Integrating and prioritizing ecosystems services at early development stages of industrial systems in a territory: the case of distributed recycling at Nancy, France

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Abstract

Ecosystem services (ES) is a powerful conceptual framework to put in evidence the benefits that humans receive from nature, most of time for free. The problem is that it is complex to link between the local ecosystem services of an urban territory and the industrial systems placed within it, identifying the priority interactions (as synergy and impacts). From a decision-maker perspective, there is no a aid decision tool to guide a multicriteria evaluation at early development stages of industrial systems. On the ecological side, there have been major efforts in the valuation of ES given by ecosystems (terrestrial, aquatic, atmospheric) to the human well-being and great advances in the developing of a standard ES baselines such as Common International Classification of Ecosystem Services (CICES). While on the industrial side, life cycle assessment (LCA) tool is focused on the quantification of the environmental impact of industrial interventions. Despite its ability to cover mutually exclusive and exhaustive impact categories, the LCA approach still has deficiencies: 1) it focuses on quantifying and reducing the net environmental impacts, but not on reducing ecological overshoot and establishing synergies with nature; 2) it considers the interactions between technological processes, but not the interactions between relevant ecosystems. Few researches have addressed the alignment the territorial priorities in terms of ES for planning and urban development with the supply/demand of ES by industrial systems. There is a need to include the ES in the desicion making process to establish the capacity of the territory in order to evaluate an absolute environmental sustainability of industrial systems. The purpose of this article is to propose a methodological approach in order to include ecosystem services in regarding the territorial and industrial endeavors. A prioritization is made based on the connection of urban ES services and the techno-ecological synergy. The results of are step forwards to create techno-ecological synergies between ecological and industrial systems. This methodological steps will applied to the case of distributed recycling via additive manufacturing (DRAM) to highlight the relevant ES from the CICES framework for the territory of Nancy, France. The technical advancements of recycling approaches using additive manufacturing are promising technical interventions to foster plastic recycling at a local level.

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