



Facilitators guide Industrial Symbiosis

FROM KALUNDBORG TO RIO



Danish Energy Agency



What is the guide and what you will find in it?

Industrial Symbiosis is a concept that promotes companies' cooperation to optimize the use of resources – reducing waste, emissions, and costs while generating environmental, social, and economic benefits.

This concept is inspired by nature, where the output of one organism becomes a resource for another. In an industrial ecosystem, residual streams such as heat, wastewater, sludge, biomass, gases, or by-products become inputs for neighboring companies, replacing virgin raw materials.

P.R.E.S.I Project

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What is

Industrial Symbiosis?

**Welcome to the Industrial Symbiosis
Facilitator's Guide!**

If you have come across this guide, it's likely that you've already heard about industrial symbiosis

and its many benefits — perhaps inspired by the case of Kalundborg Symbiosis, or motivated by the important collaboration between Denmark and Brazil to advance industrial symbiosis as a strategy for decarbonization and circularity in the industrial sector of Rio de Janeiro, through the PRESI Project, based in the Santa Cruz Industrial District.

Whatever your starting point may be, this guide is dedicated to you — someone who recognizes the importance of a shift in mindset toward a more sustainable society, values the preservation of natural resources, and understands circularity as an opportunity to unite economic growth with environmental benefits.

If your goal is to bring industrial symbiosis into your own context, this guide will support you on that journey. Drawing on Danish and Brazilian experiences, it offers a practical and accessible overview of the pathways to becoming a facilitator, outlining the roles of key actors, the necessary resources, the main challenges, and strategies to overcome them.

At first glance, industrial symbiosis may seem complex — but at its core, it's about connecting the right partners and mobilizing available resources to create shared value.

Industrial symbiosis means development, innovation, and sustainability — but above all, it's about people: collaboration, trust, and a shared sense of purpose.

We hope this guide inspires you to embark on your own journey as an industrial symbiosis facilitator, contributing to the creation of a more circular, efficient, and sustainable economy.

Industrial Symbiosis (IS)

is a concept that promotes companies' cooperation to optimize the use of resources reducing waste, emissions, and costs while generating environmental, social, and economic benefits.

This concept is inspired by nature, where the output of one organism becomes a resource for another. In an industrial ecosystem, residual streams such as heat, wastewater, sludge, biomass, gases, or by-products become inputs for neighboring companies, replacing virgin raw materials.



What are the benefits of Industrial Symbiosis?

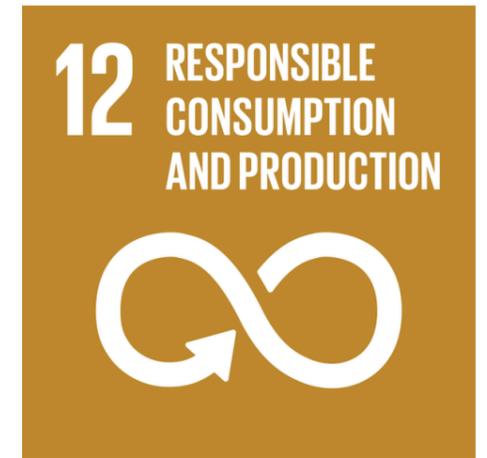
Welcome to the Industrial Symbiosis Facilitator's Guide!

Industrial symbiosis transforms isolated industrial operations into collaborative circular networks, where:

- Resources circulate, reducing extraction.
- Waste becomes value, minimizing handling and disposal costs while creating new revenue streams.
- Shared systems reduce costs and environmental impacts.
- Innovation emerges from collaboration.
- Companies enhance their competitiveness in a market that is increasingly attentive to sustainability practices;
- Territories increase their ability to attract new investments, positively impacting the local economy.



SDGS DIRECTLY RELATED TO INDUSTRIAL SYMBIOSIS



In the context of the green transition, IS directly supports the UN Sustainable Development Goals (SDGs), directly and indirectly as follows:

SDG 9

Industry, Innovation and Infrastructure

Core alignment with IS: industrial innovation and shared infrastructure

SDG 12

Responsible Consumption and Production

Waste reduction, resource reuse, circular economy

SDG 13

Climate Action

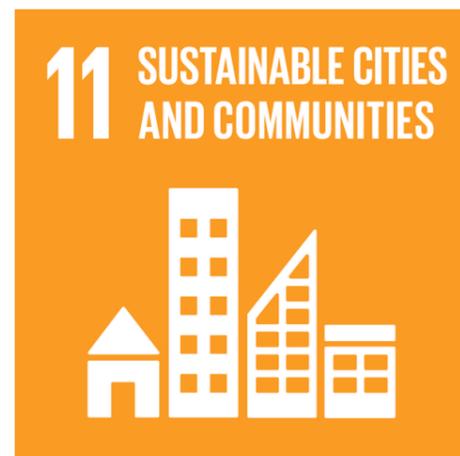
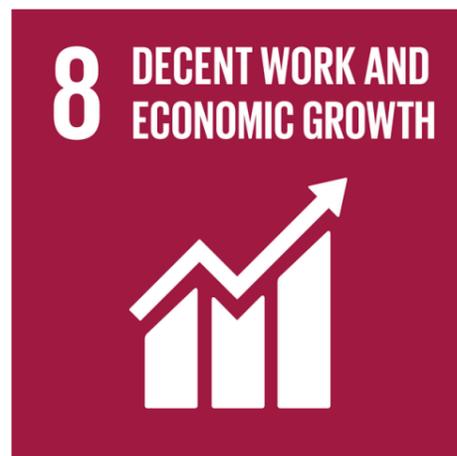
Emissions reduction through improved energy and material efficiency

