oriented teaching modules at Campus Bornholm, demonstrate how the spin-off functions as a communicator, capacity builder, and driver of change. It is not only about transferring knowledge, but about creating spaces for reflection, action, and new communities.

A key strategic element in the development of Go-SYM has been that the methods and materials are designed for easy adaptation and replication in other geographic and cultural contexts across Europe. This includes the board game, teacher guides, and digital learning modules all of which can be customized to local cases, businesses, and resource types. This strengthens the project's European scalability and knowledge-sharing capacity.

At the same time, the project has demonstrated that social innovation requires long-term effort, continuity, and local presence. In its first phase, Go-SYM has been driven by strong personal commitment and limited resources but with a significant effect among those who have engaged. It is precisely in this tension between the informal and the structural, the experimental and the strategic, that Go-SYM finds its strength.

Across the activities in Chapter 4, the following key points emerge:

- **Green education is a prerequisite** for local empowerment and legitimacy.
- **Social spin-offs build bridges** between technological innovation and civic engagement.
- **Long-term anchoring** and European dissemination require learning, collaboration, and place-based development but can be strengthened through targeted method-sharing and adaptable formats.

Go-SYM is not just a component of the project it is a living testament to how SYMSITES' goals can become reality through people, places, and relationships and holds potential **for** mutual inspiration across regions in Europe.

5. Local Symbioses through Design: Four Steps Toward Circular Change

The establishment of Go-SYM in Svaneke has led to a series of tangible symbiosis initiatives and social innovation activities, all sharing a common foundation: they have been developed, tested, and adapted in close collaboration with citizens, businesses, and institutions. To ensure that these processes were meaningful, systematic, and locally rooted, the work has been guided by BOFA's internally developed **Design Manual for Circular Change** a method created during the EU project WASTEMAN.

The design manual provides a four-step model for translating complex waste and resource challenges into concrete, collaboration-based solutions. The method has proven highly applicable in the SYMSITES context, where the goal is to develop I-US as both a technical system and a social practice.

Step 1 – Get Specific: Build Insight into the Local Challenge

The first step is to understand the local context in depth. In Svaneke, this meant identifying:

- Which actors, waste streams, and resources exist in the area?



- What relationships and practices are already in place?
- Where are the frictions, opportunities, and untapped potentials?

Through conversations, workshops, and field studies, a shared understanding was developed of how waste moves through the town and where new connections could be formed (e.g., between Spröt and the local brewery, or between schools and daycare centres for joint sorting systems).

Step 2 – Take Action: Test Concrete Interventions

Based on the insights, a series of small but meaningful experiments were initiated:

- Voluntary bio-waste sorting in businesses (Spröt, Vinøst)
- Reuse of wine bottles from Siemsgaard for local fruit juice production
- Pilot testing of an educational board game on resource transformation
- Excursions and local mapping projects with school students

These activities required no major investments but generated momentum, engagement, and visibility.

Step 3 – Make It Work: Systematize and Share What Works

Following the first trials, a process began to structure and document the most promising initiatives:

- Development of teaching materials and the board game for open use
- Creation of a digital materials bank in collaboration with Campus Bornholm
- Involvement of teachers and other stakeholders in co-developing new modules
- Partnerships with businesses and institutions to establish resource routes

The result is a set of scalable and transferable methods and formats that can be used in other parts of Bornholm and extended across the SYMSITES European network.

Step 4 – Learn and Adjust: Reflect and Improve

The final step involves collecting feedback, evaluating results, and making necessary adjustments. This has been done through:

- Surveys of students and teachers
- Feedback from participating businesses and partners
- Internal reflection processes within Go-SYM and BOFA
- Continuous iteration of messaging, game mechanics, and collaboration formats

This reflexive approach ensures that symbiosis development in Svaneke is not static but continually adapts to new needs, opportunities, and learnings.



Methodological Strength and Replication Potential

The four-step model from the Design Manual has proven especially valuable in a setting like Svaneke, where diverse actors must be engaged in a shared local context. The method balances structure and flexibility and enables the progression from idea to action in a way that fosters genuine ownership among participants.

All core materials from Go-SYM including the board game, teacher guides, business cards, and educational modules are designed with replication in mind. This means they can be easily adapted for use in other European towns and regions with similar circular ambitions.

