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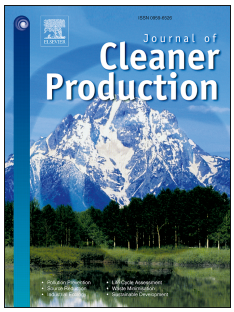

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Optimizing the Green Open Vehicle Routing Problem with Time Windows by Minimizing Comprehensive Routing Cost

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Abstract

With the rapid development of the sharing economy, outsourcing logistics operations to third party logistics has become an efficient way of reducing costs in freight transportation. It can be modeled as a variant of the open vehicle routing problem (OVRP), where the vehicles do not return to the depot after servicing customers. However, very few papers have studied fuel consumption in the context of third party logistics. In this work, the mathematical model of the green open vehicle routing problem with time windows (GOVRPTW) was described based on the comprehensive modal emission model (CMEM). A hybrid tabu search algorithm involving several neighborhood search strategies was designed to solve this problem. Computational experiments were performed on realistic instances based on the real road conditions of Beijing, China. The effect of empty kilometers is analyzed through comparing different cost components. Compared with closed routes, the open routes reduced the total cost by 20% with both the fuel emissions costs and the CO_2 emissions cost down by nearly 30%. For the experiments with congested nodes, the fuel and emissions cost rose by 12.3%, and the driver cost even increased by 31.3%.

Keywords: open vehicle routing problem, time windows, fuel consumption, tabu search, vehicle type, traffic jam

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