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Greentech Park Program

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Greentech Park Program

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1 Introduction

The seek for sustainable development has pushed companies to apply improvements that make their activities less environmentally impactful. Barbieri[3] emphasizes that improvements in the environmental performance of companies are necessary, since it has increased the awareness of the population in general and the consumers who wish to consume more sustainable products. There is also the concern of companies to reduce the consumption of resources and energy. The same happens with entrepreneurs who have a certain environmental awareness and who take into account the environmental practices of technology parks to choose where to install their companies.

Considering this reality, the necessary environmental improvements can be realized from the application of the tools of Industrial Ecology. For Graedel and Allenby[4] industrial ecology is a tool that allows the planning of an industrial system, where, as in nature, no generated waste is accumulated. One of the premises of industrial ecology is to optimize the total cycle of materials (from cradle to cradle) where natural resources, energy and water are elements that must be optimized for use, respecting nature's ability to support change. Eco parks, one of the tools of industrial ecology, can help companies in industrial districts achieve greater environmental gains.

For UNEP, the industrial definition of green Jobs are not necessarily confined to agricultural or manufacturing industries, but easily expand into services industries. More specifically, they include industries like i) agriculture, forestry, and manufacturing, which can create value-added by reducing the use of energy, land, and water, ii) energy supply and renewable energy industries, such as solar, wind, and tidal power generation, iii) construction, waste management, and activities to promote energy efficiency and eco-friendly housing construction, and iv) green financing to support eco-friendly management.

The UNEP[5] report predicts that sustainable green growth will influence job creation or destruction in four different ways. First, additional jobs will be created as, for example, in the manufacture of pollution-control devices to be added to existing production equipments. Second, some employment will substituted as, for example, in the shift from fossil fuels to renewables or from landfilling to recycling. Third, certain jobs will be eliminated, such as when packaging materials are banned, and finally, many existing jobs will simply be transformed as skill sets, word methods, and profiles are greened.

The aforementioned reflects the change in the employment world as industrial society has envolved through green growth. We should aim for well balanced simultaneous developments in the areas of economy, society and environment, which meets the objectives of incubation and technology parks, which is regional development, fostering innovative and social entrepreneurship and connection with large companies. Among the three, the social

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[3] BARBIERI, J.C. **Gestão Ambiental Empresarial**. São Paulo: Saraiva, 2007. 382 p.
[4] GRAEDEL, T. E.; ALLENBY, B. R. **Industrial Ecology**. Upper Saddle River: Prentice Hall, 2003. 363 p.
[5] United Nations Environment Programme [UNEP]. (2008). **Green Jobs: Toward decent work in a sustainable, low-carbon world**.

and/or environmental aspects of development had been frequently ignored in many countries.

The São Leopoldo Tech Park (Tecnosinos) is located within the São Leopoldo campus of the University of Vale do Rio dos Sinos (Unisinos), and its main objective is to create an environment that allows the emergence and installation of technology-based companies. These companies have a positive impact on the economic and socio-environmental development of Brazil and Rio Grande do Sul, especially in the Vale dos Sinos region.

The Tecnosinos is one of the few technological parks that has the governance model based on the triple helix. The local government, represented by the city municipality, the Associação Comercial, Industrial, de Serviços e Tecnologia (ACIST) and the Information Technology Center, which gave rise to this technological park, and Unisinos also share responsibility for making the park one of the best in Brazil

Within this context of economic and socio-environmental development, the use of cleaner technologies, reduction energy and raw material consumption, waste management, and other initiatives in the area of environmental management, can characterize a technological park as "green", which demonstrates environmental concern and applies it in its activities. Considering the need to adapt to the global reality, where natural resources are increasingly scarce and the environment is increasingly degraded, Tecnosinos seeks, through the Greentech Park Program, that the companies that integrate it are more sustainable.

Thus, the Greentech Park project is an initiative associated with the Tecnosinos and Unisinos' vision of the future, responsible for the executive management of the park. In 2004, the University awarded the ISO 14001 certification, which certifies that the institution complies with all norms to reduce the impact of its activities on the natural environment – and that makes Unisinos the first university in Latin America to obtain this certification.