As such, Go-SYM and its associated methodological approach represent a concrete model for locally anchored social symbiosis development one that can inspire both SYMSITES partners and other actors working toward bottom-up circular transitions.

5.1 Guide to Small-Scale Symbioses

A Guide to Establishing Local Symbiosis-Based Innovation Ecosystems in Small Towns (Based on Experience from Svaneke)

This guide offers a step-by-step model for how small communities and EcoSites can work with I-US through locally anchored innovation, citizen engagement, and social value creation. It is based on practical experience from Svaneke, and draws on methods from BOFA's *Design Manual for Circular Change*, the social spin-off *Go-SYM*, as well as concrete educational and prototype projects.

Step 1: Map Local Resources and Challenges

"Understand what you have and what you're trying to solve."

Actions:

- Host a participatory mapping workshop with citizens, businesses, and institutions
- Identify existing infrastructure, skills, traditions, and key actors
- Define local challenges (e.g., seasonal economy, aging population, climate adaptation)

Example from Svaneke: Mapping of food waste from cafés, wine bottle return systems, school and leisure activities

Output: A shared map of local resources and opportunities for circular development

Step 2: Identify Symbiotic Actor Pairs or Networks

"Find partnerships where value can circulate."



- Use the quadruple helix approach (public sector, businesses, academia, and civil society)
- Match actors based on complementary needs and resources e.g., waste from one business as input for another

Example from Svaneke: Collaboration between Spröt and local gardens (bio-waste), Siemsenngaard and juice producers (reused wine bottles)

Output: A network map of potential and existing resource flows

Step 3: Frame a Shared Purpose or Local Mission

"Create alignment and shared ownership."

- Facilitate a co-creation workshop to define a local mission (e.g., "Make Svaneke Denmark's most circular town")
- Apply principles from mission-oriented innovation: clear challenge + collaborative solutions + measurable impact

Example from Svaneke: Local momentum built through collaboration between schools, citizen groups, and businesses on circular initiatives

Output: A local innovation charter or symbiosis manifesto

Step 4: Prototype Micro-Innovations in Practice

"Small, visible actions create trust and energy."

- Launch small, fast pilot projects with visible environmental or social benefit
- Involve youth, community champions, associations, and small businesses

Examples from Svaneke:

- Pilot collection of food waste from cafés and restaurants
- Development and testing of a resource symbiosis board game in schools
- Reuse of wine bottles in local food loops

Output: One or more early-stage success stories to build momentum

Step 5: Document Social Value Creation

"Track not only outputs but also impact."

Develop indicators for social spin-offs, such as:

- New partnerships and community networks
- Youth and citizen engagement
- Improved sorting systems and resource loops
- Creation of green jobs or educational programs



Example from Svaneke: Evaluation of school programs, student reflections, feedback from businesses and educators

Output: A local impact report or storytelling platform for social innovation

Step 6: Build Local Capacity and Organization

"Make collaboration part of the town's identity."

- Establish a local coordination group or innovation hub (e.g., Go-SYM)
- Partner with vocational schools, secondary schools, and universities
- Train local facilitators in design thinking, symbiosis logic, and social entrepreneurship

Example from Svaneke: Partnership with Campus Bornholm to co-develop learning modules and a digital materials bank

Output: A long-term structure to sustain and expand local symbiosis work

Step 7: Reflect, Adjust, and Share Learnings

"Treat symbiosis as a process not a destination."

- Hold regular reflection meetings and feedback workshops
- Apply process-oriented thinking: create space for change, experimentation, and iteration
- Share lessons learned with other towns, EcoSites, and EU partners

Example from Svaneke: Iterative development of materials and experience sharing via webinars and teaching formats

Output: A living innovation ecosystem that evolves over time and inspires others

Appendices and Replication Tools

The following materials and methods can be adapted and reused in other towns:

- Editable resource symbiosis board game
- Curriculum plans and teacher guides (for both lower and upper secondary levels)
- Four-step Design Manual for local circular change
- Templates for actor mapping, local mission design, and learning logs
- Evaluation tools and indicators for social impact
- Digital materials bank (shareable via project platforms and partner networks)

5.2 Sub-conclusion – Deliverable 5.1: Social Spin-Off and Local Anchoring

Deliverable 5.1 documents the establishment and development of the social spin-off Go-SYM in Svaneke, Bornholm, as a concrete embodiment of SYMSITES' ambition to embed I-US within real-life community contexts. Throughout the project,



a diverse range of locally adapted activities have been launched, merging circular practices, educational innovation, and civic engagement.