SDG 17

Partnerships for the Goals

Collaborative governance among private sector, government and academia

SDGS INDIRECTLY BUT STRONGLY SUPPORTED



In the context of the green transition, IS directly supports the UN Sustainable Development Goals (SDGs), directly and indirectly as follow: SDGs indirectly but strongly supported

SDG 6

Clean Water and Sanitation

Wastewater reuse and reduced potable water extraction

SDG 7

Affordable and Clean Energy

Waste heat recovery, shared energy systems

SDG 8

Decent Work and Economic Growth

Regional economic development and new business models

SDG 11

Sustainable Cities and Communities

Eco-industrial parks and sustainable territorial planning

SDG 14

Life Below Water

Reduction of industrial discharge into waterways

SDG 15

Life on Land

Reduced extraction of natural resources and soil contamination



National Framework

Such as Brazil's NDC commitments to the Paris Agreement benefit from IS by promoting decarbonization through circularity and energy efficiency.



How Industrial Symbiosis Works

Exchange of different types of resources and services.

Industrial Symbiosis materializes through the exchange of different types of resources and services that traditionally would be treated as waste or managed individually by each company. These exchanges include the reuse and cascading of water, where treated wastewater from one industry can serve as input for cooling, washing, or process operations in another. They also involve the sharing of energy streams, such as waste heat recovery, enabling one company's excess thermal energy to replace the need for fossil fuel consumption elsewhere.

Additionally, industrial symbiosis can convert biomass and other organic residues into valuable inputs through composting, bioenergy generation, or biotechnological processes, while chemical compounds and metals can be recovered and reintegrated into industrial value chains, reducing dependence on raw material extraction.

Beyond physical resource flows, symbiosis can expand into shared services and shared infrastructure, such as common laboratories, joint logistics, environmental monitoring systems, or wastewater treatment facilities. These collaborative solutions enhance operational efficiency and foster long-term financial gains.

For these exchanges to be viable, several enabling conditions must be present. Resource flows must demonstrate technical compatibility, meaning that the physical, chemical, and operational characteristics of residual materials must align with the needs of other companies. Geographic proximity also plays a central role, as shorter distances reduce transport costs and environmental impacts while facilitating daily interaction and coordination. Most importantly, symbiotic relationships depend on trust and governance structures that ensure transparency, shared value, confidentiality, and equitable benefit distribution among participants. Finally, the active involvement of public authorities – through adequate regulatory frameworks and public-private cooperation – is critical to unlocking the full potential of symbiosis, especially for exchanges involving regulated materials such as wastewater, by-products, or energy networks.

In Kalundborg Symbiosis – the world's most mature and advanced industrial symbiosis network – the partners have, for more than 50 years, proven that Industrial Symbiosis is more than an environmental strategy. It's also a business model for competitiveness and regional development.



About Kalundborg Symbiosis

Kalundborg Symbiosis is the world's first industrial symbiosis, where companies exchange resources, energy, and by-products to reduce waste and CO₂ emissions.

What is Industrial Symbiosis Facilitation?

Industrial Symbiosis facilitation refers to the intentional coordination of stakeholders to promote cooperation among industries to enable mutually beneficial exchanges of water, energy, materials, services, knowledge, and infrastructure. Rather than providing consultancy services or imposing regulatory mandates, the facilitator acts as a neutral orchestrator who supports the emergence of trust, transparency, and long-term collaboration. The role of the industrial symbiosis facilitator is key in making new industrial symbiosis possible.

The Kalundborg Symbiosis serves as a leading example of a formal facilitating entity that actively nurtures and expands symbiotic collaboration over time. Through continuous coordination, communication, and technical support, it ensures that partnerships remain strong and mutually beneficial. By establishing frameworks that build trust and confidence, the facilitation team helps create constructive relationships and a shared approach to addressing common challenges among the partner companies. This ensures long-term viability and success.

The Role of Institutions in Being Facilitators

Considering the various contexts in which collaboration between industries for the implementation of industrial symbiosis strategies can be encouraged, different types of entities can act as mobilizers of the process, building a local group of facilitators for the symbiosis process.

The facilitation process begins with at least one institution stepping forward to lead the initiative. This entity should have a solid understanding of the local context and be able to identify the key partners for project implementation.

