Eco-industrial parks: business inspired by nature

A new Polish study suggests that industrial parks should take a leaf out of nature’s book and model themselves on natural ecosystems. The researchers describe relations between businesses in terms of relations found in ecosystems, such as symbiosis. Through this they identify the necessary conditions for the success of an eco-industrial park.

The use of eco-industrial parks (EIPs) to promote sustainable development has received considerable policy interest. An EIP is a community of businesses on the same site who aim to collectively enhance their environmental, economic and social performance. The concept of an EIP can be likened to a natural ecosystem. This is particularly in terms of recycling – in an EIP, one business’s waste can be another business’s resource. As natural ecosystems are effective at recycling their resources, they are key examples for the efficient recycling of materials and energy in industry.

This study directly compares EIPs to natural ecosystems by considering each business as a ‘living organism’, which needs ‘food’ (i.e. input) and energy. The industrial ‘habitat’ is the area that contains the infrastructure and resources, including information and transportation systems. Like a natural ecosystem, the enterprises can be classified into producers, consumers and ‘decomposers’. There are two types of industrial producers: those that make products and those that make energy. Industrial consumers are trade and service companies and do not produce any material goods except for waste. Industrial decomposers are enterprises such as wastewater treatment plants or recycling companies.

The study classifies the interactions between enterprises as either ‘positive’, ‘negative’ or ‘neutral’. Negative interactions are the equivalent of parasitic and predatory relationships. They are undesirable in an EIP but can be inevitable in a free market economy. Neutral interactions occur when two enterprises function side-by-side without affecting each other. This is acceptable in an EIP, but it is preferable for positive interactions to dominate.

Positive relationships are the equivalent of symbiosis or mutualism, as found in nature, where both enterprises benefit. In an industrial ecosystem the most common form of positive relationship is when a by-product of one enterprise becomes an input material for another.

The study suggests some minimal conditions to create symbiotic or positive relationships. Diversity is crucial - the greater the range of enterprises, the greater the opportunity for positive relations. It is impossible to create symbiotic relationships if only industrial consumers are members of the EIP. There must be at least one industrial decomposer or producer.

To demonstrate the application of this ecosystem model, the study presents two case studies. The first is Ecopark Hartberg in Austria, supported by the municipality, the government and the EU. It has three producers, two decomposers and several consumers. One example of a positive relationship in Hartberg is between a waste company and an energy producer. The waste company converts organic waste into biogas and supplies the surplus to the energy producer.

The second EIP case study is ValuePark in Schkopau, Germany, that consists of a large chemical and plastics producer (the ‘anchor’ company) and 13 smaller companies. Six companies have symbiotic relationship with the anchor company as they use its plastics and chemicals in the manufacture of plastic goods such as PVC windows and plastic packaging.

By identifying positive relationships and the required conditions, this model could help design and develop other EIPs.


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