The process has shown that even in a small town with limited resources, it is possible to build a dynamic and evolving innovation ecosystem, when local knowledge, institutional partnerships, and citizen-driven experimentation converge.

Key outcomes include:

- The active involvement of citizens, schools, associations, and local businesses in sorting, reuse, and co-design initiated through trust-based collaboration and direct, informal outreach.
- The development of educational tools such as a resource symbiosis board game and an upper secondary school curriculum, tailored to the Bornholm context and openly available for adaptation and replication.
- The application of BOFA's four-step design methodology, which provided a robust yet flexible model for initiating local circular transitions.
- The creation of a replication guide, based on hands-on experience in Svaneke, now serving as a toolkit for other European EcoSites seeking to foster socially embedded circular innovation.

This deliverable also reflects key challenges. Participation in formal stakeholder events was limited, and much of the coordination depended on individual initiative. However, those who did engage often became highly committed contributors and have since evolved into key enablers of local transformation.

The work in Svaneke demonstrates that the success of social symbiosis initiatives is not defined by scale, but by authenticity, practical relevance, and the ability to adapt methods to local culture and context.

Looking ahead, the Go-SYM initiative will be expanded through continued collaborations with Campus Bornholm, the potential establishment of new spin-offs (e.g., a regenerative pilot at the Svaneke Plantation), and extended partnerships across education, civil society, and the green economy.

In conclusion, Deliverable 5.1 presents a tested, scalable, and replicable model for how social spin-offs can anchor symbiosis-based circular innovation at the community level with the potential for broader European dissemination through networks of learning, mutual inspiration, and ongoing experimentation.

6. Conclusion

Deliverable 5.1 demonstrates how social spin-offs can serve as effective anchors for I-US in small towns and rural communities. Through the creation and piloting of the Go-SYM initiative in Svaneke, Bornholm, the SYMSITES project has shown that social innovation, citizen engagement, and circular resource use can be successfully combined even in contexts with limited infrastructure and capacity.

The Go-SYM spin-off has enabled a range of activities that translate the abstract goals of I-US into tangible, locally relevant action. This includes:

- **Engagement of diverse local actors** (citizens, schools, businesses, associations) in sorting, co-design, and reuse initiatives;



- **Development of educational tools** like the resource symbiosis board game and modular teaching programs that embed circular thinking into school curricula;
- **Pilot testing of circular practices**, such as reusing wine bottles and redistributing food waste for biogas or compost;
- **Application of BOFA's four-step design model**, offering a methodical approach to developing local symbioses;
- **Production of a 7-step replication guide** enabling other EcoSites to adapt and scale these innovations.

Challenges such as limited formal participation, dependence on individual initiative, and the complexity of communicating I-US concepts in everyday language were addressed through adaptive strategies, informal engagement formats, and iterative learning. These efforts resulted in deep local ownership, trust, and commitment among participants.

The success of Go-SYM lies not in the scale of activities, but in their authenticity, responsiveness to local conditions, and capacity to evolve. It serves as a prototype for how local communities can co-create and sustain socially embedded circular ecosystems providing valuable insights and tools for replication across Europe.

Looking forward, Go-SYM will expand through further collaboration with Campus Bornholm, exploration of new spin-offs (e.g., a regenerative project at the Plantation), and integration with SYMSITES' technological developments. This model offers a path toward systemic change, grounded in people, place, and practice.

In essence, Deliverable 5.1 offers a living example of how socially driven symbiosis can be implemented, replicated, and scaled in diverse European settings bridging the gap between high-level policy and everyday life.



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Appendices

Appendix 1- Cardboard game

Embedding the concept of industrial and urban symbiosis in a local context

Table of content

- Why engage people/youth in the ideas of urban/industrial symbioses?
- An interactive learning experience: Why a board game?
- How does the board game work and involve the youth?
- Outputs from the tests of the game
- Ideas for how to replicate board game in other geographic contexts
- Conclusion

Why engage people/youth in the ideas of urban/industrial symbioses?

