Improving Cleaner Production through Biologically Inspired Urban-Industrial Networks

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Abstract

Biologically-Inspired Design is a growing field that has many applications. While this is normally used for individual products or materials, applied at a systems level, the inspiration stems from the structure and makeup of ecosystems. Over the last few decades, ecologists have developed Ecological Network Analysis (ENA) to better understand ecosystems, and both industrial and urban systems have been analyzed using ENA. Specifically, Eco-Industrial Parks (EIPs) that look to mimic the cyclic nature of food webs have been analyzed using ENA showing that these networks can still be improved significantly before they reach the levels of observed natural food webs. Similarly, urban networks (such as water and energy networks) have been looked at with ENA at a high level with insight gained about trophic levels in a city and how they compare with food webs. However, the industrial and urban networks have been analyzed at different scales and in separate systems. In this paper, we propose to further the use of ENA for industrial and urban networks. Specifically, the industrial networks will be combined and analyzed with the urban networks. This better represents how these networks function in reality whereas before some critical connections may have been ignored. A case study will be used to exemplify the method and benefits of our approach.

Keywords: *biologically-inspired design, ecological network analysis, industrial ecology*