

## ECO-INDUSTRIAL PARK - A TOOL FOR SUSTAINABLE DEVELOPMENT

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**Abstract:** *Local communities embracing the concept of Eco-industrial park are looking for some additional benefits for all the interested parties – both public and private: higher economic efficiency, the increase of competitiveness by applying last minute technologies, generation of additional revenues through positive regulations at the community level, the creation of jobs, solving the conflict between economy and environment, diminishing the demand on the county infrastructure, decreasing the effects of pollution, using energy from regenerating sources and replacement materials. Communities and enterprises creating Eco-industrial parks will have common grounds for industrial development, which is much more competitive, more efficient and much cleaner than traditional industrial parks. Moreover, the new business niches will be open to recruitment or new incubators. Eco-industrial parks represent a special category compared to industrial parks, a category which is different from the classical ones due to the fact that they are designed in such a way so that they promote the collaboration between companies in order to reuse recyclable materials and green energy sources. A long-term vision must reflect the focus on the creation of collaboration networks between firms and the fact that an Eco-industrial park should be a business community, not only a mathematical sum of companies located in the same geographical area. The quality, continuity and interconnection of economic flows within the firms of an Eco-industrial park are important characteristics for the success of Eco-industrial networks. The following discussion tackles the way in which an Eco-industrial park is set-up: creating and implementing an Eco-industrial park in accordance with the principles of circular economy or transforming an already existing industrial park into an Eco-industrial park. The quality, the continuity, the number of interconnected firms, the flows of resources and the relations between the firms are success factors within Eco-industrial networks. The successful cases – especially those in the USA or the Northern countries – have proved that Eco parks engage a multitude of entities, from regional/local authorities to non-governmental organizations; in these entities' action the objectives and actions of the firms; management overlap with those of the community management.*

**Keywords:** eco-industrial park, resources, circular economy, local community , sustainable development

**JEL classification:** F21, F22

### 1.Introduction

In the last decades, high technology industry was connected to the regional development and the involvement of local communities. The running of some economic-industrial activities based on high technology processes was concentrated in certain areas, known by the name: industrial parks, industrial areas, technological parks, scientific parks, business centres, technological districts or industrial districts.

Such areas are many times associated to concepts like economic growth poles of multiplication effects.

An industrial Eco park can be defined as a business community (production, services etc.) which seeks to improve its economic, social and environment performance in concert with the administration of human, financial and material resources.

The purpose of an Eco park is to improve the economic performance of participating firms, reducing to a minimum their negative impact on the community, environment and other interest groups.

Communities and enterprises creating eco-industrial parks will have a common ground for industrial development, which is much more competitive, more efficient and much cleaner than traditional industrial parks. Moreover, the new business niches will be open to recruitment or new incubators.

Local communities embracing the concept of Eco park are looking for some additional benefits for all the interested parties – both public and private: higher economic efficiency, the increase of competitiveness by applying last minute technologies, generation of additional revenues through positive regulations at the community level, the creation of jobs, solving the conflict between economy and environment, diminishing the demand on the county infrastructure, decreasing the effects of pollution, using energy from regenerating sources and replacement materials. The Eco parks can generate benefits both for the local-regional community as well as for the companies operating there; these benefits are given by the recovery of resources, more ecological production, lower environment taxes, high company productivity, government facilities, interaction system among the firms, etc. The eco-parks should be conceived so that they can support the implementation of this whole system.

## **2. What is an "industrial Eco park"?**

An eco-industrial park is a community of manufacturing and service businesses in which member businesses seek enhanced environmental, economic, and social performance through collaboration in managing environmental and resource issues. By working together, the community of businesses seeks a collective benefit that is greater than the sum of individual benefits each company would realize by only optimizing its individual performance (Lowe, Ernest A. 2001).

The Eco-industrial parks can be best defined as business communities that cooperate with each other and with the local community to efficiently share resources, subassemblies and reuse of waste from partner firms (Côté and Cohen-Rosenthal 1998).

The definition provided by Peck and Ierfino associate the Eco-industrial parks to Eco-industrial development or the industrial development. We are talking about parks in which there is material and energy cycling, the waste or the output of one firm essentially becomes an input into the production process of another firm. All these waste exchanges result in cost savings and revenues for the firms. (Peck, Steven & Ierfino, Laura. 2003)

An Eco-industrial park (EIP) is a community of companies, located in a single region, that exchange and make use of each other's by-products or energy (Desrochers 2002).

An Eco industrial park is an entity, designed and managed according to the idea of Circular Economy and the theory of industrial ecology. Through their own

management system, the companies are connected to form a complex in which the products or waste of one company can become the raw material or resources of another company. (SEPA 2003).

The Eco-park can be perceived as an instrument to ensure the industrial development in urban areas, quantifiable through the benefits of the local communities in the economic, social and environmental area.