The park has consolidated companies that are levers and anchors of the program, such as SAP that has its buildings recognized as LEED (Leadership in Energy and Environmental Design certification). Investments continue to be conducted in the park's buildings, such as the building called Partec Green, an ecofriendly building that will also receive the LEED certification. This new venture will increase the reception capacity of new companies and certify that the work and the resulting construction are adequate to sustainability standards, reiterating the park's proposal and commitment to value environmental practices, including waste disposal and reuse of water and use energy.

Environmental and sustainable development seeks to meet the needs of the current generation based on the economic, environmental and social pillars, and without compromising the right of future generations to meet their own needs. The production focus on good practices and ecologically correct alternatives assembles the challenge of integrated production with the environment essential.

The park reached in 2017 approximately 5,500 employees updated in micro, small, medium and large companies, divisions in the areas of information technology, automation and semiconductors, health technologies, social-environmental technologies and digital communication and convergence. In the park there are companies with different nationalities, customs and practices in relation to environmental criteria and market segment. Thus, the Greentech Park Program seeks to level and adapt environmentally the participants companies, respecting the development of entrepreneurship and environmental maturity of each organization, seeking a synergy that helps reduce the consumption of resources and waste generation of the park as a whole.

Following the United Nations (UN)[6] proposal on the 17 Sustainable Development Objectives (SDOs), the Greentech Park complies with the plan to reduce the negative

[6] United Nations (UN). Sustainable Development Goals. Available on: <http://www.un.org/sustainabledevelopment/>

environmental impact of cities, from the moment the park disseminates environmental initiatives to the organizations to do so. The establishment of the park ensures the support for economic, social and environmental relations around the Vale do Rio dos Sinos region, that is, it reinforces, through its actions, both national and regional development plan. Greentech Park fully fits the SDO no. 11, as it implements policies and plans for adaptation and innovation regarding climate change and environmental impacts.

In this way, the application of the concept of eco park in Tecnosinos can help companies to increase their concern with environmental issues and to become more competitive, as they become companies with more environmental awareness and responsible for making their activities impact less negatively the environment. What is important is that these companies, together, use the concepts of cooperative environmental management in their activities as a way to prevent these negative environmental impacts.

Facing the need for respective parameters and related areas as park companies, the Greentech Park program was created and is developed at Tecnosinos, which also serves as a facilitator of this important business center.

2 Green Initiatives in Science and Technology Parks

The growth of eco-industrial parks (EIPs) represents an important trend in the new industrial reality[7], which the purpose is to achieve environmental benefits and economic growth through collaboration between companies, and as such, they must be able to promote industrial symbiosis.

The process that involves the interchange of materials, energy, and water between companies, thereby generating better collective benefits than could have been achieved if all individual benefits were combined is known as industrial symbiosis[8]. Green technology parks initiatives, such as the Taiwan Science Park example, indicate concern about environmental responsibility and the impact that innovation ecosystems have on their region[9].

An example of how Brazil is developing in terms of sustainability in technology parks is the new Ecotec Damha Park[10], which involves a series of sustainability issues applied to business buildings, in order to minimize the impacts of business activity and to collaborate with the preservation of the environment in which the enterprise is inserted. The sustainability standards allowed for the certification of the venture in the AQUA Process (High Environmental Quality), conferred by the Vanzolini Foundation.

Another example is the Porto Digital Technology Park[11], located in Recife. The park collaborates with environmental preservation through its ITgreen program, aimed at promoting information technologies for socio-environmental development and Porto Leve, a sustainability project that seeks to provide innovative and ecologically sustainable services.

The National Demonstration Eco-Industrial Park in China[12], namely, the Rizhao Economic and Technology Development Area (REDA) show the environmental benefits of industrial symbiosis performances, and argue that economic benefits mainly resulted from stricter environmental standards, tax preference, benefits from material substitution, and financial subsidies, is the critical driver for the stakeholders to participate in industrial

[7] Shi, H., Chertow, M., Song, Y., 2010. Developing country experience with ecoindustrial parks: a case study of the Tianjin Economic-Technological Development Area in China. J. Clean. Prod. 18 (3), 191e199.

