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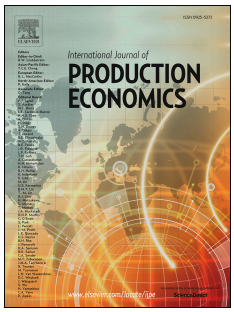

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Incorporating Inventory Risks in Location-Routing Models for Explosive Waste Management

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Abstract

Explosive waste poses growing threats to people and the environment in the vicinity during the process of transportation, collection and periodic storage. In this paper, attention is drawn to reduce the environmental risk derived from facility location, inventory level and multi-depot vehicle-routing of explosive waste management. Unlike other works in the literature, the risk is assessed as the impact volume associated with certain hazard radii posed by the explosions happening en route and at site. An optimization model minimizing total cost and risk is developed to simultaneously decide 1) where to locate the collection centers, 2) how to manage the inventory level for each center, 3) how many vehicles need to be purchased; 4) how to route explosive wastes from generation nodes to collection centers, and 5) how to route explosive wastes from collection centers to recycling centers. A solution procedure on the basis of the TOPSIS method is proposed to solve the optimization model within reasonable computation time. Lastly, the application of the developed approach in Nanchuan of Southwest China and a wide range of numerical experiments are conducted. The results show significant improvement in both system cost (34%) and environmental risk (57%).

Keywords: Location-inventory-routing problem; Bi-objective optimization; Reverse logistics; Volume-based explosive risk assessment; Hazardous waste management

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