At the same time, Industrial Symbiosis implementation is strengthened when multiple institutions share complementary responsibilities. In order to succeed in setting up an industrial symbiosis it is important to consider the specific roles and competences of the actors involved - and to engage them in the process. The main stakeholders are:

- **GOVERNMENT**
- **INDUSTRY**
- **INDUSTRY ASSOCIATIONS**
- **ACADEMIC INSTITUTIONS**
- **REPRESENTATIVE INSTITUTIONS**

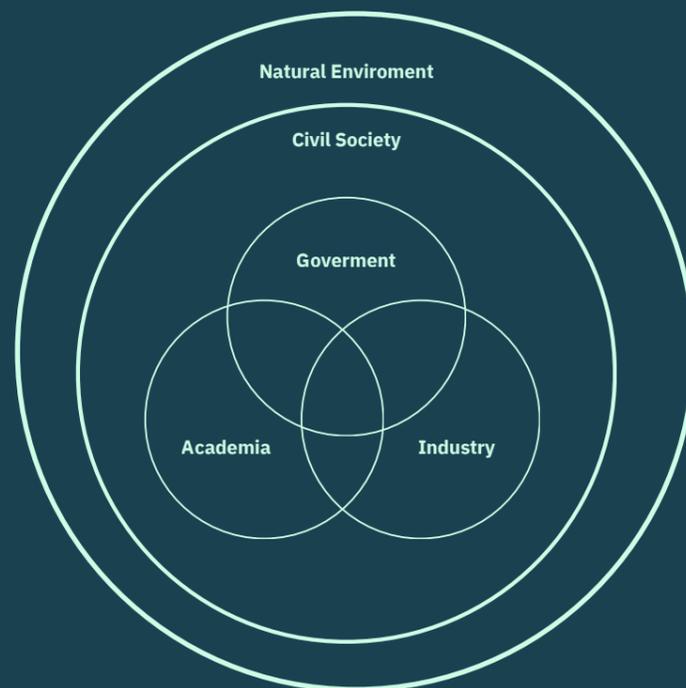


Government

Government agencies play a fundamental role in encouraging the industrial sector to adopt practices that foster the transition to a more circular economy. They are also responsible for enabling policies and regulatory frameworks that support the valorization of waste streams, ensuring public-private collaboration, and for formulating policies that foster and finance innovative practices. However, they may face challenges such as bureaucratic fragmentation, limited continuity due to political cycles, and difficulties in adapting regulatory frameworks to keep pace with evolving practices. To overcome these difficulties, governments must adopt coordinated governance practices, encourage the creation of experimental settings for regulatory innovation, for instance regulatory sandboxes and promote the institutionalization of mechanisms to secure the long-term continuity of industrial symbiosis programs.

Industries

Industries are key actors because they possess the technical knowledge and tangible resource flows needed for symbiosis. Their main barriers involve time constraints, risk aversion, low prioritization of new initiatives, and uncertainty regarding financial returns. Consequently, early implementation of low-complexity synergies, supported by feasibility indicators, helps build confidence, trust and mobilize decision makers. Leadership engagement together with continuous internal and external communication are essential for maintaining commitment.



Industry associations

Industry associations such as AEDIN and the Kalundborg Symbiosis function as impartial conveners that unify companies around shared goals. They are well positioned to house a dedicated symbiosis secretariat capable of coordinating data management, workshops, communication, and institutional representation. Their main challenges involve securing sufficient technical resources and adapting their governance structure to incorporate the symbiosis model. Partnerships with academia and public agencies are effective strategies to reinforce their technical capacity.

Representative organizations

Representative organizations such as business support institutions – whether organized by sector or by company size – play a crucial role in fostering symbiotic practices among the companies they represent, ranging from large industries to SMEs. They can provide training, facilitate access to financing, and promote visibility for successful cases. Since these institutions have broad mandates, prioritization of strategic industrial areas and staged approaches are needed to avoid dispersion of effort. Together, these organizations ensure that symbiosis is not limited to large firms but becomes a regional development strategy.

Academic and research institutions

Academic and research institutions contribute with specific scientific competences—such as material characterization, LCA analysis, and modeling—and ensure that implementation efforts are grounded in evidence. Nevertheless, they often operate under different time horizons than businesses and may lack familiarity with industrial decision-making. Integrating students and researchers into active industrial projects enables a more agile and practice-oriented scientific contribution.

Civil society

Civil society also plays a critical role in strengthening the legitimacy and long-term acceptance of industrial symbiosis initiatives. Local communities, NGOs, and community associations can provide valuable perspectives on environmental and social priorities, ensuring that symbiosis projects contribute to quality of life, environmental justice, and inclusive development. Their involvement increases transparency, reinforces trust between industries and the surrounding territory, and encourages industries to adopt more responsible practices that align with community expectations. When civil society is actively included in dialogue and decision-making, industrial symbiosis becomes not only a technical innovation, but a pathway to territorial sustainability grounded in shared benefits.

Facilitation tips and key learnings

Common Challenges

Experience from Kalundborg Symbiosis and from the Santa Cruz Industrial District demonstrates that the success of Industrial Symbiosis depends not only on technical compatibility between resource streams but also on the quality of social relationships and communication. Trust must be actively cultivated through repeated opportunities for face-to-face interaction, exchange of operational knowledge, and collaborative ideation. Visual tools such as resource maps and symbiosis network diagrams help companies understand the broader system and identify where they can contribute.

Confidentiality agreements help manage data-sharing concerns, while phased pilot projects enable stakeholders to observe benefits before committing major investments. Regular communication of results and positive outcomes reinforces motivation, improves legitimacy, and inspires replication. In addition, institutional continuity is essential – without long-term political or organizational support, symbiosis networks are vulnerable to discontinuity.