[8] Chertow, M., Ehrenfeld, J., 2012. Organizing self-organizing systems e toward a theory of industrial symbiosis. J. Ind. Ecol. 16, 13e27.

[9] Kung, Shiann-Far. Green Development Strategies at Southern Taiwan Science Park. Technopolis, Best practices for Science and Technology Cities. 2014.

[10] http://institutoinova.org.br/parque-ecotec-damha/sustentabilidade/

[11] http://www.portodigital.org/home

[12] Yu, F., Feng, H., Cui, Z. 2015. Evolution of industrial symbiosis in an eco-industrial park in China. J. Clean. Prod. 87, 339 – 347.

symbiosis. The action of governments in industrial symbiosis development is to constituting strict environmental standards, resource comprehensive utilization schemes, financial support and circular economy and eco-industrial park planning guidance.

The eco-industrial system at Kalundborg[13], created in the 70s in Denmark is the most influential example of industrial symbiosis. The companies in the region collaborate to use each other's by-products and otherwise share resources. For the success pf the park, four drivers are central for fostering collaboration i) a pragmatic environmental mindset, ii) the existence of opportunities to explore possibilities, iii) mutually beneficial initiatives and iv) the presence of dominant needs which stimulate a proactive search for solutions.

3 Development

The Greentech Park Program[14], created by TECNOSINOS in 2012, establishes guidelines on the environmental management area of all activities of the park, as well as the companies that compose it. Creating and exposing all the requirements that must be followed to implement and maintain the system and environmental management policy. Greentech Park is a program developed and managed by a technical committee composed of startups and companies consolidated at Tecnosinos, by managers of Tecnosinos and by a research group in the area of sustainability of Unisinos.

It has the purpose of inspiring employees and disseminating environmental actions of organizations, as well as improving or maintaining environmental quality through actions aimed at reducing energy and raw materials consumption, as well as the impacts generated by production. In addition, the dissemination and stimulation to good practices are its goals that aim the environmental improvement of processes, products and services; training of the employees involved, for the effective understanding of the concepts and functioning of environmental management in the park; promotion of sustainability as a way for participating organizations to add value to their business.

Greentech Park's self-implementation and certification plan takes place without an external certification entity. Tecnosinos members operates it, elaborating a replicable method and without adding costs to the participating organizations, which guarantees the environmental policies practiced in the park, and that are in accordance with the required environmental practices.

The establishment of the program involved all incubated companies of the Park of the “socio-environmental technologies” area in the composition and execution of the work plan. The model of the program was validated from a pilot in which participated around 50 companies, for a period of two years. This pilot included the application of an environmental checklist in the selected companies to verify their level of environmental maturity. The score obtained in the checklist is 0 to 120 points, dividing the environmental maturity of the companies into three levels. The level 1 complies with the legislations and recommendations of the management system. Level 2 addresses opportunities for improvement and best practices and level 3 addresses advanced environmental management practices. To obtain the Greentech Park seal, it is essential that the organization meets the requirements of level 1.

The check list is divided into five areas:

- Management: environmental licensing, company policies, training, production models, measurement and control;
- Consumption: energy, water, office supplies, displacement;
- Waste Generation: management, generation, selection/separation and destination/treatment;

[13] Valentine, S. V., 2016. Kalung Symbiosis: fostering progressive innovation in environmental networks. J. Clean. Prod. 118, 65 – 77.

[14] http://www.tecnosinos.com.br/greentech/

- Investments: product/process certification, inputs, systems, equipment, smart, green certificates;
- External Partners: suppliers selection, joint actions, extension of good practices.

