

# WHAT IS ECO-INDUSTRIAL DEVELOPMENT?

---

*Edward Cohen-Rosenthal*

Work and Environment Initiative, Cornell University, USA

Eco-industrial development presents an archway to a better future. For business, eco-industrial development offers new avenues for profitable companies. For communities, eco-industrial options lead to more rooted businesses, good jobs and a cleaner environment. For local and global ecosystems, eco-industrialism promises a lighter load on the environment. In some ways, eco-industrialism is the sunny side of the street from doom-and-gloom environmental scenarios. It seeks to uplift, not to commiserate; to connect rather than dismantle. Eco-industrialism doesn't solve all environmental or business challenges but instead deploys a systemic scan at multiple levels to find and re-find best possible solutions.

My goal in this chapter is to sketch out the broad themes of eco-industrial development—to broaden perspective on theory and practice. I'd like to describe this broader framework first and then relate it to what have become standard definitions of eco-parks and networks. I'll leave it to others in subsequent chapters to more fully articulate the role of stakeholders and actors, describe key parts of the implementation process and provide vignettes of actual work in progress.

A new way of thinking about economic development is taking shape in communities around the world. It comes out of a common-sense observation that most places where we work waste too much, dump too much waste in the land, air and water and wantonly pass along disposal of products to the next users. The costs of these are borne in higher prices, large sums for clean-up and in pollution of the commons. We know that there has to be a better way of working.

For those who have come to be intrigued by these issues as a powerful economic development approach, finding a way out of inflated controversies between the economy and the environment serves as a magnet to this concept. It promises better, faster, more responsible development; synergy, not enmity.

Those who see the issue through the lens of industrial ecology dream that, as in natural systems, waste equals food and that linking one company's 'throw-aways' to another's

needs will provide better environmental and business outcomes. Finding and acting on those possibilities is a role for eco-industrial practice.

Those who seek a new age of environmental excellence recognise that incorporating environmental excellence at the system and process level leads to better and less expensive results. Problems with limited solutions at the department or firm level have new options presented when the field of play is a cluster of companies.

For business people bold enough to understand that environmental responsibility is a bottom-line concern for the future—one that insurance companies, banks and customers will increasingly demand—this is the path to take. For entrepreneurs who understand that business opportunities abound not solely in control technologies but even more so in the integration of environmental benefits into the full range of products, here is a new playing field.

For those who see cookie-cutter development in strip malls or call centres that look and act all the same, eco-industrial development provides an alternative that celebrates the possibility of place. It looks at the particular geography, business climate, human potential and other factors that make places special. It avoids a race to the bottom in terms of tax giveaways and instead emphasises what locally can lead to extraordinary success.

For communities, eco-industrial development rather than promising utopia challenges those already doing business in the community and those recruited to move in to ask ‘Why not the best?’ Significant and continuous improvement in business and environmental performance is the goal. Especially in areas reeling from environmental injustice, it turns the tables on the approach to development. Rather than focus the most energy on keeping out bad investment, it actively seeks the best possible businesses that fit into the local business, social and natural ecology. Instead of begging for a break, it proudly offers opportunity.

## **1.1 Sustainable development: the contributions of industry**

Eco-industrial development is a subset of sustainable development but walks in largely uncharted territory. As we will demonstrate, it also reflects the three Es of the sustainability stool: economy, environment and equity. Sustainable development tends to focus on broad models of biodiversity, global warming, forest cover and oceans. Solutions look at overall fiscal policy, tax laws, tradable permits and so on. These can be valuable perspectives and scales to consider when combined with actionable strategies that make a real difference in a relatively short time.

When we take an ecosystemic approach to analysis and solutions, we begin quickly to understand that any large-scale environmental problem such as desertification, soil and water pollution, species preservation, air quality and population are manifestations of billions and billions and billions of point-sources. Together they exhibit themselves at a larger scale as critical environmental problems.

The role of industry in anthropogenic alteration of the environment writ large is given short shrift.<sup>1</sup> Even community-based sustainable development activities often ignore industry as part of the solution. Community-based indicator projects run out of steam when it comes to the real engagement of industry (Hart 1999).

Yet industry in each transaction—every purchase and sale—influences the larger commons. Each decision on what materials and energy to use and how to use them is a pixel in the picture of industry's contribution to environmental problems or to their resolution. Aggregating micro-level efforts are too often overlooked in addressing sustainability's conundrum. The Hoover Dam or Yellow River approach represents large-scale public works as the prime solution: allegedly big solutions to big problems. And these dam projects come packed with lots of unwanted side-effects for many species, including humans. I prefer, instead, to learn whether water conservation, crop selection and distribution systems could be more fully explored, often at lower cost and greater impact. Many little choices add up to major impact while adjusting more dynamically to local constraints. The same is true in industry, where broad and systematic approaches are more likely to have a larger and sustained aggregate impact than a single or limited set of flashy projects.