Role of Facilitators in Creating Symbiosis Opportunities

Facilitators perform the function of transforming potential synergies into real exchanges, and mobilizing the right partners to make it happen. To accomplish this, it is crucial to apply systemic thinking in order to interpret industrial processes as interdependent components of an ecosystem. Strong communication and stakeholder management skills are required to align priorities, build collaboration, and sustain engagement from both leadership and operational teams. Creativity and persistence are fundamental, as not all opportunities will be feasible or successful on the first attempt. It is also important to highlight that different types of professional backgrounds contribute to a successful industrial symbiosis - you do not have to be an engineer in order meaningfully contribute to the facilitation process of industrial symbiosis.

Institutional backing is a decisive factor. Facilitators must be embedded in or supported by credible organizations – such as government agencies, academic institutions, or business associations – in order to can guarantee access to resources, legitimacy for negotiations, and durability beyond individual project cycles.

This structured support is what transformed Kalundborg from a bilateral exchange initiative into a globally recognized industrial ecosystem and what currently underpins the evolution of PRESI in Santa Cruz. With strong governance and consistent facilitation, Industrial Symbiosis becomes a long-term development strategy that aligns economic competitiveness, environmental protection, and regional resilience – a true “win-win” model for industry and society



Facilitation Process



In order for you to be able to facilitate an industrial symbiosis development in your area it is important to have an understanding of the different phases that your development will go through.

The process in Santa Cruz evolved through multiple streams of activity, requiring different levels of engagement and coordination among stakeholders – enabling progress from conceptual understanding to bringing real exchanges closer to reality, with tangible economic, environmental, and social benefits.

Low-hanging fruits, or short-term opportunities, are those that require minimal investment or process adaptation while generating immediate environmental and economic benefits.

The first phase focused on introducing the concept, engaging companies, collecting data, and mapping material, water, energy, and residual flows within industries, followed by the identification of potential synergies.

The second phase involved creating an opportunity map and identifying barriers and requirements for project development, leading to the design of pilot projects.

The third phase – currently underway – focuses on presenting opportunities to key decision-makers within the companies to secure the necessary resources and promote internal reorganization to move the strategies forward.

The final phase requires a high degree of coordination, mutual trust, and institutional maturity, as it entails concrete changes in companies' production processes.

The case of the Santa Cruz Industrial District has also led to the identification of different types of projects that can be implemented, varying in their level of complexity and maturity: low-hanging fruits, medium term opportunities and long-term complex projects.

Medium-term opportunities are associated with adjustments in infrastructure, regulatory alignment, or intercompany operational coordination.

The PRESI project identified opportunities such as the valorization of residue from steel company as gypsum feedstock for plasterboard fabrication; reverse logistics solutions for ink cans; expansion of an existing initiative that converts organic residues generated by local industries into high-quality compost distributed to nearby farmers; shared water and effluent management; integrated utility systems – such as steam, compressed air, and district cooling; and the shared supply of compatible chemical inputs for wastewater treatment.

These projects typically require regulatory adaptation, financial assessment, and coordinated decision-making among multiple companies – which is why they rely strongly on the presence of a facilitating organization.

Finally, long-term complex projects are strategic initiatives that involve technological innovation, robust investment in new infrastructure, and partnerships with external actors. In Santa Cruz, these include advanced R&D projects on low-carbon hydrogen, biogas conversion, Power-to-X (P2X) fuels, and CO₂ capture, utilization and storage (CCUS).

Future collaboration opportunities are also being developed with international stakeholders and funding agencies, with potential to strengthen green industrial transformation in the region. Additional initiatives may include shared industrial services, such as transportation, security, and emergency response, aligned with a broader vision of sustainable and efficient industrial governance.

In the case of Santa Cruz, the structured facilitation process – led by AEDIN and supported by the State Government, and academic partners – enables continuous progress, moving from short-term pilots to medium-term scaling and long-term technological transformation, positioning Santa Cruz as a benchmark in Brazil for circular and low-carbon industrial development.

As a facilitator of a new industrial symbiosis it is vital that you together with your stakeholders get a realistic overview of these different types of development activities. This will help you align ambitions, agree on timelines and create a shared vision of the development of your symbiosis.

Practical Tools & Methods



The Technical Screening Tool and Method

The Industrial Symbiosis screening methodology consists of two main phases: pre-screening and on-site screening. Together, these provide a structured approach for identifying IS opportunities in new industrial areas or parks.

Pre-screening:

This “desktop” phase gathers readily available information about the area—such as existing infrastructure, companies, utilities, and resource flows—using public sources like databases, maps, reports, and business registries. The goal is to identify potential clusters and select the most promising sites for further investigation.

On-site Screening:

Following the pre-screening, detailed assessments are carried out at a minimum of three production facilities within the selected area. These site visits, conducted with company representatives, explore production processes and resource use to uncover internal optimizations and external symbiosis opportunities. Clear communication and preparation are essential to align expectations, build trust, and ensure relevant staff participation.

