

SESSION 3B:
DISCUSSION AT THE LEADING EDGE –
INDUSTRIAL SYMBIOSIS AND REGIONAL
DEVELOPMENT

The first year of the ISRS (2004) included a session on urban & regional planning; its aim was to describe the role of regional IS systems and examine institutional initiatives for their implementation. This year, we push the conceptual framework beyond the regional planning of IS to a system greater than IS: the impact of IS on regional planning more generally. What does an IS approach offer the general planning process? As our first speaker aptly put it, this analysis takes IS beyond industry: we have to think of society and the world.

Both speakers addressed water use and economic development, albeit in differing contexts: Mr. Ramesh Ramaswamy in India; and Dr. Malcolm Bailey in the Yorkshire-Humber region of England. Both used an IS approach to examine the (primarily but not exclusively industrial) flows of water in the region, and fed their results into the respective larger regional planning process. Central to NISP-YH's contribution to regional economic development was its ability to engage with companies and to take a regional view of resource flows. The regional analysis of resource flows in India, when combined with the more traditional socioeconomic drivers of planning decisions, elucidated tradeoffs and alternative solutions to development that neither approach could have done alone.

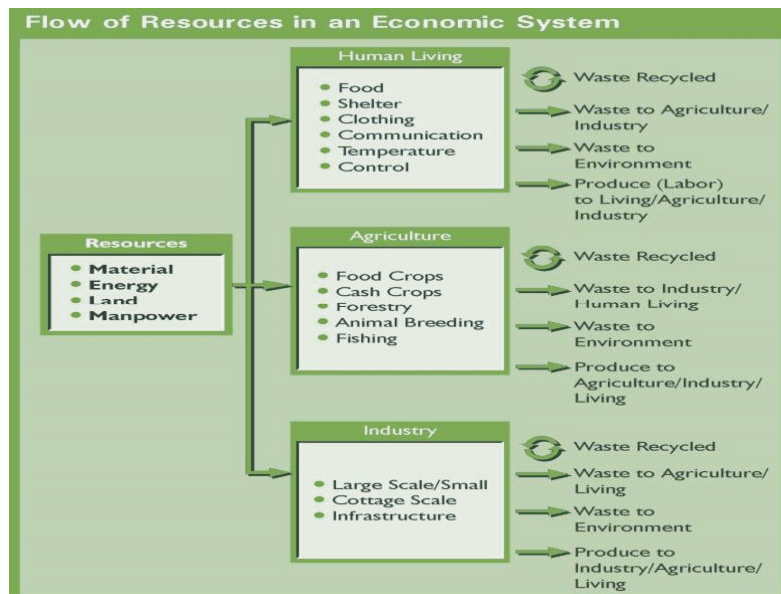
Industrial Symbiosis and Regional Planning¹

Mr. Ramesh Ramaswamy, Resource Optimization Initiative, India

Mr. Ramaswamy started by making explicit three basic concepts: First, in most planning processes, the current basis for decision-making is monetary. Second, environmental issues in the developing world have great significance for the survival of the current generation, not just future ones. Third, the speaker's definition of industrial ecology is that it "involves analysis of socio-economic systems based on a study of flows of material and energy resources and aims to optimize their use." Not just economics, not just material flows – but a whole range of social issues. When one is looking at regional development, one can't look at individual exchanges with millions of small actors; one must aggregate the flows to look across the sector, and across the region.

¹ Editors' Note: Case studies presented by Mr. Ramaswamy are available at www.roionline.org

Figure 1 The scope of Industrial Ecology.



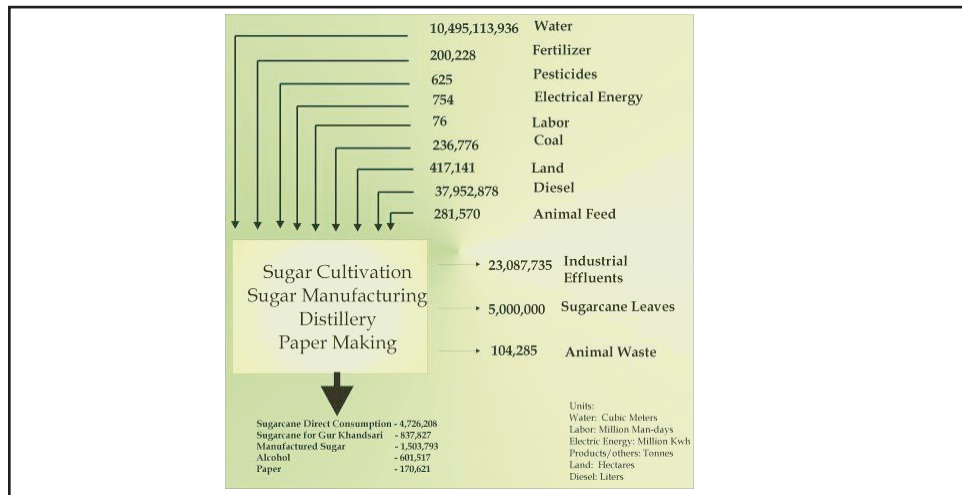
Source: Erkman and Ramaswamy 2003

INDUSTRIAL SYMBIOSIS: APPLICATIONS IN AGRICULTURE

In India, 50% of the energy used and 90% of the water are inputs to the agricultural industry – a situation representative of many developing countries. An analysis of the resource flows through 3 selected agro-industrial systems (rice, sugarcane, cotton) was performed and a set of metrics were created to address the question: what kind of yield does society receive from each crop? Sugarcane was expected to be the most pernicious due to large amounts of waste generated.