No one solution will resolve the blights caused by industry. Within these larger expressions of environmental damage are many particular subsystems, each with its own unique characteristics, often requiring special solutions. Carrying eggs requires an idea of a basket—not just running back and forth with a few eggs in hand. A framework or scale shift is the conceptual basket for carrying ideas to where they can be unpacked and deployed. Eco-industrialism is just such a basket. Particular responses reflect the system's core values, practices or patterns. In the case of eco-industrialism, its applications evolve from applying several basic principles:

- Always ask how to achieve business and environmental excellence in the same breath.
- Always look for mutually beneficial connections with and among businesses, materials, energy, natural systems, markets and the local community.
- Think systemically; experiment locally.

Eco-industrial answers don't arrive wrapped up neatly in a kit with instructions on how to glue it together. No one approach, one machine, one chemical process or one law is up to the task of systemic changes in time or for all time. This is true for people too when we look for who is responsible for creating and correcting environmental problems. No one manager, one worker, one inspector, one activist or one guru can or ought to bear that burden. Taken together, each person, all six billion of us, represents parts of a human ecosystem by which we are all affected and for which all bear responsibility. This accountability also must find expression in the many millions of businesses around the globe who are enjoined to exploit the opportunities that they have to influence our future for the better—not diminish our common legacy.

1 The International Human Dimensions Programme of the UN based in Germany attempts to deal with these issues around climate change, but its budget is limited and only one of its five major programmes is on industrial transformation.

Eco-industrial development results in uniqueness. None of the projects described in this book is exactly the same as another. Those who seek benchmarks to copy will do better to visit today's efforts for inspiration—not the Holy Grail. The reason is simple. All businesses (one can make a broader assertion about all things) represent niche players. Each business or set of businesses is nested within an environment that includes its market, suppliers, geography, community, materials availability, energy sources, weather, population, transportation and so on. By necessity, its particular identity is a singular mould. We can sort them into categories. However, category is categorically an abstraction. To succeed in the real world, the particular is pre-eminent. Companies that ignore this truth find that their dissonance with the world around them leads to fundamental conflicts. Eco-industrialism asks each person, company, community or country to find its niche, reinvent its niche if necessary and celebrate the power of its specialness. Some have tried to create the franchisable eco-park and have run into this obstinate truth.

## 1.2 Why focus on industry?

For many of my colleagues who look at ecological systems and natural resource management a focus on industry feels strange to them. For some, it is consorting with the devil, preferring petitions and regulations to harness the beast. For others in the policy arena, industry is just one of the many stakeholders at the table. Sustainable development theorists frequently ignore the role of industry.

On the contrary, the role of industry is central in how we address the environmental crisis. Industry is a much larger part of the problem than is normally recognised and can take much more a part of the solutions than it has been allotted. If what we are trying to do is to manage the impact humankind has on the environment, then it is in industry that we find fault and hope. The room for improvement is incredible: 90% of materials and energy that go into the making of a product are never incorporated in the final product. These products are discarded very briefly after being purchased and, in a single leap, wind up in the rubbish heap (Hawken *et al.* 1999). A modest improvement in these figures could go a long way. Industry is an instrument of human intention and, as such, can refocus itself in ways that profitably meet human and environmental needs.

When I use *industry* as a term it is not related just to private-sector manufacturing. The state-owned aluminium plants in the former Soviet Union were much more of a problem than similar plants privately owned in the United States. Transportation is an industry with enormous environmental impact. Further, the service sector constitutes an industry, as does the government in that they require particular patterns of resource and energy use. They too must change. When we ask the following questions, it provides an important focus:

- Who makes the products that make up the building and construction sector?  
Industry.
- Who makes the retail units that lead to household contribution to pollution?  
Industry.

- Who makes the pesticides and fertilisers that provide the basis for non-point-source pollution and for industrial agriculture? *Industry.*

I make these statements not because there is malice or premeditation among the overwhelming percentage of businesses. I also recognise that ‘natural causes’ contribute to environmental loading, as does the stress on overburdened natural cleansers of the environment. But, to really deal with household, construction, industrial or municipal waste, etc., go upstream and you find industries where product design, production processes and embedded energy and resource use has to be addressed. If you want to create solutions, these industries can keep materials and energy in play delaying depletion while seeking sustainable substitutes and, we hope, restoring new life to natural systems.

### 1.3 Eco-industrial parks and networks

Defining eco-industrial development (EID) is not an easy task. It has been used to describe a wide variety of applications. My perspective is that it can cover industrial parks and estates, specific EID networks and relations in industrial districts as well as conscious partnering at the enterprise level. In some ways, it is easier to describe what it is not. Ernie Lowe has observed (2001):

Some developers and communities have used the term EIP in a relatively loose fashion. To be a real eco-industrial park a development must be more than:

- A single by-product exchange or network of exchanges
- A recycling business cluster
- A collection of environmental technology companies
- A collection of companies making ‘green’ products
- An industrial park designed around a single environmental theme (i.e. a solar energy driven park)
- A park with environmentally friendly infrastructure or construction
- A mixed-use development (industrial, commercial and residential)

Although many of these concepts may be included within an eco-industrial park, the vision for a fully developed EIP needs to be more comprehensive. The critical elements are the interactions among the park’s member businesses and the community’s relationship with its community and natural environment.