During the walkthroughs, the technical team documents material and energy flows using the Onion Diagram and Resource Mapping Model, identifying residual resources that could be exchanged between companies. Findings are summarized in a Screening Report and an Action Matrix, listing potential projects, responsible persons, stakeholders, and priorities—covering both internal optimizations and cross-company symbiosis projects.

For a more detailed introduction to the concept of technical screenings the project partners behind the PRESI project will be happy to connect with you!



Facilitation Tools – Creating Engagement and Institutional Backing

Beyond the technical screening and material mapping, a key focus of industrial symbiosis implementation is to engage stakeholders through facilitated meetings and workshops involving both public and private partners. These workshops aim to:

- Build awareness and institutional support for the concept of industrial symbiosis among stakeholders and specially from decision-makers.
- Expand the project’s reach by involving new stakeholders and fostering a wider, more collaborative community
- Strengthen trust and develop a shared vision for the future

The discussions enable projects to advance continuously – from the initial stage of concept presentation and stakeholder engagement, through the identification of opportunities and discussion of implementation challenges, to bilateral meetings aimed at advancing negotiations. These recurring spaces for interaction help consolidate the concept of symbiosis among participants and, as the process evolves, become progressively more strategic, accompanying the maturation of the projects and the movement toward the practical realization of the initiatives.

Such activities are essential for any future symbiosis facilitator. Industrial symbiosis cannot thrive within a single company—it must be approached more holistically in a broader circle of companies and other relevant stakeholders. This is a collaborative process that requires active facilitation, open dialogue, and a willingness to think beyond individual gains toward the shared benefits of the broader system.

A variety of methodologies can be applied to structure workshops, aiming to explore shared values, define common goals, and discuss local barriers and opportunities. It’s important to note that the challenges will differ from country to country and district to district, so it is crucial to dedicate time to understanding the specific needs and realities of your ecosystem. Below, we present a widely used and effective model to foster spaces for exchange and reflection, where different perspectives on relevant topics can be explored.

Method: The World Café Workshop

One highly effective format for these early-stage dialogues is the World Café, a widely used participatory method designed to spark conversation, build relationships, and surface new ideas quickly. It provides structure while encouraging openness and creativity among participants.

How to Run a World Café:

Prepare the space

Arrange several small tables (ideally 4–6 people per table). Each table should have paper, markers, and space for note-taking.

Define the key questions

Select 2–4 guiding questions that address shared goals, challenges, or opportunities related to industrial symbiosis.

Start the conversation

Participants discuss the first question at their tables for 15–20 minutes, capturing key insights on paper.

Rotate and connect ideas

After each round, one person remains as the “table host,” while others move to new tables to cross-pollinate ideas.

Synthesize and share

After several rounds, all participants come together to summarize the main themes, patterns, and potential actions that emerged during the discussions.

This process helps create a strong foundation of shared understanding, trust, and ownership—essential ingredients for successful collaboration and long-term industrial symbiosis.

Recommended questions to explore:

What are your company or organization concerned about right now?

What challenges can industrial symbiosis help us meet? Are there issues that thread our license to operate?

What shared goals or values unite our efforts toward a circular future?

How can my organization contribute to a wider circular infrastructure?

What specific challenges do we face in making industrial symbiosis a strategic priority?

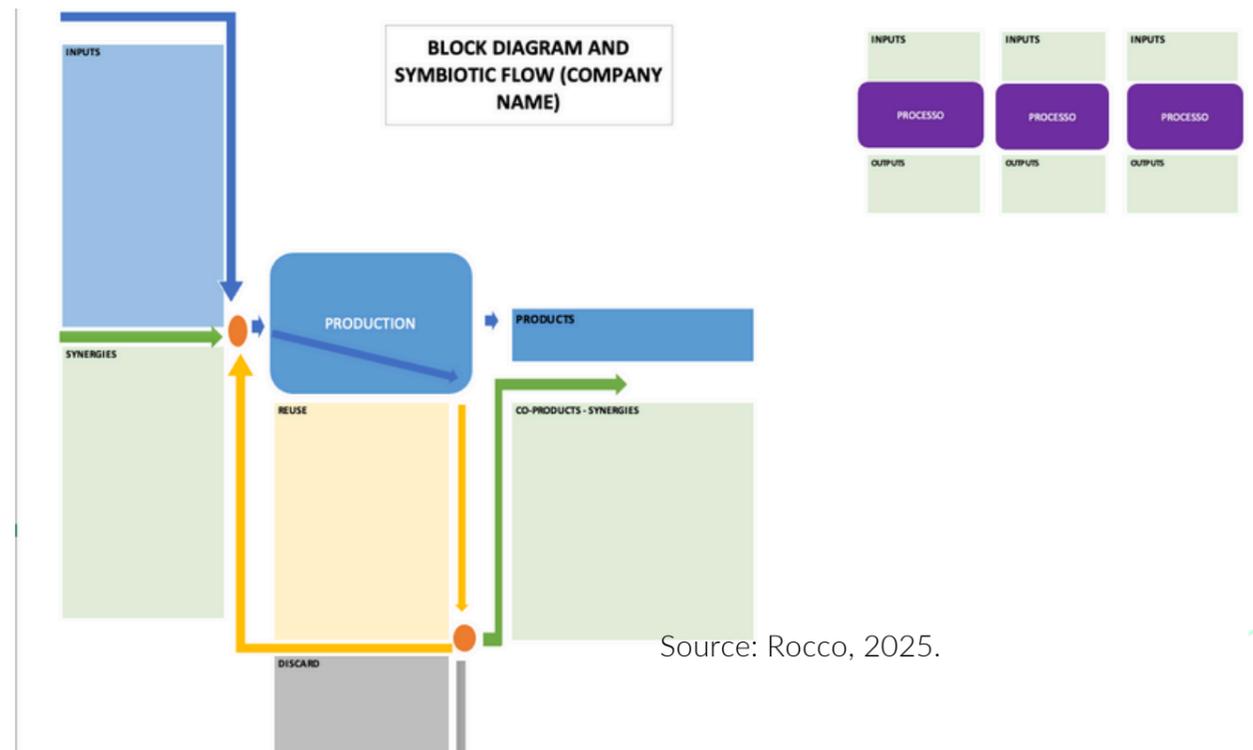
The application of the screening methodology: the evolution of the Symbiotic Flow in Santa Cruz

