

Methods and tools of industrial ecology: strategic sustainable development essays...

[Business](#), [Management](#)



Industrial ecology

Industrial ecology, also called as “ science of sustainability,” is an emerging and exigent discipline for engineers, scientists and policy makers. The approach of industrial ecology assists to understand the industry and environment connections to shift from the thinking of past faults to forward thinking (Kapur and Graedel 2004). Five hierarchical and mutually dependent levels for the system are described for strategic sustainable development (SSD) to progress toward the target results, the state of sustainability. With proper implementation of its application and appropriate usage of the strategic sustainable development IE will promote business competitiveness and product modernization (Erkman 1997). Several core elements characterizing the IE discipline are:

- The biological equivalence
- The approach of systems perspective
- Function of technological modification
- Role of companies
- Eco-efficiency and dematerialization
- Forward-looking research and practice (Kapur and Graedel 2004).

IE provides numerous tools and methods to investigate the environmental challenges at each level, from processing, production to offering suitable remedy. Some of the significant components of IE are life cycle assessment, design for Environment, industrial symbiosis, Eco-efficiency, dematerialization and decarbonization and Industrial metabolism. To ease the understanding of growing numbers of approaches, a five-level model of

SSD provides a scaffold where various tools can be treated supporting each other through different contributions (Korhonen 2004). The first level of the SSD system constitutes the global ecosystem (as a parent system). The three dimensions of this system include economic (e. g. costs and profits), social (e. g. equity, development, human rights, responsibility) and ecological (e. g. material and energy flows and ecological biodiversity). The second level of SSD model is the complimentary outcome of development within the system. The System Condition for social sustainability demonstrated by four system conditions for ecological sustainability:

1. Concentrations of substances taken out of the Earth's crust.
2. Concentrations of substances generated by society.
3. Degradation by physical resources.
4. Human needs are met worldwide at societal level. (Robèrt et al. 2002)

The third level proposes the procedures to obtain a successful outcome (sustainability) of level 2. The principles of backcasting and flexible platforms are provided to offer a vision to management. The fourth level moves ahead with the practical actions in order to acquire the goal of sustainability inside the global ecosystem as well as its economic and social subsystems (e. g. recycling and switching to renewable energy). The fifth level deals with metrics and tools that inspect and monitor the success of the actions. It includes the material and energy flows and their influences on the parent ecosystem and its subsystems (Korhonen 2004; Robèrt et al. 2002).

Implementing Industrial ecology and strategic sustainable development

Korhonen argues that IE contributes to all five hierarchical levels in SSD.

Nonetheless, the utilization of IE outside the systems model, risk and complexities can be generated leading to unsustainability. That can make sustainability policy and sustainability management more complicated.

Based on the ecological economics and environmental management it is recommended to proceed with the incorporation of IE into the extensive SSD concepts and approaches (Korhonen 2004).

Moreover, O'Rourke argued in his work that defining the goals of IE is challenging and feasible since different people articulate extensively different explanation about these goals. Two broad goals out of the realm are advanced. First, obtaining closed material cycles and secondly, recognizing an essential prototype shift in our opinion about industry-environment relations (O'Rourke, Connelly and Koshland 1996). IE has enthused widespread scientific debate and inventiveness in industry, in the proposal and execution of public policy and the commercial environmental management. The SSD model is considerable that it successfully places the IE among the many other approaches and tools used in ecological economics, pollution prevention, cleaner production, life cycle assessment and corporate ecological management. Furthermore, the premeditated thinking is the solution to attaining success in practice since IE must have bridged the business strategy and decision-making, with an approach of corporate social responsibility (Korhonen 2004).

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