

An intuitionistic fuzzy MCDM framework for selecting environmentally responsible freight transport service provider: A transport service buyer perspective

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Abstract

Freight transportation practices accounted for a significant share of environmental degradation and climate change over the years. Therefore, environmentally responsible transport practices (ERTPs) become a serious concern of freight shippers and transport service providers. Past studies reported that a little attention is paid to assess the ERTPs of freight transport companies. This paper proposed a hierarchical framework consists of five ERTPs dimensions and thirty-three practices including four new practices. The transport firm selection is affected by multiple expert opinions, lack of information availability, decision-making ambiguity, and background of experts. The evaluation of such decisions requires a multi-criteria decision-making (MCDM) method under group decision-making approach. This paper used an intuitionistic fuzzy set integrated analytic hierarchy process (IF-AHP) and ViseKriterijumska Kompromisno Rangiranje (IF-VIKOR) method. The applicability of the proposed framework is validated with Indian freight transport industry. The importance weight of ERTPs are computed with the help of IF-AHP method and performance of selected transport companies' w.r.t. ERTPs are measured by IF-VIKOR. The result analysis shows that environmental knowledge sharing among freight transport actors, quality of organizations human resource, collaborative green awareness training programs, promoting environmental awareness program for employees, and compliance of government transport emission law and practice have been ranked top five ERTPs which significantly contribute to the environmental sustainability of freight transport industry. The proposed framework is also ranked freight transport companies based on ERTPs. Two different sensitivity analysis approach are presented to check the model robustness. This research is expected to provide a reference to develop ERTPs in emerging economies freight transport industry and contribute to the development of sustainable freight transport system.

Keywords

Environmental sustainability; Sustainable freight transport; MCDM; Intuitionistic fuzzy AHP; Intuitionistic fuzzy VIKOR;

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Aalok Kumar is a Senior Research Fellow of Department of Management Studies, IIT Roorkee, India. He is working in area of sustainable freight logistics planning. He was awarded gold medal in master course of Industrial Engineering and Management from IIT(BHU) Varanasi. He also presented his work in many reputed operations and supply chain

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Prof. Ramesh A. is working as Associate Professor in the Department of Management Studies, IIT Roorkee, India. His research area includes humanitarian supply chain management, multimodal freight transportation, healthcare waste management, operations research, and operations management. He obtained Master of Technology in Industrial Engineering and Doctor of Philosophy in operations management. He has published more than 30 research papers in reputed journals and conferences.