The system boundary was defined as the state of Karnataka where the average land holding is 1.5 acres; aggregating flows for the multitude of actors was necessary for a regional perspective. Along the value chain, only the immediate product was included in the analysis (e.g., sugar as product of sugarcane, not the cakes in which the sugar was later used). The result was that sugarcane generates greater yield per hectare for employment, water and power use than either rice or cotton because it is a highly symbiotic crop: the molasses by-product goes into the distilleries; bagasse is used to make paper. This analysis contradicts the popular belief that sugarcane shouldn't be grown in such a dry area, and clearly illustrates the need to think beyond just economics.

Figure 2 The sugar cane system consists of the cultivation of sugarcane, the manufacture of sugar, ethyl alcohol production from the by-product molasses, and paper making from the by-product bagasse.



Source: Ramaswamy 2006

IDENTIFYING PLANNING PRIORITIES – DODDABALLAPUR INDUSTRIAL AREA

This area suffers a local water shortage: ground water is the only source, and it has been contaminated by the textile dyes and pesticides released by the local industries. A new airport planned for the area may be expected to bring a substantial increase in

local population; water requirements are anticipated at 100 million litres per day, which the area does not have. This case demonstrates the need to consider more than just industry when identifying planning options.

PLANNING THE DEVELOPMENT OF THE LEATHER INDUSTRY

In the 1970s the export of raw hides and skins was banned in India in an effort to capture the added value from tanning in-country. The tanning industry requires a lot of water and releases contaminated water to the rivers; rivers are drying up and water is already being trucked in, an unsustainable solution. The leather industry will need a new solution. It is proposed to move the leather industry next to the sea in a symbiotic system with an incinerator (to burn the high-energy organic matter contained within tannery sludge) and a desalination power plant (to provide the clean water). One of the barriers to advancing this solution has been the many governmental departments involved: Power Ministry, Environment Ministry, and Ministry of Commerce representing the leather industry.

The issues arising when using an IS approach to inform the planning process include:

- System definition: relevant to administrative, data collection and development. A more systematic approach is needed for determining the system boundary.
- Data collection and analysis: it is very difficult to gather data at regional levels to be able to map flows. Many things can change in the time it takes to map the flows.
- Dissemination and implementation: The system in India is very traditional and compartmentalized. To address the system, it is imperative that people work together. Relevant legal issues, sometimes a low priority, include movement of hazardous material and shifting liabilities.

REFERENCES

- Erkman, S and R. Ramaswamy. 2003. *Applied Industrial Ecology – A New Platform for Planning Sustainable Societies* AICRA Publishers, Bangalore, India.
- Ramaswamy, R. 2006. “Industrial Ecology and Agro Industrial Policy”, Resource Optimization Initiative, Bangalore. January

Industrial Symbiosis as a Regional Development Tool

Dr. Malcolm Bailey, NISP-Yorkshire & Humber Regional Director, UK

The Yorkshire Humber (YH) region is a largely industrial area in the north east of the UK. The south of the region traditionally hosts coal mining, and chemical and engineering activity; the north is mainly agricultural. About 20% of the UK's power is generated in this region, and thus the region is very conscious of its carbon footprint: the regional economic strategy (owned by the regional development agency) identifies as priorities moving the region toward a low-carbon economy (e.g. through resource efficiency), and proving sustainable development as an engine of economic development and regeneration (through new partnerships and new ways of working). The NISP-YH program, active in the region for 3 years, was expected by the regional development agency, one of its funders, to deliver flagship projects demonstrating dual benefits for economic and sustainable development. In delivery terms, it has been demand-led by industry – a 'bottom up' approach emphasising improved business performance for participating companies.