There has been some confusion about eco-industrial parks in the mistaken notion that they must resemble the Kalundborg industrial symbiosis, shown in Figure 1.1. In fact, Kalundborg is more of a network than a park. There is no common management group, and all the relations are bilateral. Further, they stretch across the region rather than residing on a single property. Paul Hawken (1993), musing on the Kalundborg example, wrote in *The Ecology of Commerce*: ‘Imagine what a team of designers could come up with if they were to start from scratch, locating and specifying industries and factories that had potentially synergistic and symbiotic relationships.’ Taking up his challenge, many

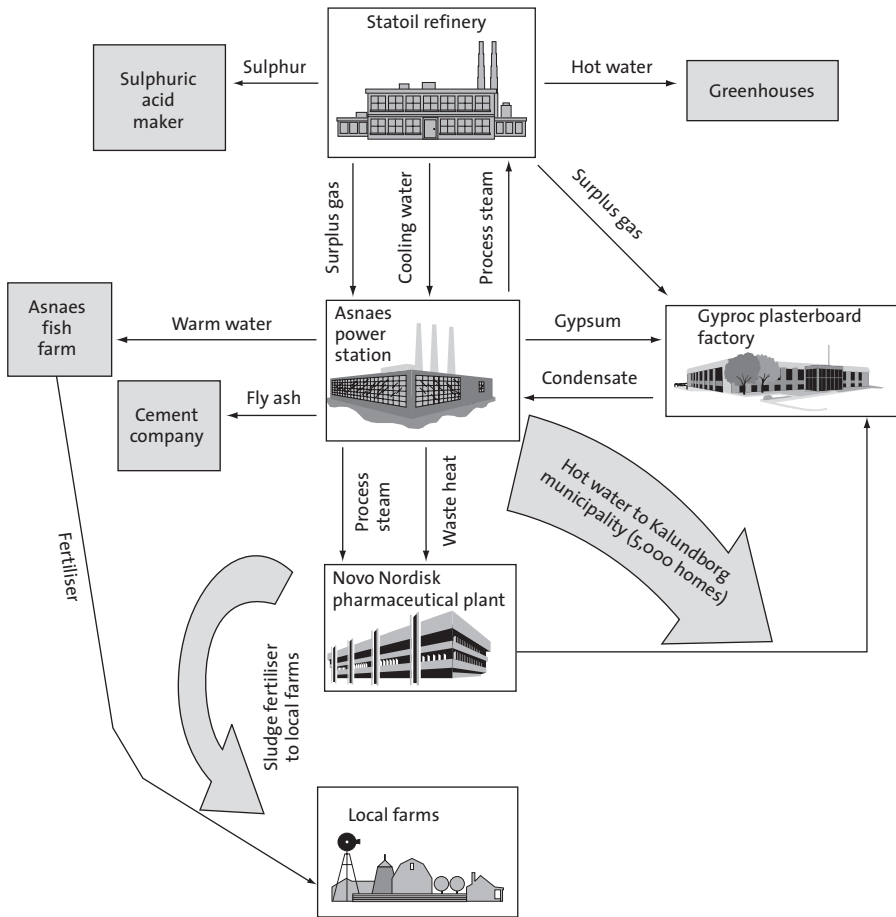


Figure 1.1 **Industrial symbiosis, Kalundborg, Denmark**

communities and entrepreneurs have tried to design a similar set of interconnections, with mixed success. The founders of the Kalundborg system will readily say that it is the relationships they formed that are key to its success, not necessarily the pipes.

Eco-industrial parks offer a discrete parcel of land where companies locate for maximum resource efficiency. The President’s Council on Sustainable Development (PCSD 1996c) defines the eco-industrial park (EIP) as follows:

[It is] a community of businesses that co-operate with each other and with the local community to efficiently share resources (information, materials, water, energy, infrastructure and natural habitat), leading to economic gains, gains in environmental quality and equitable enhancement of human resources for the business and local community.

