

A variational inequalities approach for a closed-loop supply chain network under environmental regulations

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Abstract

Global climate change has encouraged international and regional adoption of pollution taxes and carbon emission reduction policies. Europe has taken the leadership in environmental regulations by introducing the European Union Emissions Trading System (EU-ETS) in 2005 and by developing and promoting a set of policies destined to lower carbon emissions from transport sectors. These environmental policies have significantly affected the production choices of European energy and industrial sectors.

In this paper, we propose a closed-loop supply chain network design problem that includes raw material suppliers, manufacturers, consumers, and recovery centers. The objective of this paper is to formulate and optimize the equilibrium state of this closed-loop supply chain network assuming that manufacturers are subject to the EU-ETS and a carbon tax is imposed on truck transport. The model is optimized and solved by using the theory of variational inequalities.

Keywords: Closed-loop supply chain network, environmental regulations, variational inequalities.

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