The Eco-industrial parks represent a special category compared to industrial parks, a category which is different from the classical ones due to the fact that they are designed in such a way so that they promote the collaboration between companies in order to reuse recyclable materials and green energy sources. In this view, in an Eco-industrial park, the way in which a company operates its production is taken into consideration when ensuring the park's general maintenance activity so that it gets through the synergy of different companies to an ecosystem from the point of view of resource use and optimize the energy consumption.

Gibbs and Deutz (2004) concluded that the Eco-parks do not merely mean a simple eco label or a green dot, but "the existence of a network of inter-organizations and the collaboration as transfer of materials and energy flows so that maximum efficiency in using the resources should occur.

The necessity of Eco-parks appeared in the countries or regions which had a very high degree of industrialization and, therefore, they were confronted with rapid resource weariness. The main advantage of an industrial park implies a physical change of materials, water and by-products (Chertow 2000).

To be able to speak about a real Eco-industrial park, a development should be bigger than: a single by-product exchange or network of exchange, a recycling business cluster, environmental technology companies, companies making "green" products, an industrial park designed around a single environment theme (for example a solar energy-driven park), a park with environment friendly infrastructure, a mixed-use development (industrial, commercial, and residential) (Lowe 2001).

We must admit that the notion of Eco-industrial park is not a concept related to environment and ecological problems. The purpose of these entities is to generate wealth for the firms and communities of people by better using resources and, paradoxically, of waste. Sometimes it is very difficult to bring to a common denominator the needs and interest of the firms, local communities, local authorities and interest groups. The role of these eco-industrial networks is to solve the "conflicts of interests" between different players who might be involved in the sustainable development of a particular area.

### **3. Influencing elements in the development of eco-industrial parks**

If the notion of industrial park has already been introduced all over the world, the eco parks aspire to be a superior economic activity stage, which covers all the drawbacks of excessive industrialization and the less sustainable use of everything meaning resources. The comparative advantages of eco-industrial parks compared to classical industrial parks result from the way they are conceived and implemented:

1. Existence of the community of interests and involve that community in the design of the park
2. Reduce the negative environmental impact through substitution of toxic materials, material exchanges and integrated treatment of wastes.
3. Maximize energy efficiency through appropriate system design.
4. Reuse, recovery and recycling materials between partner firms.

5. Link or network companies with suppliers and customers where the eco-industrial park is situated.
6. Continuously improve the environmental performance by the individual businesses and the community as a whole.
7. Have a regulatory system which permits some flexibility.
8. Use economic instruments which discourage waste and pollution.
9. Existence of an information management system which seeks to train and educate managers and workers about new strategies, tools and technologies to improve the system.
10. Marketing strategies to attract companies which fill niches (Côté and Cohen-Rosenthal 1998)

The premises for the design and success of an Eco –industrial park are: integration within natural systems – the design of eco parks in harmony with the characteristics and constraints of local ecosystems; energy systems – the large-scale use of regenerating sources, the reuse and recycling of materials among the enterprises in the Eco park; the identification of companies in the region as consumers and generators of secondary useable products through resource and recycling network exchanges; information management systems – the existence of an exchange of information between companies on the local environment conditions, community, feedback on the performance.

A long term-vision must reflect the accent regarding the creation of networks of firm collaboration and that an eco-industrial park should be a business community and not just a mathematic sum of companies located in the same geographic setting. The success factors for an eco-industrial park are: geographic setting, close proximity of companies, exchanges of materials and energy, diversity of players, continuity of flows, economic viability, low economic risks, economic gains are shared approximately equally, existing institutional regulations, environmental awareness in the firms, balanced interdependence relationships between partners, similar organisational cultures of firms, active participation, commitment, trust, vision of the Eco-industrial parks, contracts / informal control mechanism, legal support, political support (Gibbs & Deutz 2004).

There are limits in creating eco-industrial parks: the firms in an industrial park can have similar fields of activity and, therefore, will generate similar products (thus, there will be relatively little ways to reciprocally use the secondary outputs of products and to discuss the reuse of outputs), the firms have limited time to negotiate the transactions necessary to use the non-marketed products of the partner firms in the Eco park (the cost to reach an agreement – and minimizing the risks – can be higher than the value of the material or energies used), the exchange of by-products is an end-of-pipe solution which can diminish the efforts of the firms to restructure the processes or the product design.

The role of resource recovery within an eco-industrial park can be, many times, as important as reaching a high level of efficiency in using regional resources. This group of firms can include: niche firms to capitalize the outputs of some large companies, production firms to use recycled materials, firms which can ensure the reuse of production machines and systems, firms to rehabilitate the equipment used and energy plants to generate fuel or non-conventional energy or regenerating energy.

The appearance and development of eco parks can transform into leverages supporting the concept of Circular Economy. The concept of Circular Economy

emphasizes the benefits of utilizing residual waste materials through the development of some complex interconnections between firms (Jacobsen 2006). The implementation of some circular economy elements promotes the minimizing of the amount of discharged waste and the adoption of ecological technologies in the economic processes (Andersen 1997, 1999).

