



PART B  
**INTERVENING  
FACTORS**

Authors: Juan Henriques, Marco Estrela, João Azevedo and Rui Dias - ISQ

Editorial and graphic design support: Laura Nolan - EIT Climate-KIC

All research, data and content was developed by SCALER partners ISQ and The University of Cambridge - Department of Engineering, with support from Strane Innovation, Quantis and EIT Climate-KIC. For more information and access to the full reports, please visit [www.scalerproject.eu](http://www.scalerproject.eu)

Published in June 2020



This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement no 768748

# GUIDELINES FOR INDUSTRIAL SYMBIOSIS IMPLEMENTATION



- A - Introduction to industrial symbiosis (video)
- B - Intervening factors
- C - Overview of strategies for IS projects implementation
- D - Synergy technical implementation
- E - Sectoral outlook
- F - Strategic recommendations

This document is part of a series of guidelines that aim to assist industry players in their implementation of industrial symbiosis.

The full series is available for download at:

[www.scalerproject.eu](http://www.scalerproject.eu)

## PART B - INTERVENING FACTORS

Over the years many case studies have highlighted the existence of determining factors - or key factors - in the emerging process of industrial symbiosis.

Classifications and denominations suggested by the literature vary greatly, but overall these factors can be demonstrated in two dimensions:

- Factors that promote and facilitate industrial symbiosis implementation
- Factors that hinder or constrain the implementation of industrial symbiosis

# ENABLERS



## SOCIAL

- Trusting environment
- Environmental awareness
- Spontaneous and self-organised approach
- Internal and external networks
- Community awareness & education programmes



## ECONOMIC

- Operational cost reduction
- Revenues from new business opportunities
- Identification of savings in waste management
- National funding
- Private contributions



## POLICY

- Legislation, policies and plans for industrial symbiosis
- Promotion of networks and waste markets
- Promotion of frameworks for circular economy



## PROCESS

- Promotion of protocols and formal agreements
- Diversification of the traditional business approach
- Promotion of spontaneous negotiations and "one-to-one" negotiations



## TECHNOLOGY

- Improving processes, incorporation of technologies
- Network promotion
- Facilities that allow for technological viability of synergies
- Digitisation of the industry through the transition to Industry 4.0



## INTERMEDIARIES

- Involvement of R&D institutions and universities
- Regional and national entities promoting synergies



## GEOGRAPHICAL

- Geographical proximity
- Logistical networks

# BARRIERS



## SOCIAL

- Social inertia
- Mistrust between partners and industrial sectors
- Conflicts of interest between partners
- Lack of knowledge of industrial sustainability



## ECONOMIC

- Lower, unclear or inexistent economic benefits
- Instability in demand factors
- Low costs associated with waste disposal
- Lack of funds (private or public)
- Market immaturity



## POLICY

- Restrictions in the existence of regulation and frameworks for waste management
- Highly complicated bureaucratic procedures
- Uncertainty in the approach of future policies



## TECHNOLOGY

- Technology integration problems
- Lack of quality materials
- Limited resources
- Implementation unviability



## INTERMEDIARIES

- Lack of intermediaries
- Poor communication
- Lack of participative networks



## GEOGRAPHICAL

- Long distances
- Lack of facilities for distribution and logistics

## INCENTIVES FOR INDUSTRIAL SYMBIOSIS

Incentives are instruments or mechanisms that support the embodiment of the enablers. The promotion of incentives is one of the most effective methods to support the uptake of industrial symbiosis practices.

# INCENTIVES FOR INDUSTRIAL SYMBIOSIS

## GOVERNMENT & REGIONAL AUTHORITIES

- Desegregated industrial waste policy frameworks
- Tax incentives (landfill, emissions, energy)
- Special tariffs (renewable energies, biofuels)
- Common waste markets
- Co-funding investment programmes
- Energy efficiency and resource efficiency programmes
- Green public procurement

## INTERMEDIARIES & KNOWLEDGE AGENTS

- Knowledge and training (institutional)
- Networking initiatives
- Dissemination initiatives (community)
- Promotion of formal agreements and protocols

## PROCESS & TECHNOLOGY

- Transition to Industry 4.0 programmes
- Databases and ICT tools

## SOCIAL & RELATIONSHIPS

- Training programmes (building awareness)
- Collaborative networks
- Sectoral clustering
- Social corporate responsibility programmes



## IMPLEMENTATION RISKS & MITIGATION ACTIONS

### POLICY RISKS

- High level of bureaucratic processes
- Different national realities
- Uncertainty in new policies
- Reduced government presence as a driving agent

### POLICY ACTIONS

- Encourage policies and legal frameworks for industrial symbiosis
- Promote the involvement of national governments and local authorities
- Encourage national programmes, R&D institutions and universities to develop applied research

### SOCIAL RISKS

- Resistance to the incorporation of new concepts
- Business skepticism
- Industrial sectors mistrust

### SOCIAL ACTIONS

- Create and promote society awareness
- Promote engagement through training & dissemination initiatives





## IMPLEMENTATION RISKS & MITIGATIONS ACTIONS

### HUMAN / INSTITUTIONAL CAPACITY RISKS

- Lack of knowledge on possible uses for available waste
- Insufficient knowledge on technology capability
- Inability of the company to face new technological challenges
- Lack of motivation
- Inability to manage a synergy

### HUMAN / INSTITUTIONAL CAPACITY ACTIONS

- Investment in the transition to Industry 4.0
- Strengthen participation in clustering and networking
- Reinforce negotiation processes through the development of formal agreements and protocols

### ECONOMIC RISKS

- Lack of funds to support initial investments
- Low industry receptiveness
- Dependence on state funds

### ECONOMIC ACTIONS

- Allocation of national funds for industrial symbiosis initiatives
- Promote mechanisms that allow for the measurement of benefits



**SCALER**

[www.scalerproject.eu](http://www.scalerproject.eu)  
[info@scalerproject.eu](mailto:info@scalerproject.eu)