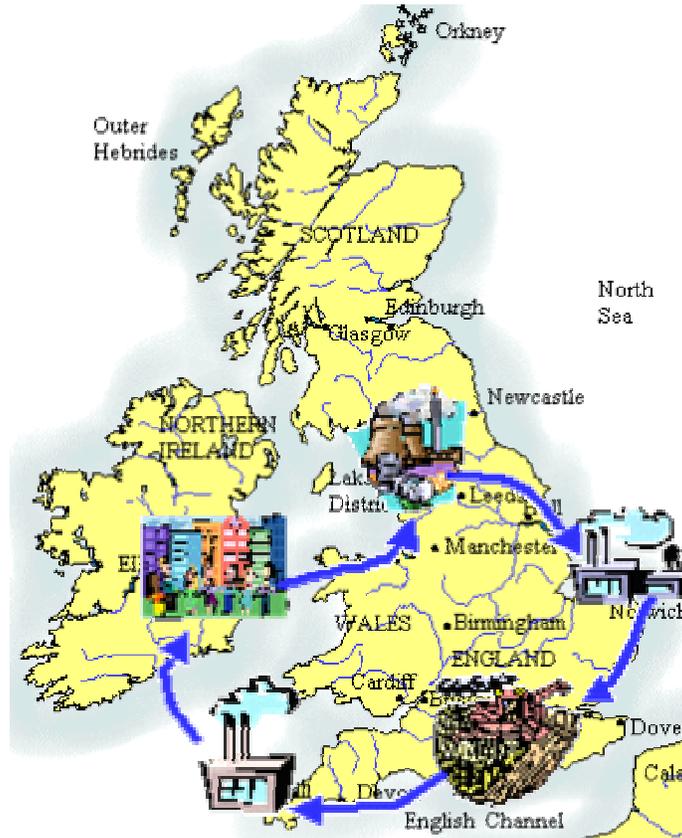


National Industrial Symbiosis Programme (NISP)

Business Delivery of Political Strategy on Resource Productivity

“Making it Happen”



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Industrial Symbiosis Networks

Industrial Symbiosis (IS) programmes can be seen as a process of *systematically* and *continuously* identifying new business opportunities brought by cooperative action for economic activities located in regions, and facilitating their realisation. The economic, environmental and social benefits created by a network of synergistic linkages offer significant potential to contribute to the efforts of achieving more sustainable industrial development. Economic benefits and competitive advantage for the parties taking part in the programmes is mostly linked to:

- reduced resource input costs;
- reduced waste management costs;
- facilitation of the development of new products and their markets,
- more efficient utilisation of production, water, energy, waste management, and logistics infrastructures.

Those will be coupled with environmental and social benefits. The environmental benefits will arise due to:

- reductions in resource consumption;
- reductions in waste generation;
- reductions in pollutant emissions.

Whereas, social benefits will be linked to:

- opening new job opportunities linked to necessary functions to enable synergies;
- improving the qualitative attributes of existing jobs;
- providing a cleaner and safer environment for the local communities.

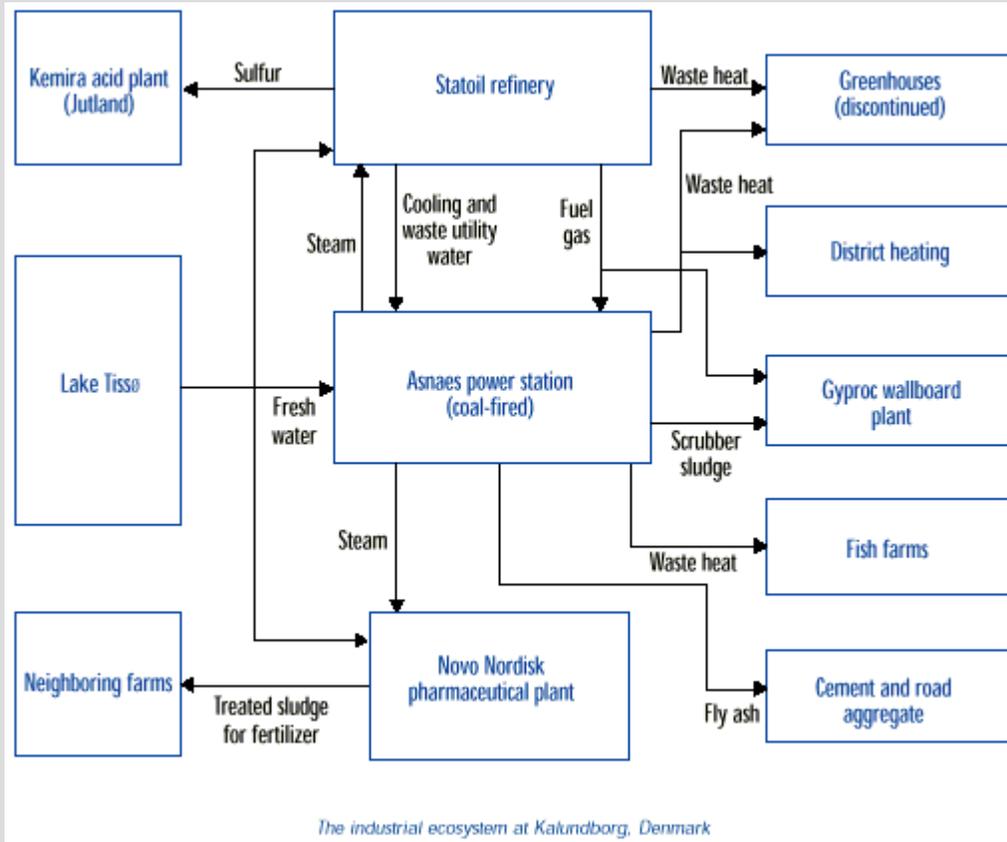
From a different perspective, IS programmes can be seen as a means of improving resource use effectiveness and efficiency at a regional level, while producing business benefits to individual parties involved. It should be noted, however, the concept of resource has a broader meaning in this context and it encompasses:

- Materials;
- Energy and energy resources;
- Water;
- Production, utilities, waste management and logistics infrastructures;
- Knowledge and Human resources;
- R&D and other well established business functions;

Information related to the most famous example of a functional industrial symbiosis network is provided in Box 1 to contribute to the understanding on “what the output of the IS programmes may look like?”

Box 1: Industrial Symbiosis Network in Kalundborg.

The development of synergistic linkages between businesses is not a new idea, and there are various examples of such linkages evolving naturally. However, most of them are limited to bi-lateral interactions between two companies (usually within a sector) in an isolated fashion, and tend to develop between larger organisations and in an ad-hoc fashion. The best-known example of a network of cross sector symbiotic linkages is observed in a Danish town called Kalundborg. The linkage, which first started with the exchange of excess steam from Asneas power plant and surplus gases from Statoil refinery in 1970s, have today evolved into a network of synergistic linkages between the power plant, the refinery, a plasterboard manufacturer, a pharmaceutical plant, a sulphuric acid manufacturer, a cement company, local farmers, fish farms, and local community (The network in Kalundborg is depicted in the Figure below). Those linkages are today enabling significant reductions in resource consumptions (19 000 tons of oil, 30 000 tons of coal, and 60 000 m³ of water usage), and in emissions (130 000 tons of CO₂, and 3 700 tons of SO₂) as well as enabling the reuse of significant quantities of waste products (135 tons of fly ash, 2 800 tons of Sulphur, 80 000 tons of Gypsum, and 800 000 tons of Nitrogen in sludge) on a yearly basis. Exploitation of these synergies has led to the businesses involved having greater security and longevity through increased competitiveness brought about through resource efficiency.



Industrial Symbiosis vs. Waste Exchange

It is a commonly encountered misunderstanding that IS programmes are perceived to be equivalent to waste exchange programmes. There are, in fact, fundamental differences between these two approaches. IS programmes cover a wide array of issues including material, energy and water balances for organisations, their production processes and capacities, needs for support functions and infrastructures, human and knowledge resources, etc., and aim to develop long-term, continuous partnerships based on direct communication of parties. Waste exchange programmes, on the other hand, focus on “one-time” “spot” exchanges of solid wastes, where producer and the user do not necessarily get in contact. Another main difference lies with the fact that IS programmes give priority to preventative measures that can improve resource use effectiveness and efficiency and can reduce the generation of waste by tackling issues at their source, while waste exchange programmes overlook the issues pertaining sources of inefficiencies and focus on generated waste only.

National Industrial Symbiosis Programme (NISP)

NISP will develop IS networks in different regions of the UK and link those regional programmes setting the foundation for a nation wide IS programme.

BCSD-NSR is co-ordinating the development of a National IS Programme (NISP). Target regions where IS programmes will be developed at the initial stage include Humberside*, West Midlands*, Merseyside*, Southampton, Grangemouth, North East, and Ireland. Programmes in those regions are/will be coordinated by BCSD-NSR’s regional partners (regional coordinators). BCSD-NSR is/will be both overseeing the work carried out in respective regions and coordinating the NISP that aims at identifying synergies among the regions and help them becoming functional. It also acts as the regional coordinator in Humberside region.

The management structure of NISP is depicted schematically in Figure 1.