The evolution of the symbiotic flow in the Santa Cruz Industrial District progressed through a structured facilitation approach based on Kalundborg Symbiosis practices and adapted to local conditions. To support the qualitative mapping of potential exchanges, a tailored screening tool was developed drawing inspiration from the Kalundborg Symbiosis model, which has organically matured over more than five decades of industrial collaboration in Denmark. This tool enables the identification of major inputs and outputs from production processes, facilitates the recognition of excess resources, and reveals opportunities for reuse, cascading and symbiotic integration among companies located within the cluster.

The facilitation journey began with structured technical visits to the participating companies, conducted by a multidisciplinary team with the objective of identifying inefficiencies and potential exchanges that could lead to improved resource performance. After each visit, the findings were interpreted and documented using block diagrams and symbiotic flow charts, which formed the basis for the first version of the industrial symbiosis opportunity map developed by the AEDIN Environmental Technical Committee.

Ten block flow diagrams were produced during this phase, each describing the operational profile of the mapped industries, their particularities, and the potential synergies identified through qualitative analysis. From this material, the first general map of real and potential symbiotic flows was created, representing the initial configuration of possible exchanges across the district.

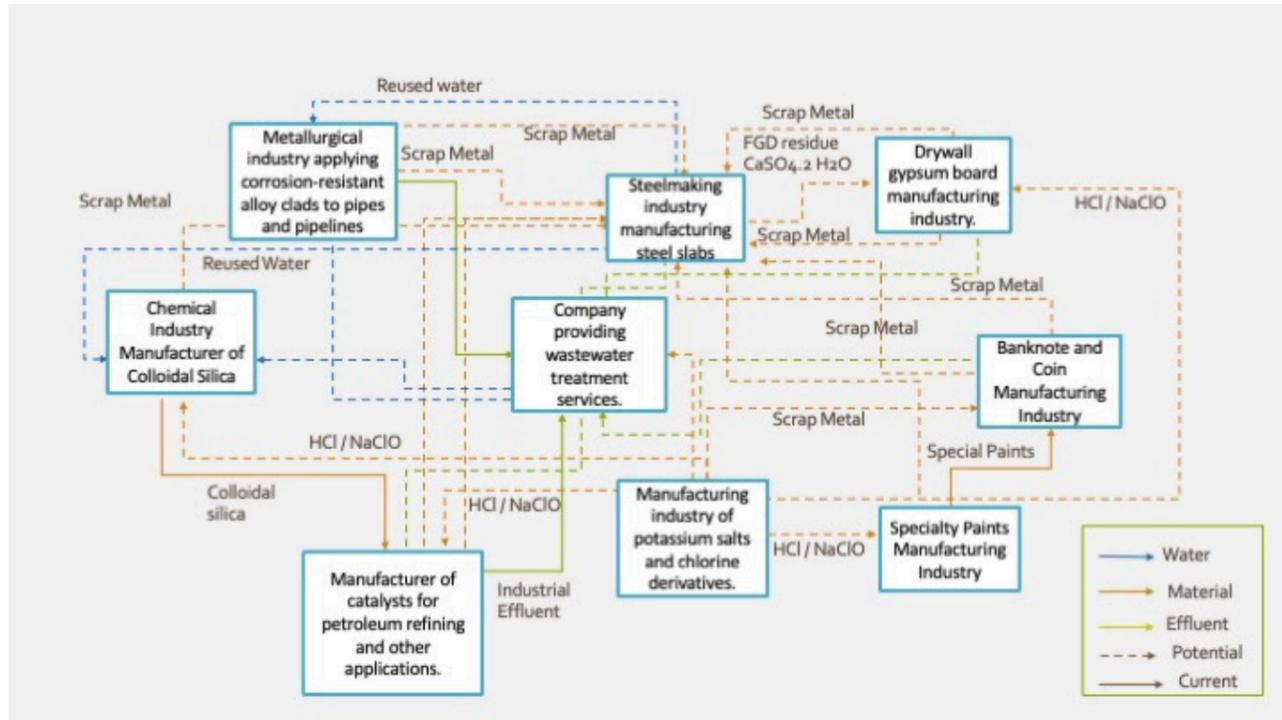
Simplified Industrial Mapping Tool Used in the Santa Cruz District



Source: Rocco, 2025.