Connection on contiguous property is not always possible or desirable. The network can take more visible and physical form when collocated. However, there are other options for eco-industrial strategies. In North Carolina, the Triangle J Council of Governments (TJCOG)<sup>2</sup> has created a successful network within a multi-county area, where mutually beneficial exchanges are identified, shown on a computer in data and GIS (geographical information system) format. Eco-industrial connections are possible within an existing industrial area where the businesses are not going to move to a new location. They can, however, seek out interconnections and preferred relationships that range from materials to marketing. If the goal remains the simultaneous achievement of the broadest possible business and environmental success, then they can be considered an eco-industrial network (EIN). This distinguishes an EIN from any association of businesses. I am much less concerned with maintaining the purity of the label than I am with encouraging businesses to look at their own practices and to connect with others to lead to sustainable businesses and communities. An EIN can also be connected to an EIP when it adds value to the park, including allowing for economies of scale for aggregating materials or to achieve other objectives.

These remain to be experimented with, but localities can carve out manageable geographic areas with diverse businesses that are encouraged to explore and self-organise eco-industrial opportunities. For rural areas this may incorporate a large territory, whereas in a dense city it may only be a few blocks. I would also argue that a larger EIN is desirable even with an EIP on environmental grounds. Any new development, no matter how 'green', will have an impact on the local eco-system. The only way to maintain or reduce impact is to work simultaneously with other businesses to improve their practices so that the overall impact on the water- or airshed is positive.

Figure 1.2 shows the advantages of thinking about eco-industrial development on multiple scales. The possibilities and permutations increase exponentially when a broader cluster is in the picture, yet it requires very clear communication, defined values, a mission, objectives and structures to be able to take full advantage of scale. A larger scale may increase the probability of mutually beneficial connections, but an eco-industrial framework moves beyond serendipity to consciously increasing the chances of positive outcomes.

## 1.4 Eco-industrial development as a framework

In essence, then, eco-industrial development is an overarching framework for the recreation of enterprises at the micro level, how communities are organised and how we live and work at larger scales. When first introduced in the 1990s and popularised by Paul Hawken, eco-industrial parks were seen as possible venues for waste exchange cleverly connected on a contiguous piece of property. It scented of interesting but improbable industrial ecology amusement parks. Seen in this manner, eco-industrial parks were indeed oxymoronic rarities—similar to a new particle generated in a high-speed physics cyclotron, requiring enormous energy, good fortune and being short-lived. It can also be

2 See the TJCOG website at [www.tjcoг.dst.nc.us/indeco.htm](http://www.tjcoг.dst.nc.us/indeco.htm).

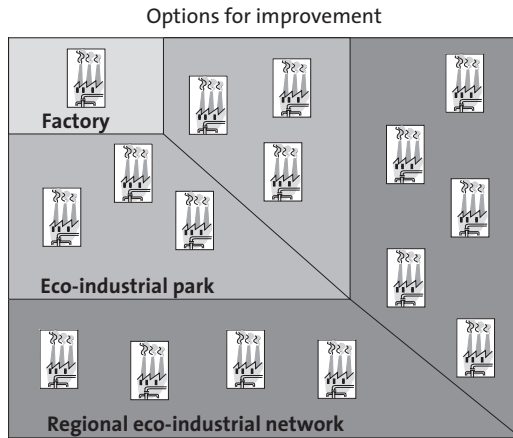


Figure 1.2 ***The multi-scale approach to eco-industrial development***

seen as a jigsaw puzzle for misplaced resources. Success was possible but not probable, especially with small and medium-sized enterprises.

Instead, we need to understand that eco-industrial connections occur all of the time in all kinds and sizes of businesses and communities. This occurs in advanced industrial companies such as Hewlett Packard, which concentrates on only its top several competences and develops dynamic partnerships in areas in which it can neither excel nor wishes to excel. It also occurs at the traditional village commerce level in many developing countries where webs of relationships broaden capacity, redirect waste towards re-use and manage inventory, among other functions. But is this activity conscious and systematic? Do those involved know how to adjust to new markets, technologies and materials? Does it add maximum value to shareholders, stakeholders and the environment? I suspect not.

In eco-industrial development, the issues of scale are central. Holonic solutions,<sup>3</sup> which operate simultaneously at various scales, from the product to the workplace to the company to the region, provide different dimensions and call for different strategies. A framework of eco-industrialism helps us to systematically ask the questions of scale and strategy. We can make things better within a specific scale without affecting the larger framework. These are good acts, but the lack of impact on the larger scale tells us that good work does not necessarily sufficiency make. The stakes are too high and the opportunities too great to be piddled away. Scale is also relevant in understanding the design and architectural implications of eco-industrial applications. A design sense of scale will take expression in technical and architectural breadth and reach. Some of the work of William McDonough demonstrates the power and aesthetic of looking at the molecular level of benign materials to the design of buildings that follows the swallows of shape and function (McDonough and Braungart 1998).

3 Holon as a term was introduced by Arthur Koestler (1967) and expanded on by John Matthews (1995) to describe the way that whole systems are reflected and refracted at different levels of scale.