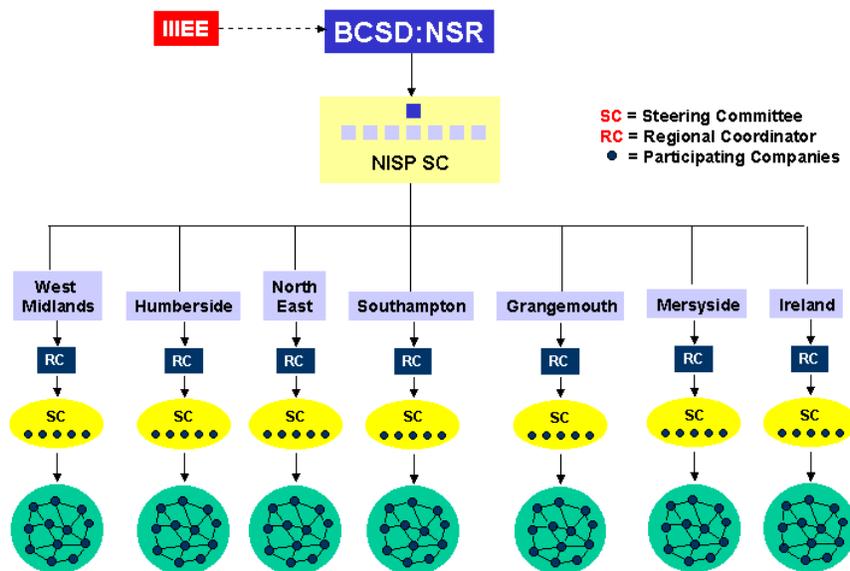


Figure 1: NISP Management Structure.

* By the time this manual is prepared, programmes in those regions are already ongoing.

Objectives of NISP

Main objectives of NISP include the following:

- To develop a national industrial symbiosis programme, delivered on a regional basis and designed to significantly reduce industry's contribution to waste generation and help it be more eco-efficient.
- To collect and disseminate information about the development of products from waste streams and the development of markets for recycled waste.
- To provide a practical methodology by which business can respond to the government strategy on resource productivity (per the strategy document of the Performance & Innovation Unit of the Cabinet Office).
- Identify and disseminate information regarding best practices and strengths in terms of developing IS networks;
- Identify the political, legislative, economic, and technical barriers against the development of IS networks and communicate them with relevant decision makers to facilitate necessary changes;

Description of Programme Development

Development of IS programmes in individual regions involves four main phases. These are *Awareness Raising and Recruitment, Data Collection, Analysis and Synergy Identification, Implementation and support*. A brief summary of the different phases are given below:-

In the first phase, members of BCSD-NSR and the regional co-ordinating body identify the key parties whose involvement in the programme is desirable. The identified parties are then introduced to the programme and its objectives, potential benefits, practical implications using different means of communication. Interested parties are brought together in a workshop marking the official launch of the programme where similar issues are communicated in a collective manner. This event not only initiates the formulation of a communication platform, which has proven to be one of the backbones of the programme, but results in the formulation of a regional steering group and a list of organisations to be recruited. Following this event, the regional coordinators work on assuring commitment from targeted industries for their participation in the programme.

Development of IS networks heavily relies on developing an understanding about quantitative and qualitative aspects of individual organisations' operation and their respective roles within the programme. The data collection phase aim to gather data from individual organisation to satisfy this condition. Governed by a confidentiality agreement signed between BCSD-NSR, the regional coordinator and the individual organisation, data regarding the organisation's inputs and outputs, their processes and operational attributes, their needs and capacities in terms of production, utilities and logistics infrastructure, human and information resources is then gathered. The data collection is facilitated with the use of an electronic data collection interface which is linked to regional and national IS database.

In the next phase, collected data is analysed. The primary focus of analyses centres round identifying improvement potential that can be realised by measures internal to individual organisations. These can be seen as preventative measures. Following this, respective needs of organisations are matched against the capacities hosted by others and resources embedded in waste and by-product streams. This process identifies the potential synergies. Necessary expertise to carry out desired analyses is preferentially provided by regional coordinators and participating companies. If necessary, external expertise is brought in.

The last phase puts the initial focus on enabling the implementation of the synergies. Firstly, the parties who have a stake in the identified synergies are informed about possibilities. Next, the barriers, if any, to their implementation are investigated. Alternative means of overcoming those barriers are identified and pursued. This may require engaging parties other than those participating in the programme. The process of overcoming barriers to enable additional synergies to evolve, as well as collecting and analysing data to identified new opportunities continues as part of the programme support.

