

A Single Leader Radner Equilibrium problem: industrial symbiosis in an Eco-Industrial Park

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Abstract

In this study, we propose a bilevel programming model for a theoretical industrial symbiosis network located in an Eco-Industrial Park (EIP). At the upper level, the leader can be interpreted as an authority that is in charge of the ecological concerns, while, at the lower level, a finite number of enterprises act as followers with economic objectives. Within the considered system and given the followers demand, the leader wants to minimize the consumption of the natural resources and the social cost arising for the community. Based on the EIP authority decisions, all enterprises compete with each other in a parametric non-cooperative game with the strategies of the EIP authority as exogenous parameters. The game evolves in a sequence of finite future periods, so that uncertainty on resource fluxes and environmental conditions has to be taken into account. This uncertainty is expressed through a finite set of all possible situations that can occur at each period. In this framework, then, a sequential game in which the enterprises controls, trades, and consumes a finite number of different natural resources is settled. The lower-level problem is formulated as a Radner equilibrium problem, and we aim to investigate on the connection between the leader behavior and the equilibrium problem of the followers.

References

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