Initial Flow General Map of real and potential symbiotic flow



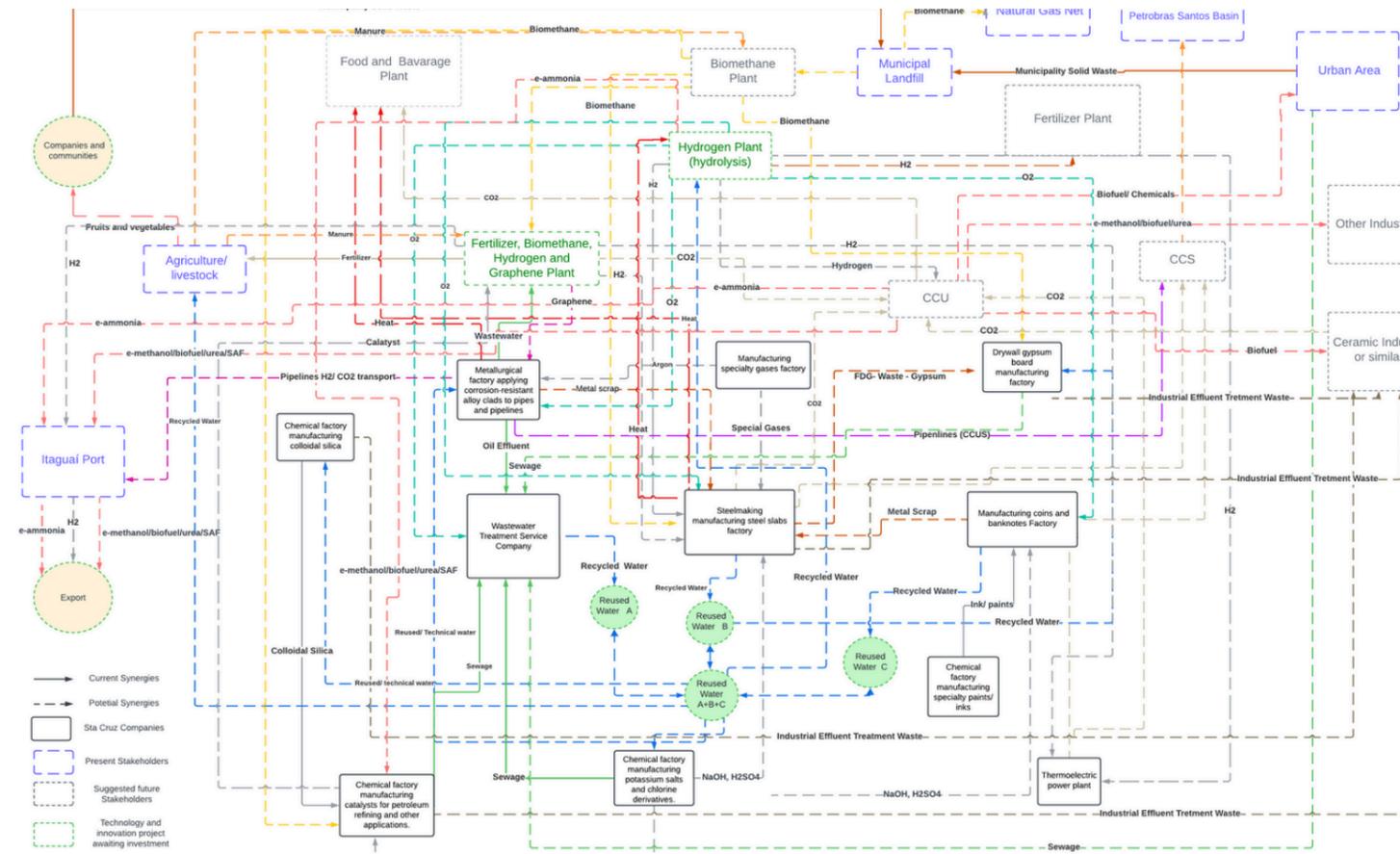
Source: Rocco, 2025.

The next step was accelerated by the PRESI Project, which included direct technical support from experts from Kalundborg Symbiosis and the consultancy Viegand Maagøe (VM). These partners conducted a pre-screening validation that assessed the technical feasibility of the previously identified flows, using data collected and structured by the AEDIN committee. Geographical proximity was evaluated using digital geolocation tools, such as Google Maps, to understand logistical viability and transportation considerations.

Three companies of strategic relevance were selected for detailed mapping, following the same methodology applied in Kalundborg. This deeper assessment enabled the identification of additional relevant stakeholders and technology providers capable of contributing to innovative

Based on the enhanced screening process, the Danish experts, working in close collaboration with the technical coordination team of AEDIN, updated the original opportunity maps by incorporating new resource flows, expanding the network of potential partners, and strengthening the technical foundation for decision-making. This collaborative effort led to the development of an updated symbiotic flow map for the Santa Cruz Industrial District. The new version integrates both existing and emerging synergies and reflects a more advanced understanding of the technological, organizational, environmental, and regulatory factors necessary to move from concept to implementation.