There are many advantages to engaging local communities in the ideas behind urban and industrial symbioses, and any local symbiosis projects. When citizens are included in decision-making, transferring of knowledge, and given tools to participate it increases their sense of ownership and empowers them to take local action on more systemic issues, such as resource consumption.

On the island of Bornholm, BOFA (Bornholm's waste company), has focused on anchoring the ideas behind urban and industrial symbioses amongst the youth, to make them reflect on their own and the island's waste production and resource use. Allowing the youth of Bornholm to get immersed in what resource symbioses mean in a local context, what such symbioses might look like, and how they could exist amongst recognisable places and organisations, is one way to make global environmental issues more tangible. It provides young people with important knowledge and ownership of how to translate larger systemic issues into manageable and concrete challenges and opportunities to tackle within their own realm. As such, it is a way of socially anchoring the concepts and ideas of resource symbioses in a local context.

An interactive learning experience: Why a board game?

To engage young people on Bornholm in the opportunities for resource symbioses on the island, a board game was developed for students in grade 7-9 in the Danish folkeskole (students aged approx. 13-16 years old). The board game allows students to learn about what resource symbioses are, while also identifying opportunities for smarter resource use in their own local context.



A board game is an interactive and fun way for students to learn, piquing their interest in a topic they might only be vaguely familiar with. The board game is designed to make the students reflect on smarter resource use, by employing various facilitative and design driven elements. In addition to the board game, students are given a brief introduction to the general concept of resource symbioses by a facilitator or teacher. Material for this is included in the teacher's guide for the game.

How does the board game work and involve the youth?

To make the concept of resource symbioses easier to grasp, the board game focuses on small scale resource symbioses that could (or already does) exist on Bornholm, i.e. a bakery using the spent grains from a brewery. The board game is centred around students playing in smaller teams, where the goal for each team is to visit different local businesses around the board to collect waste products, which they can then hand over as resources to other businesses to establish local resource symbioses.

A key strategy for making it an interesting learning experience for the students, is to make the game competitive. The competitive element was incorporated by having the smaller teams play against each other in a race to earn as many points as possible within a given timeframe, as well as making it possible for teams to take or trade collected resources from each other.

To make the students reflect on the hierarchy of the multiple ways that waste or byproducts can be used, teams gain more or fewer points depending on where they deliver the waste product to. A waste product is worth more points when incorporated into a resource symbiosis between two businesses, and less points if the waste product is delivered to the local recycling station.

The board game is designed to be simple in setup, but through competitiveness and information on board game elements, encourages the students to engage in dialogue about the value of waste products, resource symbioses and what they might look like in their own very local context.

To ensure this, the board game was tested two times during the development process. First amongst employees at the consultancy who developed the game (Behave Green), who had not been involved in the making of the game. Hereafter, feedback was received, and relevant adjustments were made. The updated board game was then tested amongst a group of students in Svaneke, Bornholm.



Ideas for how to replicate board game in other geographic contexts

The board game can easily be replicated to be played in other geographic contexts. The general design can be replicated 1:1 and files for all board game components can be downloaded in an editable format from. However, content of course must be adapted to the local context it is meant to be played in. This is what you need to do and be aware of, when replicating the board game to your geographic context:

- **Identifying possible resource symbioses** – make a list of the types of local businesses in your geographic context, note down what waste products they produce, and then identify possible resource symbioses amongst the different businesses. We recommend creating a morphology matrix to organise this. You now have a structured overview of all the businesses to include on the board, and which “business cards” and “resource cards” to make.
- **Business cards** – fill in information about each of the selected businesses: the name/title of the business, a short description of what the business produces, a list of resources they can use in their production, and a list of the waste products they create.



- **Resource cards** – the name of the resource, a short description of what the resource is, and in what production settings it can be used.
- **The board** – redesign the board to visualise the outline of your geographic setting. Plot the local businesses across the board using relevant icons, logos or pictures. Make sure to create maximum distance on the board between businesses that can connect in a resource symbiosis. This ensures that resource symbioses are not made too fast, and that the game is not too easy.
- **Introduction to the game and concept of resource symbioses** – students should be given a brief introduction to the concept of resource symbioses. The length and complexity of this information should be tailored to the students in your target group. We recommend keeping the information brief and simple.