There are a large number of acronyms and programmes for sustainability and environmental improvement. Many, if not all, can be included in particular eco-industrial applications. This is an embracing concept that seeks systematic solutions to economy and community. Environmental management systems such as the Eco-management and Audit Scheme (EMAS), Green Productivity and the ISO 14000 series can all be incorporated at various system levels with eco-industrial development. It can subsume design for environment, by-product synergy, pollution prevention, cleaner production, green accounting and a host of other techniques. The subject of this book is far from the only answer to environmental challenges, but it represents an intellectually defensible framework from which profitable, equitable and healthy actions can emerge.

## 1.5 The ‘eco’ in eco-industrial

The use of the term ‘eco-industrial’ has been a matter of some discussion. Some who have no problem with the goals of eco-industrial applications avoid using the term because it ostensibly sends a message that raises the neck hairs of some business people who see environmental concern as only more cost and regulatory interference. ‘Eco’ echoes the twin mantras of eco-industrialism—simultaneous concern for economic success and commitment to environmental excellence. Let me first take on the issues of economic success. Eco-industrialism is a voluntary, market-driven approach that uses the discipline of internal and external markets to assure price, performance and quality. Eco-industrialism supports the end results of profit enhancement and frugal use of resources, but it asks us to rethink our relationships, the effect of our products on ecosystems and the impact of the processes of production on employees and affected communities. The elegant solution, the one we may need to dig deeper to find, is one that accomplishes both business and environmental improvement (Fig. 1.3).

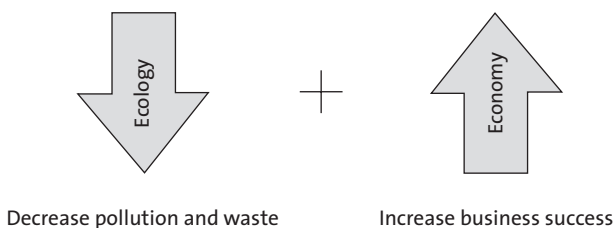


Figure 1.3 **Principles of eco-industrial development**

The goal of eco-industrial development is not to do the same with less. Its charge is to do far more with far less. The economic measure is return on assets (ROA). I have long suggested an internal benchmark of at least 30% higher ROA compared with performance of comparable traditionally organised companies. Current practice has not yet evolved far enough to be able to test this figure, but I suspect the number is low. This is dependent on a few variables. First, cash liquidity must be preserved based on shared investments

in infrastructure, technologies and services. Although control over core technologies may be necessary, the uptime of equipment provides a significant return. Second, strong environmental management reduces liability, lowers energy costs while it increases reliability, lowers disposal costs and seeks to obtain value (or cash) from recovered materials. Third, eco-industrial companies are looking for a broad range of opportunities to partner: from transportation, to trade shows, to improving the value of employee benefits. Fourth, they are looking for revenue enhancement either by partnering to bid on certain jobs or by creating new products or services that serve definable unmet needs in the marketplace and reach companies with environmental supplier requirements. Hence, income goes up while costs go down. The flexibility of cash management provides a means to weather more difficult times and to take advantage of opportunities.

I promote the ROA focus not only as an industry advocate but also as a committed environmentalist. Wasteful use of resources should not be rewarded in the marketplace. The stock valuations of companies that aggressively look for new more resource-efficient strategies and practices ought to be reflected in their share price. This has already been shown in several models of 'green investing' (Foecke 2000). As green investing focuses less on not investing in the 'bad' companies with violations and more on supporting those that exhibit good practices, the more the differences will become apparent from complacent and wasteful companies.

I make no excuses for environmental companies that manage themselves so poorly that they cry into the kerchief of their environmental purpose. They should manage in a way that uses their assets wisely, meets customer needs and avoids overengineering of the product. Or they should go out of business and see if someone else can do it better. Propping up poor practices only enables more waste and hurts the reputation of the industry.

The 'green' consumer has represented about 3–4% of the market over the past 20–30 years, with little variation. Joel Makower (1993), editor of *The Green Business Letter*, has pointed out that surveys have shown that, given similar price and quality, 70–80% of consumers will choose the product with the environmental attribute. For eco-industrial companies the goal should be to significantly beat their competitors on cost and quality. For there to be a significant impact on the economy, green approaches have to come out of the shadow of micro-niches and take on or influence the behaviour of the larger market in their product or service segments. Today's approach of overpriced 'green products' and the appearance of poor performance makes any significant impact whimsical. Eco-industrialism can provide them with the difference to play in the big league. As we demonstrate the superior value of eco-industrial management, it will easily attract capital.

Strong management does not mean autocratic styles. Team-based management reflects the values of eco-industrial use, where skill flexibility, interdependence and full asset utilisation are valued. One can introduce new ways of working that reflect ecological principles rather than outmoded, mechanistic, heavy-handed management practices (Cohen-Rosenthal 1998c). Eco-industrial companies seek to increase their productivity through better indoor air quality and well-lit and attractive workplaces and motivate employees with fair family-wage jobs with benefits.