Updated Symbiotic Flow General Map of real and potential symbiotic flow



Source: Rocco, 2025.

The evolution observed in Santa Cruz demonstrates how a facilitated and iterative approach can progressively transform an industrial territory. The transition moves from exploratory mapping and initial opportunities toward strategic, high-impact resource exchanges, contributing to a more competitive, circular and low-carbon industrial ecosystem for Brazil.



Embedding *Symbiosis in Institutions*

How to build long-term capacity

Industrial symbiosis represents an opportunity to strengthen innovation, competitiveness, and sustainability within the industrial sector. At the same time, its implementation process brings challenges that require stakeholders to coordinate and mobilize efforts to drive a transformation in industrial culture. For this reason, it is essential that the initiatives developed are structured in a way that allows them to become permanent within each organization involved.

The following presents key strategies to ensure that industrial symbiosis is embedded as a lasting practice within institutions.

Engaging the technical teams of the companies

The engagement of companies' technical teams is an essential element of the process, as it enables the start of discussions on production processes and the potential for cooperation among industries. Involving these professionals from the outset helps identify opportunities related to the use of waste and by-products—topics they are already familiar with—and supports the gradual development of discussions on adopting new practices and fostering organizational culture change.

Capacity building for technical teams is also a strategic tool to strengthen engagement. Introductory sessions and workshops that present, in a practical way, the benefits and implementation approaches of industrial symbiosis help create a shared knowledge base and stimulate internal mobilization. From this foundation, it becomes possible to move forward with actions aimed at raising awareness and securing the commitment of business leadership.

In Santa Cruz, technical engagement was promoted through the creation of an Environmental Committee within AEDIN, bringing together representatives from all associated companies. While most of these representatives come from environmental areas, professionals from innovation, operations, and other technical functions can also play an important role in consolidating symbiosis initiatives.'

Engaging the leadership

The engagement of business leaders is an essential step for consolidating industrial symbiosis. Once they understand the opportunities associated with this approach, leaders can make strategic operational and investment decisions that effectively enable project implementation.

As business leaders generally have more limited availability in their daily routines, it is important to make use of strategic discussion moments to ensure their participation. In these settings, communication should be guided by a business-oriented approach, highlighting the technical and economic aspects most relevant to decision-making. To assess a project's feasibility, leaders need a clear understanding of the required investments, the expected economic, environmental, and social returns, and the degree of production process reorganization that may be necessary.

Organizing events with the participation of authorities at key stages of the project — such as the launch or the delivery of milestones — proved to be an effective strategy during the PRESI project. Targeted meetings among specific company leaders are also essential to strengthen commitment and align priorities.

In addition, identifying companies that act as references within each industrial area — those that lead innovation processes and encourage others to follow — can be decisive in fostering adherence

and accelerating the diffusion of industrial symbiosis.

Communicating the partnership

To ensure the visibility of the project — both among the participating companies and external stakeholders who may become future partners — constant and effective communication is essential. Strategies such as presenting progress in events and meetings, publishing project update bulletins, and engaging with the media can help boost the initiative by positioning the companies as active players in advancing sustainability.

It is not enough for only the directly involved parties to understand the benefits and achievements of industrial symbiosis — it is equally important that this information reaches the broader public, strengthening recognition and engagement around the initiative.

Formalizing agreements

To consolidate the institutionalization of industrial symbiosis as a strategic approach, it is essential that partnerships and proposals be formalized among the main parties involved. Establishing institutional frameworks at the governmental level and formalizing cooperation agreements — such as memorandums of understanding and bilateral partnerships — are possible strategies to ensure continuity and strengthen commitment among stakeholders. Confidentiality agreements are also essential to guarantee legal security for all parties involved.

Closing Remarks

We hope that, as a reader of this Facilitator's Guide, you have felt inspired to take action – whether individually, within your business, or across your community – to advance more circular and resource-efficient production. This guide was designed to help you understand not only why circularity matters, but also how to put it into practice through collaboration and shared purpose.

We firmly believe that circularity is not only essential for the green transition – it also helps future-proof businesses and strengthen their competitive advantage.

This work couldn't have been done without the:

The Facilitators Guide
from Kalundborg Symbiosis
- from 2021



All the work presented here was made possible because, some years ago, a few people recognized industrial symbiosis as a valuable opportunity within their context and brought together the right partners to make it happen. Our intention in sharing this experience is precisely to show how achievable it is.

The PRESI Project – and the broader journey toward industrial circularity – still has a long way to go, but every transformation begins somewhere. We invite you to be part of this ongoing movement.

Finally, we would like to express our sincere gratitude to all the partners who made this work possible, providing valuable contributions not only to the PRESI Project but also to the development of this guide.

If you would like to learn more about the facilitation process or about industrial symbiosis in Denmark and Brazil, we warmly encourage you to reach out to the consortium behind PRESI. We would be delighted to share our experiences, insights, and support as you take the next steps on your own circular journey.

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This guide was developed through the collaboration of the project team and several partner institutions that met on May 12, 2025, to discuss the challenges of implementing industrial symbiosis and how this material could best support project development based on the needs of local stakeholders.

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