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Pôle Tertiaire - Site La Rotonde - 26 avenue Léon Blum - 63000 Clermont-Ferrand

Room Pascal 313

Industrial symbiosis, a model of strong sustainability: An analysis of two case studies, Tampico and Dunkirk

Jury

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ABSTRACT

Industrial symbiosis (IS) is presented as an inter-firm organizational strategy with the aim of social innovation that targets material and energy flow optimization, but also structural sustainability. In this study, we present systems thinking and geographical proximity as the theoretical framework used to analyze industrial symbiosis through a methodology based on System Dynamics and the underpinning use of Causal Loop Diagrams, aiming to identify the main drivers and hindrances that reinforce or balance the industrial symbiosis's sustainability. The understanding of industrial symbiosis is embedded in a theoretical framework that conceptualizes industry as a complex ecosystem in which qualitative and quantitative approaches can be integrated, if we use a methodology flexible enough to encompass the complexity of the stakeholder's values and motivations in the same analysis. Furthermore, the methodology performs a comparative strength over descriptive statistical forecasting, because it is able to integrate social causal rationality when estimating attractiveness in a region or individual firm's potential. The stakeholders' influence becomes essential to the complex understanding of this institution, because by shaping individual

behavior in a social context, industrial symbiosis provides a degree of cooperation in order to overcome social dilemmas for actors like the tension between efficiency/resilience, who cannot be achieved by their own. The proposed narrative encourages us to draw up scenarios, integrating variables from different motivational value in the industrial symbiosis. We use the Altamira and the Dunkirk case studies to explain the role of geographical systems analysis, identifying loops that reinforce or regulate the sustainability of industrial symbiosis, and three drivers: "Efficiency/Resilience dilemma", "Industrial symbiosis governance", and "The role of global recycling networks in the by-product valorization". The social dimension integration in the analysis of a complex system is indeed applied to enhance the understanding of IS dynamics, but a great potential is foreseen for other micro-level social systems like for example urban metabolism dynamics or bio-economy.

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