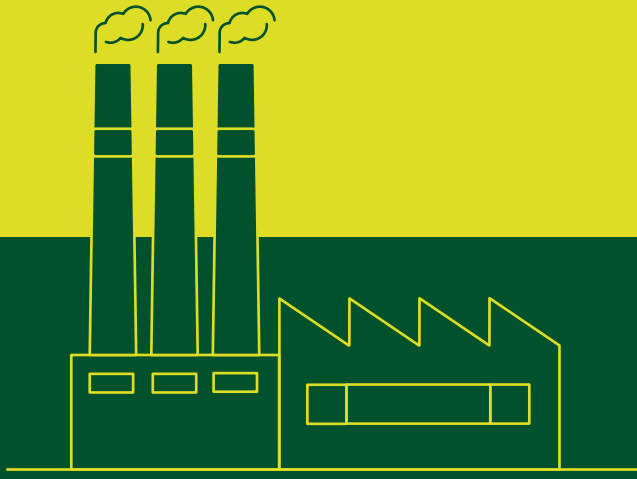
Yorkshire Circular Lab

Working Together for Net Zero

A Business Guide to Industrial Symbiosis

1.

What is Industrial Symbiosis?



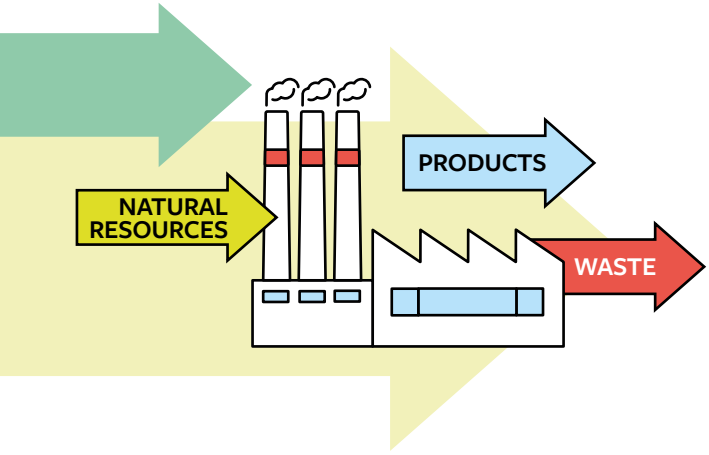
Industrial symbiosis is part of the transition from a linear economy – in which we take, make and waste resources – towards a more circular economy to reduce resource use, use products for longer, recycle when things reach their end of use, and safely reintegrate materials back into natural cycles if they cannot be circulated anymore.

Industrial symbiosis connects businesses so they can share resources like waste, energy, or expertise in ways that save money, cut emissions, and spark new ideas. It's about working together to turn one company's leftovers into another's opportunity and to use the minimum resources needed in the first place.

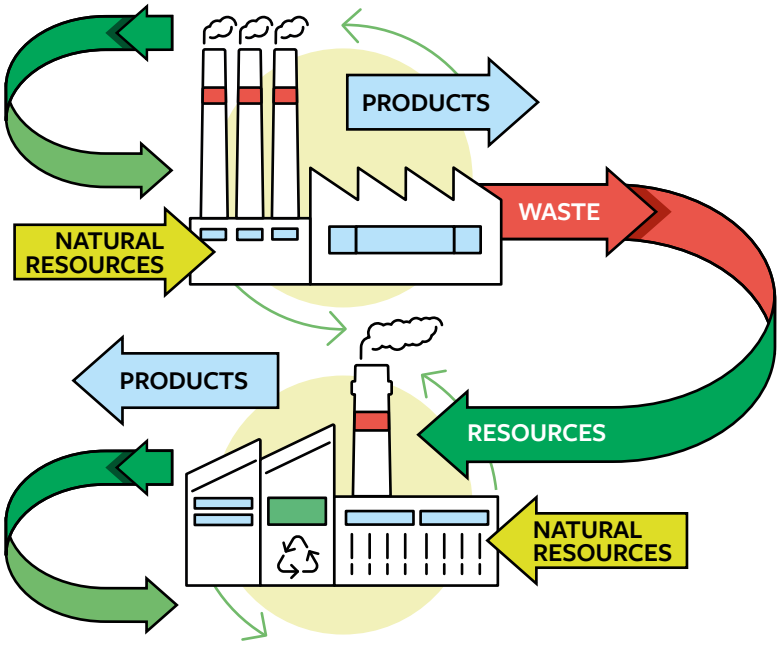
Industrial symbiosis is about engaging *"diverse organisations in a network to foster eco-innovation and long-term culture change. Creating and sharing knowledge through the network yields mutually profitable transactions for novel sourcing of required inputs and value-added destinations for non-product outputs, as well as improved business and technical processes"* [1].

