



Eco Industrial Parks

Waste produced by industries in the Greater Toronto Area (GTA) is a major contributor to air pollution and the decline in human health in Ontario. Additionally, industrial energy consumption is a major contributor of greenhouse gas emissions.

According to Audra J. Pott Carr (1998) of the College of Architecture at Texas A&M University, the solution to industrial pollution is having “industry fit the [ecological context of each specific site] instead of changing the environment to fit industry”. Waste can be reduced if industrial systems operated more like natural ecosystems. Eco Industrial Parks (EIPs) operate using principles of industrial ecology and bio-mimicry: one company’s waste = another company’s resource.

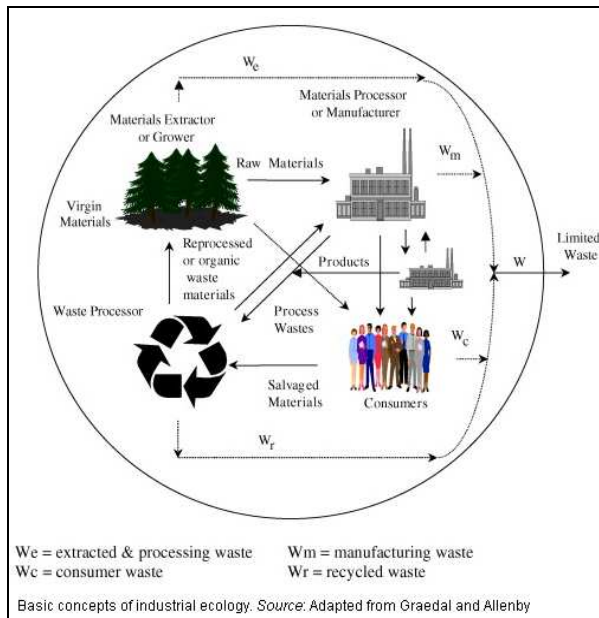
Suzanne G. Spohn (1997) states that there are different types of EIPs. In *Virtual EIPs*, regional companies in a network are physically separate, but connected through cooperative buying or sharing of employees’ services. *Zero Emissions* or *closed loop manufacturing EIPs* are located in close proximity; they eliminate almost all wastes by sharing water, energy, and heat, and by recycling low value by-products. Most eco-industrial parks are a combination of the two (ibid). Some ideal sites for EIPs include: brown fields, vacant lands, greenfield lands, infill lands and abandoned military bases. Ontario has over 10,000 designated brownfields sites. In addition, as part of municipal redevelopment strategies and retrofits, manufacturing and industrial lands can be upgraded to EIPs.

The idea of eco-industrial parks is not new and the concept is relatively simple: generate as little waste as possible while reducing the energy consumption and carbon footprint per industry, contributing to the sustainability of the whole system. The waste produced by one industry becomes the fuel/production material for another industry. This ensures that materials and energy are recycled and all industries involved share energy through cogeneration, and reduce their waste through recycling of materials between each industrial operation. The process produces economic benefits: the operating costs are shared while production benefits are optimized. The largest challenge to implementing EIPs include institutional barriers and lack of coordination. David Gibbs and Pauline Deutz (2007) demonstrated that it is best to build upon existing and potential linkages, and economic incentives to encourage pollution prevention, than to start from scratch.

Eco-industrial parks are emerging in several parts of the world including in Denmark, China, Germany, Sweden, Holland, France, United States and Canada in response to the oscillating energy prices of crude oil, the inefficiencies of the current industrial sector, and the threat of future energy shortages. Preventative measures such as end of pipe treatment, pollution prevention technologies, industrial ecology and locally produced energy increase energy efficiency and reduce waste production.