While synergies confined to respective regions are given priority, under the NISP umbrella similar analyses are carried out to identify synergies among parties located in different regions. BCSD-NSR and NISP steering committee formed by representative from individual regions carry the responsibility of identifying and facilitating the realisation of synergies among regions. This process is significantly assisted by the information management structure adopted for the programme and in particular its *NISP Database* element. The information management structure adopted for NISP is schematically represented in Figure 2.

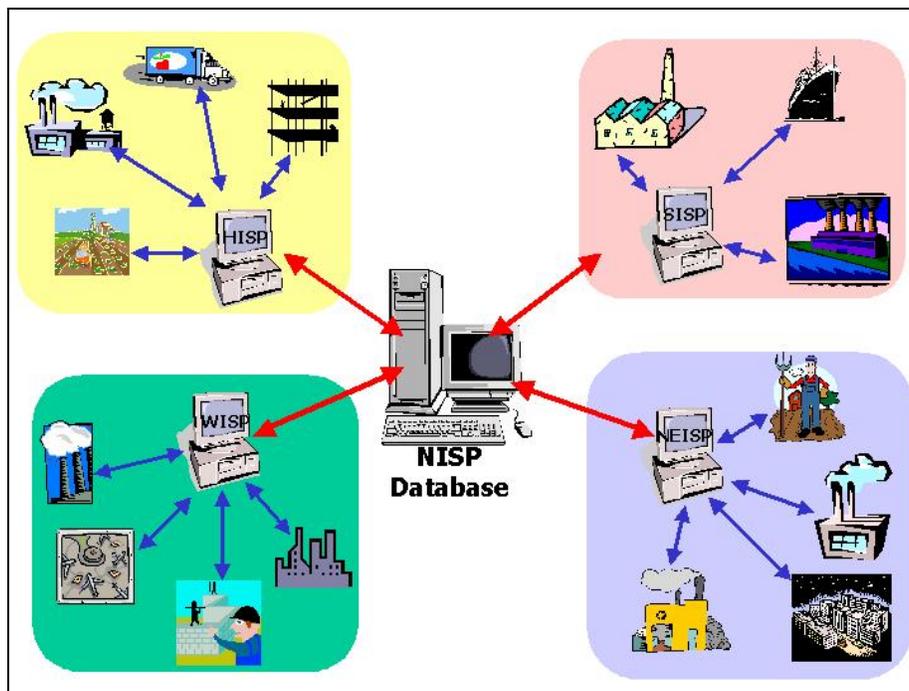


Figure 2: NISP Information Management Structure.

Examples of Industrial Symbiosis Networks

In addition to the network in Kalundborg mentioned earlier, there are other similar initiatives where IS networks are being developed. Although there are nuances among those initiatives, their main objectives are similar. Following are a few selected examples of such on-going initiatives.

Gulf of Mexico By-Product Synergy Programme - This programme was the inspiration for the starting a programme in the Humberside region. Tom Knudson, Managing Director of Conoco set up the Business Council for Sustainable Development in Mexico who initiated the by-product synergy project. A significant report is available on the synergies achieved and how previously categorised wastes were used as feedstock for other industries. When Tom Knudson came to Europe he founded the Business Council for Sustainable Development – North Sea Region.

Burnside, Nova Scotia, Canada - A cross-sectoral industrial symbiosis project is underway involving companies from over twenty industrial sectors including: - Air Conditioning, Automotive Repair, Building Materials, Chemicals, Construction, Food Processing, Printing, Packaging, Waste Disposal and Recycling, Paints and Transportation.

Rotterdam Industrial Ecology Project (ENIS) - Companies around the harbour are creating a by-product exchange model with funding from Europe and Netherlands Government. A small staff is already in place.

Industrial Ecosystem Development in North Carolina – recent study over two years has identified that 48% of the 182 companies providing data could benefit from synergies with concomitant reductions in wastes and pollution.

Humberside Industrial Symbiosis Project: Initial studies conducted in Humberside region indicate significant improvements in productivity, resource usage, and pollutant emissions by improved integration among chemical companies and the installation of a CHP plant. Synergies related to water system and organic waste also offer promising improvements for the region.

West Midlands Industrial Symbiosis Project: - without formal data collection several synergies have emerged....

- 1) Over 5,000 tonnes per annum of waste vegetable oil going to be converted to diesel substitute
- 2) Over 1,000 tonnes per annum of a by-product of the plastics industry to compost additive
- 3) Unspecified amounts of wood chip to waste to energy

Inter-regional: - companies in Humberside and West Midlands involved in two separate synergies.

Relevant Industrial Symbiosis Literature

Following selected material can be referred to deepen the understanding regarding Industrial Symbiosis and its underlying concept of Industrial Ecology.

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