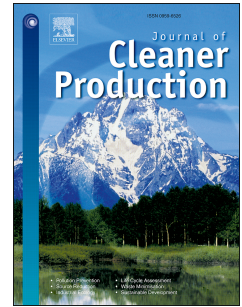


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# Heterogeneous Fixed Fleet Vehicle Routing Problem Based on Fuel and Carbon Emissions

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**Abstract:** In this paper, we study an emission-based heterogeneous fixed fleet vehicle routing problem (E-HFFVRP) with considerations of fuel and carbon emissions. This problem involves routing a fleet of a fixed number of vehicles with various capacities to serve a set of customers. It seeks to minimize the objective function, which incorporates the fixed expenses and variable costs consisting of fuel consumptions and carbon emissions. It is a new variant of the heterogeneous fixed fleet vehicle routing problem (HFFVRP), in which a fleet consists of a fixed number of vehicles with different capacities, fixed costs and variable costs. We formulate this problem with a mixed integer programming model by introducing an approach to calculate fuel and carbon emissions. Moreover, a split-based adaptive tabu search (SATS) algorithm using an optimal split scheme and an adaptive tabu search algorithm is proposed. Its key features and components are designed accordingly. Results of numerical experimentations on two sets of generated instances confirm the efficiency and effectiveness of the algorithm.

**Keywords:** Vehicle routing; Freight transportation; Heterogeneous fleet; Fuel; Carbon emissions

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