

Industrial Symbiosis Expanded for Building a Sustainable Society

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- a global increase of 70 % in urban solid waste by 2025.
- increase of 1.3 billion tones per year of waste in 2015 to 2.2 billion tons in 2025.
- if the global population actually reaches 9.6 billion by 2050, it will take almost three planets.

Linear
(end-of-pipe)



Circular
(regenerative)

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- Research question: How can greater symbiotic relationship between consumers and other economic agents impact on a more sustainable society?

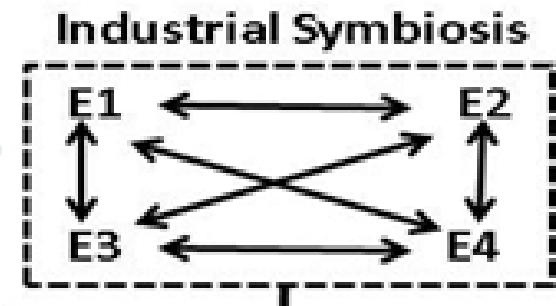
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- This discussion aim to present a framework for a conceptual model of Industrial Symbiosis Expanded.
- Prosumer => Producer-consumer

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- The reason for the relevance of this proposition is that most of the time the concept of Industrial Symbiosis is related only to interorganizational relationships (Ammenberg et al., 2015, Martin, 2015, Trokanas, Cafelja and Raafat, 2015).

Eco-Industrial parks



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Industrial Ecology → Industrial Symbiosis

Industrial Symbiosis is a theme in the field of research that deals with Industrial Ecology

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- Industrial Symbiosis



Mutualism



Commensalism



Parasitism

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- Erkman (2001) presents four challenges:
 - a) Evaluate systematically waste and by-products;
 - B) Minimize environmental damages caused by the dispersion of anthropic activities;
 - C) Dematerialization of the economy;
 - D) Reduction or elimination of the use of energy derived from fossil fuels.

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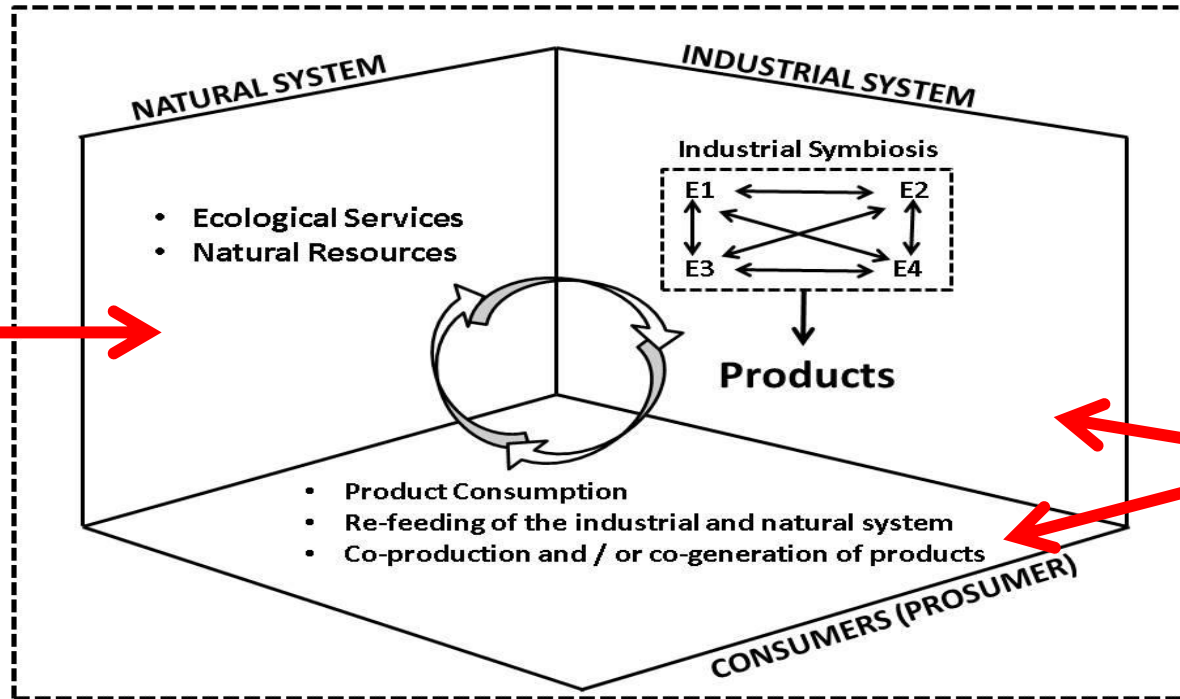
- Industrial Symbiosis
 - aligned with the Circular Economy (Andersen, 2007), and it is necessary to follow **three principles** to achieve it, they are:
 - I - the creation of organizations oriented to Circular Economy;
 - II - the formation of industrial parks focused on ecological issues;
 - III - the establishment of a society directed towards eco-efficient consumption.

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- The insertion of prosumer in the production system can be evidenced in the studies of Nazari et al. (2014) and Rathnayaka et al. (2014) on the **production and consumption of energy** and the gains in establishing synergistic relationship between companies and consumers.

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INDUSTRIAL SYMBIOSIS EXPANDED



• Reduce and mitigate use

• Increase Resilience

Mutualism

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- when consumers are inserted symbiotically into industrial systems, not only can they play a passive role of consumption, they can act as co-producer, or by **re-feeding** the system with post-consumer waste.
- Plastic Industry (Textile industry)
- symbiotic interaction and cooperation between the three synergetic systems - natural, industrial and “prosumer”.

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Thank you!!!