

# **The UK National Industrial Symbiosis Programme: Towards Developing a New and Integrative Methodology to Evaluate Industrial Symbiosis Networks**

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## **Introduction**

Following the completion of a comprehensive literature review (Agarwal & Strachan, 2006) in the area of eco-industrial development, the key focus of our current research has been to develop a framework to evaluate the effectiveness (i.e. the benefits and limitations) of industrial symbiosis (IS) networks. Despite a growing interest in eco-industrial development activities in various parts of the world, limited tools and techniques are available that can assist the evaluation of IS networks. It appears that one of the strategic mistakes that developers and/or co-ordinating bodies tend to make, is not to measure and quantify the effectiveness of IS networks. The aim of our research is to address this weakness by developing a new and integrative framework to evaluate the effectiveness of IS networks. In doing so, we hope to contribute to both theory development and professional practice in industrial ecology and in particular eco-industrial development.

## **Background**

This research is set in the context of the UK National Industrial Symbiosis Programme (NISP) which is the first industrial symbiosis initiative to be launched on a national scale. Like emissions trading scheme, the climate change levy and other environmental initiatives, NISP is a visible manifestation of the UK Government's commitment to an agenda of ecological modernisation (Gibbs, 2003). There is now an emerging literature on evaluating key European Union (EU) and UK Government Programmes including e.g. the EU and UK Emissions Trading Scheme (von Malmborg & Strachan, 2005). Representing an attempt to contribute to broader debates regarding governance, sustainability, policy learning and implementation, this research is set firmly in the context of industrial ecology and eco-industrial development. Having worked in the field of environmental management for a number of years we are concerned that industrial ecology and eco-industrial development have failed to sufficiently influence mainstream policy and management. Having set the research into context we now turn to the work of NISP.

## **Evaluating Effectiveness: The Need for an Integrative Measurement Framework**

In facilitating our project it is helpful to note that, since the launch of NISP, regional co-ordinators have been encouraged to develop case studies of successful industrial symbiosis projects. NISP executives recognised that documenting cases would be an effective way to provide evidence of the economic, social and environmental benefits from member participation and further act as a marketing tool to promote its work. To date more than forty cases have been developed e.g. an international solution to a UK waste problem, exchange of unused chemicals etc. (NISP 2006). It should be noted that to ensure a degree of rigour the data reported in company cases needed to be confirmed by participant members. However, inconsistencies have arisen in the way data is collected in different regions. Recognising this weakness, a consistent reporting method throughout the programme is being pursued. It is further anticipated that this will facilitate the UK Government's Business Resource Efficiency Programme (BREW) requirement that NISP produces a comprehensive list of programme outputs. It is also stipulated that NISP must have these outputs verified by an independent body. To satisfy this requirement, the consultancy firm Databuild Ltd was contracted to verify the outputs claimed by NISP.

## **Complexity in Measuring Effectiveness**

It should be noted that the involvement of various funding bodies in NISP activities and their different requirements adds greatly to the complexity of developing an evaluation framework. For example, the BREW programme partly funds NISP to achieve waste reduction targets whereas regional development agencies collaborate with the programme in order to achieve their economic development targets i.e. the creation of new jobs and business growth. In order to develop evaluation metrics for NISP, measures utilised within the UK BREW Programme metrics were given priority both by NISP and Databuild Ltd, as it takes into account the application of 'attribution' and 'persistence'.

## **Attribution**

The application of attribution assists in capturing the perception of businesses involved regarding the degree of assistance they have received from NISP. In order to measure attribution, Databuild Ltd collected data from businesses in order to identify the proportion of benefits that were actually attributed to NISP. Involvement of other organisations e.g. Carbon Trust in assisting participating companies alongside NISP made it difficult to

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capture the proportion of benefits that may be attributed to the activities of NISP. In addition, it was difficult to capture change(s) in business thinking/practice and longer term benefits arising from NISP's involvement. While there was some initial concern with this approach to assessing attribution, it has been robust because beneficiaries have tended to respond frankly.

#### Persistence

The application of persistence needs to estimate the time scale over which the benefits of a project are expected to last. It should be noted that because of developments in new technologies and processes, and the emergence of new products, the benefits of individual IS projects will decline over time. Further, NISP has only been in existence for a few years and it is unable currently to fully capture persistence. The proportion of projects needs to be followed up after a number of years in order to establish a typical persistence factor and therefore capture persistence of any benefit(s) effectively.

#### First Year NISP Achievements

NISP's achievements for 2005/2006 are outlined in table 1, which have been independently verified by Databuild Ltd. It involves all measures that satisfy BREW requirements and takes into account the application of attribution and persistence. Attribution has been measured on three levels: None – 0%, Partial – 50% and Full – 100%. The approach to persistence in measuring the benefits has been flexible as it was found difficult to establish persistence individually for every project until or unless a typical persistence factor has been established. In cases where persistence can not be estimated, the benefits of the projects were assumed to last for 5 years gradually decreasing by 25% every year.

Table 1: Outputs originated from NISP activities for the year 2005/2006

Brew measures	Reported outputs	Adjusting for attribution	Adjusting for persistence	Output per £1M invested
Materials diverted from landfill (Tonnes)	636,852	393,670	1,360,395	388,684
Hazardous waste eliminated (Tonnes)	221,625	110,813	289,531	82,723
Virgin materials saved (Tonnes)	950,137	598,957	2,129,306	608,373
CO2 saved (Tonnes)	328,964	279,118	1,198,264	342,418
Water saved (Tonnes)	264,475	132,238	330,594	94,455
Additional sales for business (£)	16,510,335	14,164,648	64,958,819	18,559,662
Cost savings to business (£)	36,449,707	31,585,723	145,768,655	41,648,185

Adapted from NISP outputs report submitted to BREW Programme

#### Conclusion

This presentation summary has introduced NISP's efforts towards a new approach to evaluating their effectiveness. We would also like to share some further lessons which have arisen from our work with NISP, as they might be of interest to other IS networks. These include the need to: (i) maintain up-to-date information regarding the nature and scope of symbiosis taking place in a programme/project; (ii) have consistent data collection throughout a programme/project; (iii) develop typical persistence factors; and (iv) capture additional benefits e.g. innovation and skills building. NISP and Databuild Ltd in collaboration with the Robert Gordon University are continuing to work on the development of evaluation models, frameworks and tools, and we look forward to sharing our findings with you in the future.

#### References

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