Some suggestions of environmental practices in Tecnosinos are available in the bank of environmental practices and were identified in some companies of the park. The bank is available on the program website and other companies that are interested may adopt these practices:

- Use of paper: the use of recycled paper for internal and external use is encouraged in companies, with specific guidelines for employees. Companies encourage the reuse of paper in their printouts;
- Use of disposables: some companies offer their employees personalized mugs, encouraging them not to use disposable cups;
- Product development: identification of the stage of ecodesign in the development of products aiming at compliance with the WEEE standard, using recyclable materials in the product or in the packaging, identification of recycling grade in plastics and design of easy disassembly and separation of materials. Compliance with the RoHS directive, with absence of lead in the electrical and electronic manufacturing, besides mercury, cadmium, among others;
- Building automation: control and automation of central air conditioning and reducing the consumption of electric energy;
- Internal actions: permanent awareness of employees about the need for rational use of natural resources and reduction of consumption of plastic cups, paper towels, electricity and water through signs, e-mails, among others;
- Use of water: use of rainwater for fire hose, maintenance of the garden and discharge of toilets and installation of control sensor to limit the time of running water in the taps of the bathrooms;
- Electric energy: tiles with air mattress and thermal ink and insulated glass that help in acoustic and thermal insulation;
- Disposal of waste: referral of industrial lamps to correct disposal in an organization specialized in recycling;
- Certification: building with international environmental certification.

4 Conclusion

Because they are not alone in the park, companies can exchange experiences and gather in search of partnerships that improve their work environment and solve problems, adopting practices that will help Tecnosinos become a green park, bringing benefits to the environment and efficiency in productive processes in companies.

Some strengths that were observed in companies during the technical visits:

- Separation of waste into recyclable and organic;
- Disposal of electro-electronic waste through campaigns carried out by TECNOSINOS and Unisinos;
- Use of the videoconferencing tool, which reduces the need for trips to meet;
- Use of documents in the digital format, which reduces the need for printing;
- Concern about reducing energy consumption by turning off equipment and lighting when it is not needed.

The pilot model, validated with 50 companies, for a period of two years, revealed an improvement in the level of maturity of these companies. It was possible to notice that 10% of the companies studied rose from one year to the next. In addition, 86% of the companies are in the first maturity level. It was also identified the need to carry out effective environmental management actions in companies to raise their level of environmental maturity. These practices are mainly waste separation in recyclable and non-recyclable, reduction of paper consumption, reduction or non-use of plastic cups (reduction in waste generation) and reduction of electric energy consumption.

With the continuity of the program, it is intended to increase the engagement of resident companies in environmental issues, and jointly with new companies. Considering the expansion plan of the park, the program attempts that the new companies enter the Park adhering those sustainable standards, in a collaborative way, involving other companies and the other members of the triple helix.

The program, respecting the ecosystem with sustainable practices, and reducing their costs with discarding waste, will train more companies and employees. Tecnosinos, subsidized by its parallel fundraising projects, is installing panels to generate photovoltaic energy and one of its buildings and replacing all the lamps in areas commonly used by LED lamps, aiming at reducing the consumption of electric energy. In this way it is intended to make companies aware that they also exchange their lamps for other more economical ones.

The entire community present in the Park, and in the region, gains from this program. The companies have a new perspective of the work ecosystem in relation to practices aimed at preserving the environment. As a result, all employees related to these companies are also aware of environmental impact reduction practices.

The Greentech Park program is innovative when proposing a methodology for continuous articulation among Tecnosinos' actors, in favor of actions focused on the environment. A structure for the protection of the environment discussed and adapted according to the reality and specifications of the park, maintains synchrony with the certification methodology and management systems that occur in the own Tecnosinos and Unisinos.
Ajuda as empresas novas a, desde a sua concepção, no caso das relacionadas à incubadora, terem a consciência ambiental, buscando o consumo consciente desde as pequenas práticas.

These results guide the managers of the parks and can be used as parameters to define an incentive policy, such as exemption from transport of by-products or discounts on treatment and disposal costs. In practical terms, this means encouraging companies to actively engage in making efforts for a more advanced level of symbiosis.

The industrial symbiosis in eco-industrial parks requires intense broker involvement to be implemented. However, market changes and technological advancement could undermine the level of symbiosis during operations.