Let's turn to the 'eco'-logical face of eco-industrial. Eco-industrial networks have before them a range of environmental measurement, control and abatement strategies for transport of goods, production and maintenance processes. This is a baseline

requirement for participation in these networks. This is not to balance the tough business approach described above but to complement it. Excellent managers know that unnecessary processes and waste need to be rooted out. Environmental management systems that focus on process and outcomes are integral to eco-industrial applications. By working at a system level, more accurate information is provided about environmental impacts across various environmental media. Monitoring can be more complete yet less expensive. Mutual assistance in solving environmental problems leads to better results and lower ecosystem impact. I am very much in favour of umbrella permitting systems that look at the cumulative impact on those in a neighbourhood (or affected by the broadcasts of smokestacks), where the real customer for pollution reduction is found. These can also be made more results-oriented than paperwork-focused, more concerned with the impact on seniors and children in a community than with sampling techniques, less expensive and time-consuming in terms of data collection and more attentive to finding solutions that work.

If the extent of the goal is to do less harm, it doesn't make a compelling case for the adoption of these techniques. From an environmental perspective, effort to restore habitat and clean up polluted land or waterways is high on the agenda. Green space taken out for construction of eco-industrial facilities should replace at least what was ripped up. Good land-use planning would use higher-density developments to minimise impact as well and would add more green space to compensate for the environmental load of operations as well as serving as an amenity for employees, the community and the birds and other wildlife.

There is also a different sense to the word *ecological* than environmental care. It has to do with the system level of analysis and action. Eco-industrial is not a strategy you do by yourself. It takes at least several co-operating parties. The by-product synergy process used by the World Business Council for Sustainable Development Gulf of Mexico looks to find that synergy in dyadic relationships between two companies. The Kalundborg industrial symbiosis is in reality a set of agreements between small sets of individual companies. In our construction of eco-industrial development, two parties working together around a few select issues is a good but suboptimised system. Seeking out the overlapping ringlets of subsystems or parallel functions in other organisations provides the venue for eco-industrial co-operation. This look at multiple organisations, multiple stakeholders and multiple functions shines a light on possible mutually beneficial action. One school of thought is the Charlie Atlas brigade, where each individual business or component demonstrates muscular excellence. The other takes a more communitarian route, where a common group and mutual support are sought. Some businesspeople prefer the sense of control they feel by flying solo. Then again, this is the least safe form of aviation! *Bonne chance!*

I prefer an ecological model that reflects natural systems. Although I recognise the importance of excellent engineering as part of the implementation of a process, I much prefer a more organic approach. In these systems, all duplication is not banished. Indeed, flexibility and multifunctionality are reflected in redundant systems that protect against glitches and simultaneously offer more opportunity. The equation of environmental awareness or organisational effectiveness with lean asceticism misses the mark widely. Natural systems are bountiful—so must be eco-industrial applications. Systems learn; they adjust to changing conditions. Rigidly welded eco-industrial proposals tumble apart when the system preconditions fall away or when the tolerances of each

component are exceeded. A process-focused eco-industrial setting learns to address challenges along the way, growing and changing as they go.

## 1.6 Renewed urbanism and rural regrowth

Eco-industrialism looks to urban areas where in years past the kind of interconnection, live work and density of commerce was characteristic. It seeks to rebuild such communities not just with the 'backsplash' of new immigrant communities that have reclaimed abandoned areas. It serves as a magnet to bring back to the city working-class families of all backgrounds burdened with two car payments and the costs of moving out to the fringes of a city to be able to afford housing and safe schools. The key to reclaiming these areas is not 'yuppification' of old 'brown' houses but the creation of good jobs where now there are abandoned eyesores, and reclaiming affordable and desirable housing. Locating good jobs and industries near current neighbourhoods with full neighbourhood support and participation can make long bus rides history while building real opportunity and wealth where people are now.

The city represents the nexus of markets, transport, raw materials, capital and skilled labour (Jacobs 1984). A city reborn revels in that advantage. That advantage works best as a package where all are connected, seeking to highlight the particular character and competitive competences of each city. Cities provide a unique scale of market and materials. There was a golden rule of industrial location made popular by the consulting company McKinsey and Company that it is best to locate closer to your market or your raw materials, based on what is heavier. With imagination, entrepreneurs in cities can mine the material resources lying fallow in landfills and abandoned buildings and properties, service particularly significant local markets, take advantage of transportation and infrastructure investments and draw on a variety of education and research institutions to attract a skilled workforce. The availability of these assets, where the overhead for maintaining most of these is a shared cost, demonstrates one of the key eco-industrial operational principles: keep fixed overheads low while expanding the range of options.