Industrial symbiosis can be described as turning the underutilised resources – broadly defined as waste, by-products, residues, energy, water, logistics, capacity, expertise, equipment and materials – from one company or sector, into resources for another, thereby keeping them in use for longer.

Linear System



Circular System with Industrial Symbiosis



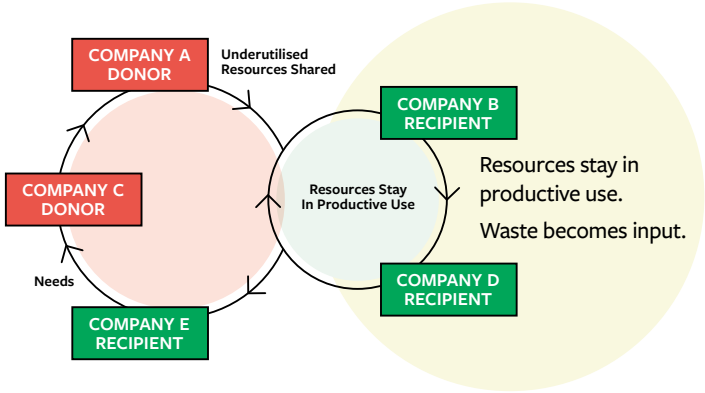
2.

Why Does Industrial Symbiosis Matter for Regional Business?

Improves Resource Efficiency and Reduces Costs

By sharing underutilised resources, companies can reduce their material inputs and operating costs, increasing competitiveness at the regional level [3].

Example:
The UK's National Industrial Symbiosis Programme (NISP) delivered over £1 billion in economic benefits by diverting 47 million tonnes of waste from landfill and avoiding 42 million tonnes of CO_2 emissions [6].



Stimulates Innovation Through Collaboration

Industrial Symbiosis encourages businesses to work together, leading to new solutions, technical innovations, and process improvements that support sustainable growth [1]. This is particularly valuable across different sectors that may not typically collaborate, enabling the creative use of by-products and materials, improving efficiency, and new ways to extract value from existing resources.

Example:
In Ulsan, South Korea, collaboration between petrochemical companies led to a new calcium chloride recovery process, reducing treatment costs and creating value from waste [4].

Builds Stronger Local Business Relationships

Mutual understanding about business operations helps in identifying opportunities and coordinating exchanges more effectively, enhancing collaboration across sectors [1].

Example:
Kalundborg, Denmark, where firms exchange steam, water, gypsum, and other materials, is a leading model of successful industrial symbiosis with annual savings of millions in resource costs [5].

Supports a Circular Economy at a Regional Scale

Keeping resources circulating within a region reduces dependency on primary materials, lowers emissions, and creates more resilient local economies [3].

Example:
In South Africa, industrial symbiosis pilot programmes supported by UNIDO enabled businesses to reduce waste while opening new markets for recovered materials [7].

3.

Identifying Industrial Symbiosis Opportunities

Could your waste be someone else's resource? Industrial Symbiosis is not just about 'waste', it's about opportunity.

Every business has something underused: Spare heat, excess packaging, empty warehouse space, even knowledge. Chances are, someone nearby could use it.

3.1 Why Bother? Here's What You Get:

☑ Lower Costs

Stop paying to throw things away. Share or sell what you don't need.

☑ Stronger Business

Use local materials, cut long supply chains, and stay resilient in uncertain times.

☑ Green and Beyond

Show customers and investors you're serious about sustainability. Sustainability means more than just carbon savings. It reflects your commitment to delivering real economic and social value that supports your region. Industrial Symbiosis helps create local jobs, shared prosperity, and stronger communities.