An eco-industrial park in Kalundborg, Denmark, is an excellent example of ‘biomimicry and industrial ecology at work. According to the Rocky Mountain Institute report *Biomimicry in Communities* (2003), what makes it so successful is its efficiency in energy, waste reduction and land use. “Flows of waste from one process become food for another process. The participants (a coal-fired power plant, a refinery, a pharmaceutical and industrial enzyme plant, a wallboard company, and the town’s heating facility) exchange a variety of resources (steam, hot water, gypsum, sulfuric acid, biotech sludge, and other “wastes”) in a manner that is mutually beneficial so all the companies save on landfill, generate revenues from previously unusable byproducts, and improve their corporate reputations”. Other examples include: Alameda County Eco-Industrial Park, San Francisco, California; Fairfield Ecological Industrial Park, Baltimore, Maryland; Phillips Eco-enterprise Centre, Minneapolis, Minnesota; Closed Project, Tuscany, Italy; Crewe Green Business Park, UK; Dyfi Eco-Park, Wales, UK; Ecopark Oulu, Finland; Emscher Park, Germany; London Remade eco-industrial sites, UK; Styrian recycling network, Austria; Vreten, Sweden and several others that are pre-operational or planned. These cooperatives are an important step in ensuring that cities are livable and healthy (Gibbs and Deutz 2007: 1686).

The benefits of EIPs are shared by everyone. They include: attracting environmental companies, savings on the cost of energy, raw materials, transportation, disposal, and permitting fees, generate economic development while protecting the environment.



According to the *Eco-Industrial Park Handbook for Asian Developing Countries* (Indigo Development 2006) “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”. The network of industries/firms have committed to reducing their ecological footprint and sustainable city development. Carr’s (1998) analysis of the Choctaw Eco-Industrial Park in Oklahoma, U.S., found that “... waste, and environmental and production costs are reduced. The industry saves money on energy, disposal fees for hazardous and non-hazardous materials, permitting fees, transportation, and the cost of new raw materials”. According to Carr (ibid), “industry [should] fit the environment instead of changing the environment to fit industry. Waste could be reduced if industrial systems operated more like natural ecosystems”. The Master Plan for the Choctaw Eco-Industrial Park features native plant species and grey water harvesting.

Eco-industrial parks can go beyond inter-firm resources-use to include numerous concepts, including pollution prevention, integration into the natural environment, green building design, eco-development, joint job training and research and development. Carr (1998) suggests that a central communication center can be set up to coordinate the relationship between the company managers, EIP employees, the residential community and municipal government and agencies.

Eco-industrial parks also reduce damage to the natural environment. According to Dunn (1995), EIP firms are designed to fit the environment instead of adjusting the environment to fit the firm. Industrial ecology cooperatives each reduce their ecological footprint and carbon footprint by diverting hundreds and thousands of tons of waste from landfill, reducing their green house gas emissions, reducing water use, reducing the urban heat island effect and restoring ecological habitats adjacent to their operations. The benefits include: improved storm water management, improved ecological integrity of urban lands adjacent to industries/factories, reduction of chemicals released into the environment, improved regulatory compliance and healthier, more sustainable cities.

In *Natural Capital* (2003), Amory Lovins, a respected ecological economist, states that the economy needs four types of capital to function properly: human, financial, manufactured and natural. Further, the existing industrial economy, which is wasteful, environmentally damaging and in many ways socially destructive, is insufficient in meeting the life needs of a post-industrial society: “What might be called “industrial capitalism” does not fully conform to its own accounting principles. It liquidates its capital and calls it income. It neglects to assign any value to the largest stocks of capital it employs: the natural resources and living systems, as well as the social and cultural systems that are the basis of human capital” (ibid).

Industries and companies that adopt principles of natural capital, systems thinking, pollution prevention and corporate social responsibility (CSR) will thrive, while industries that continue to pollute will fall behind. The difference between the two systems (one circular and adapting and one linear and rigid) lies in the concept of green economics. Innovative industrial partnerships can make improve their bottom lines through integrating industrial ecology into their processes. In short, nature can inform design and development processes, and make industries more energy and cost efficient, while significantly reducing their ecological footprint. The key is to model industries on biological processes (bio-mimicry). According to the Rocky Mountain Institute report (2003), eco-industrial parks, like nature:

“rewards cooperation and makes symbiotic relationships work; fits form to function efficiently; develops diverse possibilities to find the best solution and survival; recycles and finds a use for everything; requires local expertise [thereby providing local job growth and stimulating local economies]; avoids excesses [and sprawl]; taps the power of limits; runs on the sun and other natural sources of energy, and uses only the energy and resources that it needs”.