Urban brownfields are not the only venues for eco-industrial approaches. Rural communities 'back on their haunches' also can serve as potential applications for eco-industrial approaches. Too much farmland is being eaten up by suburban sprawl; urban applications of eco-industrialism would take some of the pressure off this unfortunate land grab. But there are ways to help young people find good jobs in their rural hometowns or regions by rethinking the use of agricultural products and by-products. Research and investment can help bioproducts that are grown or are tossed away be turned into valuable raw materials used for value-added manufacturing or processing industries. For example, there is a way to use the whey from cheese processing to create various plastics. Society is moving from the processing of petrochemicals, a by-product of detritus from millions of years ago, to use of bioproducts that helps lower the level of global warming while increasing the level of global economic opportunity. These come not just from land-based farming but also from greater use of the wonders to be found in marine environments. The rural ethics of respect for the land and frugality dovetail

with eco-industrial principles. Communal barn raising on the prairie and dale provides a model for co-operation in a community that can create new economic opportunity.

## **1.7 Eco-industrialism: an alternative to environmental elitism**

Eco-industrialism strikes at the heart of environmental elitism and architectural pretension. Rather than focusing solely on pristine neighbourhoods within new urbanist walking distance to a Starbucks or trails for off-road vehicles, eco-industrial development seeks the full range of jobs. It does not reject the making of things but asks us to make the things we use with more care and more resource efficiency, thus making them better products. It asserts that all citizens, all workers, deserve workplaces and living spaces that are healthy.

The making of artefacts is not an ancient artefact itself nor an activity to be relegated to the lowest-paid and worst working conditions in exploitable parts of the globe. This is a dangerous mythology, especially in the United States. When Sweden and Germany, both with higher labour and social costs, can remain worldwide leaders in manufacturing, then it says more about the paucity of the US effort to provide good jobs than the fact that manufacturing is passé. Someone makes the mugs for the coffee salons, the chairs people sit in on the patio, the bricks that provide the veneer of the building, the cleaning fluid for washing the dishes, the flour that goes into the croissants and so on. There are metals and plastics fashioned to use in the computers that serve the Internet economy. Yet, if one listens to the insistent drone of academic and government pundits, these jobs have disappeared for good and the future is all about e-trade and virtual everything. Internet applications provide amazing opportunities as part of the new economy, but they represent only one aspect of the economy and are often linked to the purchase of goods, transport of these goods and can't escape consideration of end use. Behind all of these activities are valued jobs—jobs for a broader range of people than those touted in cyber-industries. All sectors require or produce products, which continue to draw on the material and energy storehouse of our planet.

When industry is viewed as poison, then it is segregated, if possible, outside the walls of the city or is cordoned off in the city with buffer zones. The segregation of industrial parks into areas that no one else wanted for residential or retail use assumes that the interaction of industrial and commercial workplaces with human habitation is to be avoided. Industrial estates become 'leper colonies' as part of the development process. A look at the master plan for most towns has considerable detail on where public facilities will be and where houses will be located. It rarely has much more detail other than hatch marks on a planning map for the industrial portion.

A victim of afterthought, industrial developers create a self-fulfilling prophecy because industry sees no other alternatives available. Now there is. Eco-industrialism challenges the outcast view of industrial development. Rather than accept the assumption that production facilities need to be shunned, eco-industrialists would prefer to see them as safe workplaces for community and employee health: old industries recreated in much

better editions. These will be new industries so attentive to community and employee health that workers can proudly live near where they earn their livelihoods. This kind of development can be more profitable for developers than putting up a sign on willingness to build to suit, more convincing to new businesses since it is based on maximising business opportunity and more acceptable to communities as new development reflects community values. I hope to see 'green' housing being located within easy reach of 'green' industry where internal process, exterior architecture and land-use planning promotes welcoming environments for nature, neighbours and employees alike. Planned communities need not be offshore islands where the morning traffic jam is its residents driving off to work. They need to be affable and affordable to working people who deserve as much as anyone else the benefits of New Urbanism properly conceived.

All of this is possible now with today's technology and processes. Individual companies have demonstrated that being environmentally proactive pays off at the bottom line and with positive public attention. But for most small and medium-sized industry, environmental management and industrial ecology are foreign concepts where the arteries leading out of the city are home to industrial shantytowns. Locked in isolation by public policy and narrow management thinking, they often don't understand that it is the absence of systemic thinking and common action that leaves them as dishevelled as the fences around the property. When they band together for mutual gain, then they can realise the benefits of industrial networks. Corporate neighbours move from being eyesores to offering helping hands.

## 1.8 Eco-industrial equity

Eco-industrialism is also about equity. Eco-industrial development is an environmental justice strategy where placards are replaced by jobs, and toxics by transparent concern for worker and community health. In community after community documented in this book, local populations have made the decision that a trade-off between toxic workplaces and jobs need not be made. In the United States, most communities experimenting with this approach have large percentages of people of colour; they have demanded that the buck stops here when it comes to environmental racism. Communities are defining what they want—and are getting it. The same is true for working-class communities where people are recognising that many of their jobs are in unsustainable industries or factories and that if they aren't proactive they will be tossed out on the rubbish heap as well, leaving their families and communities to pick up the pieces. It is the goal of eco-industrialism to provide for family-wage sustainable jobs in companies that can profitably compete in the marketplace over time by constantly looking for new alliances and adjusting to new supply and market conditions.