☑ Smarter Use of Resources

Make the most of what you already have, materials, energy, even people.

"In West Yorkshire, the Resource Efficient Business Fund helped SMEs save thousands through smart resource use. Industrial Symbiosis makes those savings collaboratively."[8]

"A feasibility study in the HEY LEP area found that industrial symbiosis could lower energy use and unlock new business models"[9]

3.2 Quick Questions to Spot an Opportunity

1 What do we waste?

Think materials, energy, water, space, equipment, transport.

2 What do we underuse?

Do you have downtime, surplus stock, or unused equipment?

3 What do nearby businesses need?

Could your 'waste' help them save money?

4 Who could help us connect?

Your local council, trade body, or business support agency.

5 What's one thing we could try this month?

Start small such as materials exchange, joint delivery, or energy share.

4.

How to Make Industrial Symbiosis Happen

Industrial Symbiosis is not just a theory! It works when businesses talk, share, and try something new. You don't need to wait for the perfect system or policy. Start with a conversation and a few simple steps.

4.1 Let's Make It Real: Practical Examples

Example 1:
"A local food processor had excess clean water and refrigerated storage. Just down the road, a drinks company was struggling with seasonal cold storage space. They shared resources, cut costs, and both improved efficiency."

Example 2:
Kalundborg, Denmark. A plasterboard manufacturer (Gyproc) receives waste heat from a nearby power plant, saving on fuel and reducing emissions. The system involves exchanges of steam, water, and waste materials between multiple companies [5].

Example 3:
Saltend Chemicals Park, Humber. Multiple chemical companies share steam, compressed air, and logistical infrastructure. This shared system reduces costs and increases energy efficiency across tenants [9].

Example 4:
Reborn Products, a bed manufacturer in West Yorkshire, reuses foam and textile waste from other mattress producers. This reduces landfill use and supports circular economy business models [8].

4.2 Start with 3 Practical Moves

1 Walk your site with fresh eyes!
What's being wasted, underused, or overlooked?

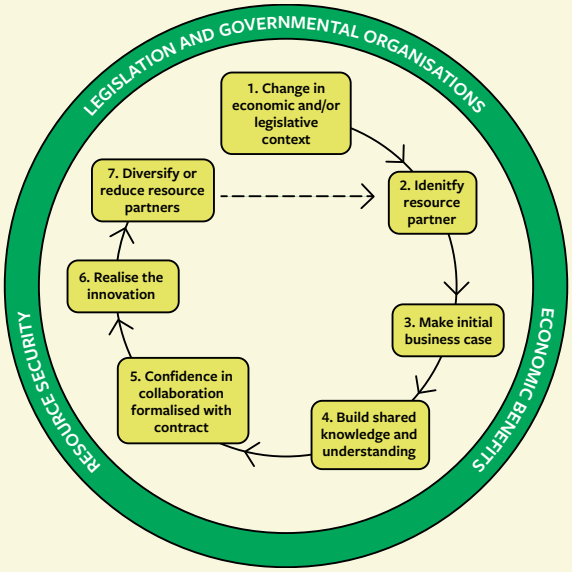
2 Pick up the phone!
Ask a neighbouring business what they waste or need.

3 Talk to local government / partner support!
Your local government's business support team, Innovate UK or the Yorkshire Circular Lab may be able to help you to connect to potential partners, funding, and advice.

4.3 What Happens Next? A Typical Industrial Symbiosis Process

Once you've identified a potential synergy and partner, here are the steps most businesses take to make it happen [2].

The relation between the case study participant and the resource partner, i.e. waste resource supplier or client, developed through similar steps in each case study. Additionally, governmental organisations, economic benefits and resource security were of key importance during the waste-to-resource innovations.



Step 1: Identify & Assess Synergy

- Map potential partners and shared resources
- Check timing, quality, and proximity feasibility

  Who to involve: Operational and sustainability managers / engineers from the companies involved, facilitator, e.g. local council business support (if funded)

Step 2: Build the Business Case & Agreements

- Evaluate costs, savings, legal implications, and contracts
- Ensure data confidentiality, liability, and permits are addressed

  Who to involve: Sustainability, finance and legal advisors, local authority representatives

Step 3: Implement the Exchange

- Set up logistics, transport, storage, metering
- Update operations and train staff as needed

  Who to involve: Site managers, technical teams, regulators for permits

Step 4: Monitor, Refine & Scale

- Track performance, resource flows, cost savings, and CO_2 reduction
- Review and explore new opportunities or deepen existing ones

  Who to involve: Data analysts, sustainability officers, business support bodies, Yorkshire Circular Lab.