According to Zhao and Lowe, the three main levels of a circular economy are:

- The first level, managers must seek much higher efficiency through the three Rs of CP, reduce consumption of resources and emission of pollutants and waste, reuse resources, and recycle by-products.
- The second level is to reuse and recycle resources within industrial parks - clustered or chained industries, so that resources will circulate fully in the local production system.
- The third level is to integrate different production and consumption systems in a region – area, so the resources circulate among industries and regional systems (Zhao and Lowe, 2004).

#### **4. Management of an eco-industrial park**

An eco-industrial park is a clearly defined area where there are exchanges of materials, energy and information between different companies and local players. Eco-industrial parks can be planned for a totally new field or for operations developed around some already existing economic processes. The quality, continuity and interconnection of flows between the firms of an Eco-industrial park are important characteristics for the success of eco-industrial networks. The trust, communication and management relations are, also important. An Eco-industrial park is the most appropriate for the mature companies in a field among which there are already institutional or collaboration relations.

The management of an Eco park may face different rejection or influence forces. These barriers have been identified and classified by Heeres into five different Types (Heeres et al 2004):

- Technical barriers – when the exchange is not accepted by the community and the interest groups
- Economic barriers - include economically unsound or risky exchanges.
- Informational barriers - arise when the information are not accurately or transparently enough presented by the project initiators.
- Organisational barriers - when the rules of the Eco-park do not match the firms' corporate rules.
- Regulatory or legal barriers.

Eco-industrial parks are entities which can work only based on a very efficient management, a management which starts with the projection stage and, implicitly the finding of some companies which will become partners and which can generate among them connections in utilizing the inputs and outputs. All the management actions of an Eco park converge in the three fundamental directions: economic responsibility, ecological responsibility and social responsibility.

Lowe (2001) identified the main management tasks of an eco-industrial park:

- Finding new forms of cooperation between partner firms and other interest groups
- Enhancing the dialogue between partners
- Maintaining and managing services

- Supporting material and energy flows
- Recruiting new companies
- Improving the environmental performance of the park and companies
- Maintaining an information system
- Linking companies and public organisations

The following debate is related to the way in which an Eco-industrial park is set up: creation and implementation of an Eco-park according to the principles of Circular Economy or the transformation of an industrial park – already existing – into an Eco-industrial park. The successful cases – especially in the USA or Northern countries – have demonstrated that Eco-parks engage a multitude of entities, from regional/local authorities to non-governmental organizations; in their action the objectives and actions of the firm's management overlap with the community management.

Salonen (2005) presents two management models of Eco- industrial parks: the "major user model" and the "infrastructure company model". In the first case, a major investor in the area owns the land of the site, leases estates to companies and works as a coordinator. In the second situation, the investors are the shareholders of the company operating in the area. In both cases, the difference from an industrial park is related to the way in which the flows of resources and waste are utilized and managed.

There can be cases when the Eco-industrial network will be built around a powerful company, an anchor tenant which links actors in the park, by-producers or service suppliers. The only condition in this case is that the mission of this corporation and the management strategies lead towards a Circular Economy behaviour.

Another situation occurs when the central entity of this Eco-industrial network is a public agency – either regional or local. The advantage of this organization lies in this public agency's institutional and legislative capacity to provide political, legislative and institutional support, especially in fields related to the flows of resources and waste reuse. Agenda 21, as an instrument of sustainable development of a community can thus contain such eco-industrial networks.

In spite of all these, we cannot state that there is a template-model for a successful Eco-industrial park. The framework –conditions for Eco-industrial networks are considerably different from country to country and within them. It is important to evaluate the needs of the community and of the partner firms and according to these to create a model of sustainable park. The parks should be integrated in an innovation regional framework which recognizes the characteristics and the innovation qualities of the environment in the region and, also the local government competences and capabilities. Regional-local authorities, other institutional entities and firms interested in developing a park should create together an organization basis.

## 5. Conclusions

The experience of classical industrial parks, which put together firms with interests, with totally different corporate culture and managerial procedures and strategies, provide us with a multitude of successful or unsuccessful examples given by a poor business environment, pollution, traffic congestion, irrational exploitation of resources. The fact that over 75% of the Europeans live in the urban area has led to the increase of pressure on the local resources, including these industrial spaces



where the enterprises are or should grow and become prosperous. Although there are many industrial parks which are developing (as demonstrated by economic indexes), they operate in a totally unsustainable manner. This growth is generated precisely by an irrational and excessive exploitation of the resources of the area/region. Eco-industrial parks do not come to fill these drawbacks, yet they determine local community/ interested parties to consider the development strategy of the area and of the firms involved in accordance with the principle of rational joint use of the resources it has. The capacity to innovate and intensify the relations between different players is the main feature of this new approach.

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