

# Eco-Industrial Networking—A Quick Literature Review



**Bunny Hayes\***

Graduate Student, University of Louisville, USA

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**\*Corresponding author:** Bunny Hayes, Graduate Student, University of Louisville, Louisville, Kentucky, USA

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## Mini Review

Since sustainability is currently being viewed as an important part of decision making and new urban and rural planning, it is important to know concepts of sustainability still vary from source to source and can depend on a variety of scale. Sustainability, for our purposes, and according to authors Yelda and Park in their 2017 paper, *Eco-industrial networking for sustainable development: review of issues and development strategies* [1] refers to sustainability as the act of being a sustaining system, whether it be in the form of human habitats, activities, or institutions. A common way to look at sustainability places the environment in charge of supplying inputs and accepts the leftover as waste. Waste disposal then becomes an external sustainability. This means that as long as resources flow and conditions are right, systems should easily be sustainable. But we do know that resources, especially non-renewable resources, are not free flowing. For this reason, input-output systems coming from the environment is not possible. Implications lead toward improvement in the efficiency of systems and toward supplying conditions that are needed for improvements. This is termed as internal (conditions for) sustainability. For sustainability to occur there needs to be both external and internal criteria met. When an urban or human area is divided, its subsets fall in the environmental, economic, and social categories. When the subsets become involved in interaction, they can have sustainability together, but each standing alone is incapable of achieving sustainability. When we connect the input-output of external sustainability to the internal requirements for sustainability, this becomes the material flow through the urban area of human settlement. The flow of materials through the city come in two forms. Linear metabolism, concerning a city, shows input is unequal to the output. The output here is deemed as trash for throwing away out of the system. The other form, a circular metabolism, contends that every output should be used as input in the system.

New directions are pointing industry complexes toward industrial symbiosis which leads to eco-industrial networks (EIN). The new job is getting large industry to realize how a production material cycle, can benefit not only those within the industrial networks, but can benefit the greater good of the globe. With chemical industry goals of zero waste to be achieved, we are going to need new, beneficial, open channels of communication and technology sharing. This development can be termed eco-industrial development (EID). Once industrial complex entities are joined in conversation, the government, on federal, state, and local levels, can join in to help review and evaluate regulations. Government assistance will be a necessity since the current regulations are targeted for risk management usually, as individual chemicals and are very precise in their regulatory statutes. Once the regulations are changed, the industries can enter risk sharing agreements. With government cooperation, EIN's can operate according to each industry complex wants and needs. A case study of Ulsan, South Korea, shows how they worked to create a model of a working industrial symbiotic network. The Korean governmental establishment of KICOX (Korean industrial complex corporation), helps the process on the industrial park-level. With these extended measures, it is hoped that Asia will be able to open conversation among the 4,000 industry complexes scattered and localized throughout the region, to learn to use the material cycle strategy which deems every output as an input for someone else.

A key factor of EIN, is of course, its economic feasibility. To determine feasibility industries will want to use costs of transactions and identify operational boundaries for these links. Using this information, Yelda and Park suggest five types of industrial symbiosis linkages.

- a) Through waste exchanges (type 1).
- b) Exchanges within a firm (type 2).

- c) Exchanges among firms collocated in a defined industrial park (type 3).
- d) Exchange among local firms that are not collocated (type 4); and
- e) Exchange among firms across a broader region (type 5).

With these guidelines set in place and showing success, other governments can easily start to implement similar models into planning and development projects, as well as decarbonization plans.

Beyond economic concerns, for EIN to occur successfully, there needs to be strong commitments from the industrial firms involved. For help with a structure for this part of networking, Reed's 2008 article, *Stakeholder participation for environmental management: A literature review* [2], has listed evaluation points for participation of the stakeholders in a common endeavor. Reed first starts with suggesting there be an underlying philosophy to bring the stakeholders together. With the threat of current pollution overloads and future climate changes, this could be the perfect theme to help with unify the stakeholders while trying to achieve trust, equity, learning, and empowerment. This philosophy coupled with eco-industrial networking could help businesses let go of traditional practices, which include environmental degradation and adverse human health impacts, and move forward to operate in balance with the environment

while still being able to make product/service and profit. Among other stakeholder participation practices, Reed suggests early and consistent recognition of stakeholders, as well as systematic representation and analyzation. Clear objectives are necessary and can incorporate economic tools such as extended producer responsibilities. Through this concept, recycling on industrial levels could be a crucial part of attaining eco-proficiencies for the whole urban community. Stakeholder participation should seek participatory fit and entail detailed facilitation. Reed makes a good call to suggest that scientific knowledge, along with local knowledge needs integration for successful participation. Even though the industrial firms, as stakeholders, have great need of commitment and trust, the process should be institutionalized. With this institutionalization it can be ensured that laws are made according to the overall needs and assessments of individualized park areas. Included with participatory laws, social organization and norms can then be better understood and utilized for overall success in eco-industrial networking.

### References

1. Yedla S, Park HS (2017) Eco-industrial networking for sustainable development: review of issues and development strategies. *Clean Tech Environ Policy* 19(2): 391-402.
2. Reed MS (2008) Stakeholder Participation for Environmental Management: A Literature Review. *Biological Conservation* 141(10): 2417-2431.



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