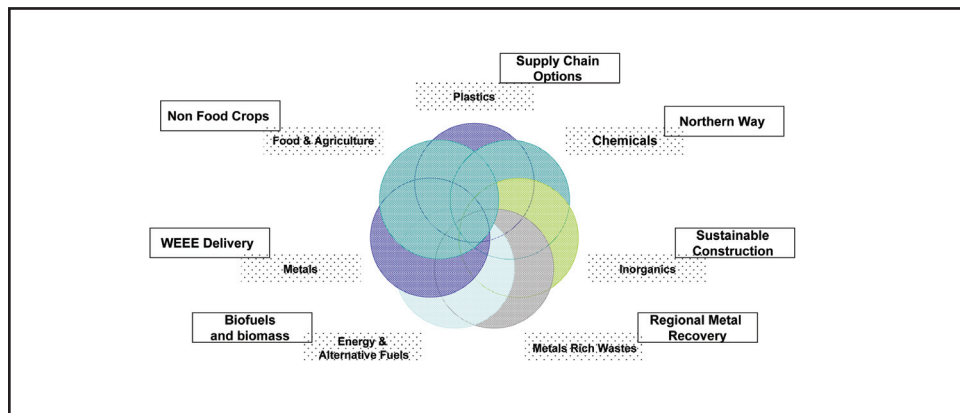
The south bank of the Humber River is seen as prime for industrial development: the industrial mix comprises 3 power stations, 2 refineries, chemical and food processing plants, and agricultural land just inland. However, there is a shortage of non-potable water for cooling and other industrial processes, in part arising from the installation of a new 750MW CHP plant, and limited capacity at the existing water treatment works. Having put forward the idea of examining the water scarcity and development issue to the regional development agency, NISP-YH was charged with the full analysis – not for its expertise in water networks, but for its skill in engaging companies and promoting dialogue with the parties involved: local and regional government, and private industry. In all, NISP coordinated and reported on discussions with 12 public and private sector organisations. Through talking to industry users, NISP-YH learned about their water supplies (borehole, water companies, seawater), regulatory constraints, and utility issues. The option for a combined effluent treatment plant for the large industry water users was explored; the variability of the feeds into the system precluded that solution. Finally, the reuse of water from the existing municipal water treatment plant yielded 3 million tonnes

per annum of non-potable water, unlocking additional capacity for further development in the strategically important area.

The NISP-YH team takes a pragmatic approach: working with the willing where business opportunities arise, rather than targeting specific companies or sectors. Through engaging with many companies, a map of the economic make-up of the region developed and synergistic patterns emerged; with them, opportunities for synergistic economic development. For example, the nature of the industries in the region yield substantial flows of inorganic materials which naturally lend themselves to the sustainable construction industry – not a consciously targeted sector, but one that's resulted from the material flows data and analysis. Metals-rich waste presents very diverse challenges, and often scale is the issue: the economics of the business case for an individual company to recover metal from sludge may be poor due to scale, but the business case for regional delivery (i.e. larger scale) may be stronger.

This 'natural mapping' of the local resource flows, developed through business interaction, enables the programme to move from the tactical to the strategic view of resource optimization, considering not only matching company A's resource with that of company B, but also multi-company and multi-component synergies, to engage in both short-radius synergies involving utilities and longer-radius synergies that tend to be dominated by materials. In reviewing these naturally emerging groupings (minerals, metals, metal rich wastes, plastics, food and agriculture, alternative fuels and energy, chemicals, etc.) at the aggregate level, the programme now naturally finds itself delivering strategic objectives in relation to sustainable construction, WEEE directives, the implementation of national and regional energy policy initiatives, implementation of the non-food crop agenda.

Figure 1 Strategic opportunities (in boxes) deriving from existing resource flows (dotted).



The presentation concluded that 'Industrial Symbiosis' through NISP demonstrably promotes economic development and regeneration, and is a showcase in the delivery of greenhouse gas reduction (and other) targets of strategic importance to the region without deviating from the imperative to deliver business results in the present.

Session 3B – Discussion and Research Questions

- The preponderance of government policy and planners consider an industry sector (or clusters) approach when planning for economic development, although doing so limits the IS solution space: for example, most (all?) chemical companies identify waste heat as an issue, but since they share the surplus, the demand side is missing for an exchange within the sector. Whereas food companies generally need refrigeration, most often powered by electricity, low grade heat (e.g. from the chemicals sector) could meet that demand. IS should be looking toward engagement strategies for sectors that more closely align to regional economic strategies but the facilitation should be cross-sector. The regional mapping of resource flows was undertaken by both speakers in the context of planning economic development. How can the IS community best contribute to the planning discussion?
- NISP does not absolutely define an approach for their practitioners so that they are allowed the freedom to react to background market conditions, regulation and policy frameworks, all of which are constantly changing. If IS is always reactive to background conditions, can it ever be integrated into policy and regulatory framework? How can it be integrated without losing its efficacy, and responsiveness?
- Three distinct approaches to IS have been discussed: geographic focus – as Mr. Ramaswamy demonstrated for the Doddaballapur Industrial Area; resource focus – as Dr. Bailey demonstrated for water; and industry sector focus – as mentioned by Mr. Ramaswamy, e.g. requiring all distilleries to co-generate. What is the most effective way to integrate an IS approach into policy and planning? What is most effective approach to interact with regional economic development agencies – is it geography, resource, sector? All three, or some combination (i.e., a resource approach to a particular sector as placed within the context of a particular geographic region)? Under what conditions is each most effective? How does the local context (cultural, political, and so on – see Session 4) dictate the most effective IS approach for that context?

