Applying Industrial Ecology

Geographic information system applied to industrial symbiosis - A case study in Geneva, Switzerland

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1. Overview of Geneva economic activities

General information:
- 447,584 inhabitants
- Surface 283 km²
- 95% of direct boundary with France

Economic activities:
- 85% trading, transport & services
- 14% industries and construction

Waste production:
(2006)
- 575,476 tons
- 222 urban
- 6% industrial
- 72% construction

Figure: Main industrial sectors in Geneva (2006)

2. Legal basis for industrial ecology implementation in Geneva1

Local Agenda 21 adopted in 2001:
«Law on public action towards sustainable development»

Article 12 (ECOSITE):
«The State facilitates possible synergies between economic activities in order to minimize their environmental impacts.»

3. History of the Ecosite work group

Ecosite work group

Sustainable development service
Private consultants
Geology and waste treatment service
Energy service
Building service
Fondation for industrial estates (FTI)

2001 2002 2003 2004 2005 2006 2007 2008

Ecosite work group

2001 Agenda 21
2002 MCA study
2003 Implementing industrial symbiosis
2004 Creation of Ecosite work group
2005 Pilot project to detect industrial symbiosis
2006 Project on building material recycling
2007
2008
4. Goals of the industrial symbiosis project in Geneva

**Goals for territorial and industrial planning:**
- To go beyond classical collecting and recycling systems by locally reusing material and energy flows through by-product exchange networks
- Study the feasibility of sharing and mutualising infrastructure and services in industrial estates
- Insert by-product reuse in decision process for industrial planning and setting up of new activities

**Goals for the SD:**
- Reducing the impact of economic activities through efficient and local resource management

**Status 2008 (database building and field projects):**
- 31 companies from 12 sectors, more than 800 flows described from 12 industrial sectors
- 6 pre-existing symbiosis detected, 17 opportunities under study, 1 implemented

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5. How can GIS helps in optimizing industrial systems

**Database linked GIS system and territorial planning:**
- Allow territorial understanding at different scales by overlapping spatial layers and data
  - Decision support tool for IS implementation
- Allow spatial problem solving such as:
  - Calculation of euclidean distance between objects
  - Definition of preferential path
  - Definition of spatial buffer
  - Choose of locations that meet some requirements
  - Decision support tool for the spatial organization of economic activities
- Possible combination with other tools to geographically anchor networks and processes
  - Linked to material flow database

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6. Building the database for flows management: conceptual model

**Technically and legally implementable symbioses in Geneva**

**Source:** SOFIES Sàrl, 2008
6. Building the database for flows management: conceptual model

Level 1: flow
deductive and/or systematic physical input/output data

Level 2: components
exhaustive taxonomy of the flow components

Classification in 17 flow categories

State company database

Source: www.portailsig.org, "Qu'est-ce que MapServer"

6. Building the interface: mapserver

Source: www.portailsig.org, "Qu'est-ce que MapServer"
6. Conclusion and perspectives

Database linked to GIS interface: systematic approach
- Create added value for technical analysis of IS opportunities and risk evaluation and can be used as a decision support
- Powerful tool for visualization and communication

Database linked to GIS interface: deductive approach
- Allow deductive analysis for all economic activities (without interaction in the preliminary phase)
- Allow data storage on material flow and can be use as basis for local MFA studies
- Introduce a new parameter in industrial estate and territorial planning
- Can be used as a guide to set up priorities and detect quick wins for an efficient and local use of resources

Thank you for your attention!

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