Local equity can be affected by adopting an eco-industrial approach, but the approach has global implications as well. Unless whole systems of production make quantum-level jumps in resource productivity and functionality, then as the population rises so does the danger to us all. Current resource-intensive approaches to agriculture, so-called durable goods, energy production, building construction and so on paradoxically mean increasing hunger, homelessness, pollution and disease.

Proclamations of the end of work are wrong. The aphorism that there isn't enough work to go around ignores the billions of inhabitants on this planet that need transportation, communication, education, healthcare, housing, etc. Eco-industrialism is about how to produce those goods and deliver those services in ways that shore up communities and universalise opportunity.

My larger argument is that we must take on the primary way in which we allocate resources—price. Price is inherently about scarcity—raise prices until the numbers who can afford a product approximate supply. In a world where there is greater demand on the Earth's resources than can be supplied, profligacy increases price and concentrates power in ways that increasingly disenfranchise the poor. Use of price to allocate resources means that most of the world's population is locked out. The World Resources Institute estimates it would take four Earths to be able to make widely available a moderate income to all the current inhabitants on the planet, based on current levels of resources needed per unit of output.<sup>4</sup> Providing basic goods on a global scale is impossible with our present wasteful processes. Eco-industrial development draws people together in tighter, more efficient and more effective ways. Efforts such as Factor 4 or Factor 10 (von Weizsäcker *et al.* 1997) have demonstrated that it is technically feasible to achieve quantum levels of improvement. I am less impressed with the technical pyrotechnics of Lovins and von Weizsäcker than I am inspired by the goal as a means to the end of a more just and livable world.

I have always seen eco-industrialism as far more than a nifty eco-efficiency trick; I see it as an avenue to take to the next system level a shift in production systems that extract far more value from resources and create opportunities to lower cost so that basic goods become more affordable to a much much wider swathe of the population. It is not the only solution to broad-scale poverty but it is an important one. It allows us to draw on cultural practices of commercial co-operation from diverse farms, villages, towns and cities around the world and adapt them to new technologies and access to markets. It allows us to create a new measure—the resource intensity per unit of basic need—and to continuously strive to drive down what it takes to provide basic human rights as articulated by the United Nations. It is in these considerations of equity that eco-industrial strategies are revealed as key to any hope of sustainable development on a global scale. The growth of industry in developing countries has a choice to make: adopt old pathways that require continued transfer of wealth to the North and indenture to the oil economy, or realise local sources of energy and materials that employ a growing and impatient population. One leads to disaster and the other to proud prosperity, where meeting basic needs is a baseline from which quality of life emerges that celebrates human community and ingenuity.

## 1.9 Virtuous cycles

It is all about relationships. By seeking out rewarding interconnections, eco-industry pulls together three virtuous cycles connected to sustainability's triad. At the economic

4 Go to [www.wri.org](http://www.wri.org).

level, it circulates money within the local economy as much as possible by creating partnerships and networks locally. As such, it creates real wealth within local communities. Any community developer knows that the more times money circulates in the local community the better effect it has on the local economy. It may eventually wend its way elsewhere, but the local connections need to be maximised.

At the materials and energy levels, the environment is better off and the economy strengthened the more times that any given unit of material or energy is collected and recirculated in a local economy—there is less damage, dissipation or dumping the more this occurs. Imported materials that are buried or burned after single use close off the opportunity to reduce costly extraction, processing and imports later on. The more they cycle through various users and uses the better it is.

Yet, at its heart, eco-industrialism is about the recreation of community: first and foremost among businesses and those who work within them. Second, there is a rapprochement with communities that have spurned their industries and have cast off appreciating the power and magic of making new things in service to our larger society. In days gone by, chamber of commerce meetings were places of information exchange, bartering and bantering. Today, we live in a world where one neighbour doesn't know his or her neighbour in the next house or apartment, nor does one company know what the next does inside an industrial park. It is in this connection—company to company, company to community, person to person—that eco-industrial development's invisible magic works its wonders.

The eco-industrial agenda is broad, bold and sweeping. It encourages innovation and new relationships. Yet unless these take specific shape then this rhetoric and other hopes for a vibrant and sustainable future evaporate. Can we cross the boundaries that need to be crossed? I don't know. Can we be as innovative as we are challenged to be? I don't know. Will this spread wide enough and fast enough to make a real difference? Again, I don't know. But what I do know is that the pioneers highlighted in this book represent seeds for a century to come blooming with opportunity. And, reaching out, together we will try to make the difference we know we can make—with imagination as far and as fast as we can.