4.4 Key Factors to Consider

- Technical: Compatibility, storage, transport, and processing
- Economic: Cost-benefit, funding, ROI = return on investment timeline
- Legal & Regulatory: Waste/residual definitions, contracts, permits
- Relationship & Risk Management: Confidentiality, mutual trust, exit paths.

4.5 Common Mistakes to Avoid

- Waiting for perfect matches before starting
- Ignoring legal clarity on what counts as 'waste'
- Trying to do it all alone. Facilitation helps

4.

4.6 Contributions to UK Government Strategies

Industrial Symbiosis supports delivery of key national goals across multiple strategies:

- **UK Industrial Strategy** (2025-35) highlights the role of resource efficiency, circular economy, and regional industrial clusters in delivering net zero and economic prosperity.
- **Climate Change Act** (2008)
  The UK's first legally binding framework for cutting greenhouse gas emissions to Net Zero by 2050. Industrial Symbiosis supports this goal by reducing industrial emissions and improving energy and resource efficiency.
- **25-Year Environment Plan** (2018, refreshed 2021)
  This long-term vision encourages sustainable use of natural resources and minimisation of waste. Industrial Symbiosis aligns with the aims by keeping materials in productive use.
- **Resources and Waste Strategy for England** (2018)
  Supports a circular economy by reducing dependency on virgin materials, increasing reuse and recycling, and promoting sustainable business models. Industrial Symbiosis delivers on these principles through collaboration across sectors.
- Industrial Symbiosis supports circular economy strategies for **Scotland, Wales, Northern Ireland** (draft), and **England** (forthcoming).

4.7 Government Incentives & Support (UK Context)

- **Industrial Energy Transformation Fund (IETF)**
  Helps energy-intensive businesses fund low-carbon technologies and process improvements.
- **Net Zero Innovation Portfolio (NZIP)**
  Supports innovative low-carbon technologies, including resource use and industrial symbiosis pilots.
- **Local Authority Delivery Funding (via Combined Authorities or Net Zero Hubs)**
  May include support for business engagement in circular economy, industrial symbiosis pilots, or energy efficiency grants.
- **WRAP and Innovate UK Grants**
  Occasional funding calls focus on circular business models, including reuse, material sharing, and resource mapping.

5.

Monitor. Measure. Improve.

Tracking the impact of your industrial symbiosis efforts doesn't need to be complex. A few simple steps can help you show real value and unlock further support or funding.

What Should You Track?

Materials reused:
e.g. tonnes of waste diverted from landfill

Cost savings:
reduced spend on raw materials or disposal

Environmental benefits:
CO_2 avoided, water or energy saved

New partnerships:
collaborations or resource-sharing initiatives

6.

Need Help Getting Started with Industrial Symbiosis?

Companies may contact the following addresses for technical or financial advice:

- **East Yorkshire:** https://heygrowthhub.com/contact-us/
- **West Yorkshire:** https://www.wybusiness-skills.com/business-support/
- **South Yorkshire:** https://business.southyorkshire-ca.gov.uk/local-support
- **North Yorkshire:** https://ynygrowthhub.com/

Yorkshire Circular Lab (YCL)

The YCL provides research, facilitation and advisory support to help businesses and local authorities implement circular economy strategies, including industrial symbiosis. Depending on funding availability, YCL can assist with:

- Identifying and mapping resource flows
- Connecting businesses with potential synergy partners
- Navigating regulatory and funding landscapes
- Monitoring outcomes and building long-term capacity

Yorkshire Circular Lab (YCL)
https://circulareconomy.leeds.ac.uk/
Email: ycl@leeds.ac.uk

This manual was prepared by Charmi Kapadia during a placement at the Yorkshire Circular Lab in 2025, with input from Dr Anne Velenturf. We are grateful for the valuable input from our regional partners in the preparation of this manual.

Yorkshire Circular Lab

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