The new economy of sustainability functions well because it ensures true economic progress and true wealth. According to Indigo Development (2006), “Instead of industrial processes being self-defeating they will operate on the interest generated by natural capital, and wealth will appreciate instead of depreciate overtime. The key to eco-industrial processes is they allow industries to internalize non-market values, so their operations reflect true costs. Doing so drives them toward sustainable consumption and manufacturing, making them more competitive, desirable and improving their regulatory compliance, while stimulating local and regional economic development and community wellbeing”. EIPs operate using principles of industrial ecology and bio-mimicry: one company’s waste = another company’s resource.

Eco industrial parks (EIPs) represent an exciting opportunity for sustainable redevelopment of derelict lands and vacant lots. A part of the vision for the GTA should be networks of eco-industrial networks that operate very efficiently through principles of industrial ecology. With each new eco-industrial park, Ontario’s ecological and carbon footprint will shrink, which means less smog, less diseases related to air pollution and cleaner, healthier cities.

Sources

Biomimicry Institute. (2006). Accessed January 14, 2008 online: <http://www.biomimicryinstitute.org/>

Carr, Audra J. Pott. (1998). Choctaw Eco-Industrial Park: an ecological approach to industrial land-use planning and design. In *Landscape and Urban Planning* 42 (2), p. 239-257.

City of Toronto. (2004).

Canadian Eco Industrial Network Virtual Library. (2007). Accessed March 1, 2008 online: <http://www.cein.ca/cein/virtual.html>

Cornell's Center For the Environment. (1995). Fairfield Ecological Industrial Park Baseline Study. Online, Internet, 9 December 1996

Dunn, S.V. (1995). Eco-Industrial Parks: A Common Sense Approach to Environmental Protection, Yale University: Connecticut, U.S.

Eco Industrial Networking- Online Library. (2006). Accessed February 7, 2008 online: <http://www.cein.ca/cein/virtual.html>

Frosch, R. (1994). Industrial ecology: Minimizing the impact of industrial waste. In *Physics Today* 47 (11), pp. 63–68.

Frosch, R., 1995. The Industrial ecology of the 21st century. In *Scientific American* 273 8, pp. 178–181

Gertler, N. (1995). Industrial ecosystems: Developing sustainable industrial structures. Center for Excellence for Sustainable Development: U.S.

Indigo Development. (2006). Accessed February 8, 2008 online: <http://www.indigodev.com/Ecoparks.html>

Lovins, A. (2003). Natural Capital. Accessed January 4, 2008 online: <http://www.natcap.org/>.

Natural Resources Canada. (2007). Accessed February 24, 2008 online: <http://oee.nrcan.gc.ca/transportation/tools/fuelratings/ratings-results.cfm?attr=8>.

Ontario Center for Environmental Technology Advancement. (2006). Toronto Region Sustainability Program. Accessed January 26, 2008 online: <http://www.oceta.on.ca/TORSUS/P2links.htm>

Rocky Mountain Institute. (2003). Biomimicry in Communities. Accessed February 2, 2008 online:

Rocky Mountain Institute. (2008). Community Energy Opportunity Finder. Accessed February 18, 2008 online: <http://www.energyfinder.org/sitepages/pid40.php>

Kirschner, E. (1995). Eco-Industrial Parks find growing acceptance. In *Chemical and Engineering News* 73 (15).

Lowe, Ernie, et al., 1995. Fieldbook for the Development of Eco-Industrial Parks, Indigo Development, publishing pending by EPA, OK, CA

Piasecki, B. (Feb. 1992). Industrial ecology: An emerging management science. National Academy of Science of the United States of America: U.S. pp. 873–875

Salvesen, D. (Feb. 1996). Making industrial parks sustainable. In *Urban Land*. p. 32

Smart Communities Network. (2007). Online. <http://www.smartcommunities.ncat.org/greendev/subdivision.shtml>

Spohn, S.G. (2006). (2006). Eco-Industrial Parks Offer Sustainable Base Redevelopment. (Smart Growth Network). Accessed February 20, 2008 Online: http://www.smartgrowth.org/casestudies/spohn_icma.html.

Varga, M. and Kuehr, R. (2007). Integrative approaches towards Zero Emissions regional planning: synergies of concepts. In *Journal of Cleaner Production* 15. Pp. 1373-1381.

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SUDA is a registered Canadian charitable organization whose mission it is to foster a healthy natural environment by providing information about sustainable city-building to key stakeholders in the Toronto region through outreach, research and analysis, networking and electronic communications.