

## Multi-Objective Optimization for the Green Vehicle Routing Problem: Approach to Case Study of the Newspaper Distribution Problem

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**Abstract :** The aim of this work is to present a solution procedure referred to here as the Multi-objective Optimization for Green Vehicle Routing Problem (MOOGVRP) to provide solutions for a case study. The proposed methodology consists of three stages to resolve Scenario A. Stage 1 consists of the "treatment" of data; Stage 2 consists of applying mathematical models of the p-Median Capacitated Problem (with the objectives of minimization of distances and homogenization of demands between groups) and the Asymmetric Traveling Salesman Problem (with the objectives of minimizing distances and minimizing time). The weighted method was used as the multi-objective procedure. In Stage 3, an analysis of the results is conducted, taking into consideration the environmental aspects related to the case study, more specifically with regard to fuel consumption and air pollutant emission. This methodology was applied to a (partial) database that addresses newspaper distribution in the municipality of Curitiba, Paraná State, Brazil. The preliminary findings for Scenario A showed that it was possible to improve the distribution of the load, reduce the mileage and the greenhouse gas by 17.32% and the journey time by 22.58% in comparison with the current scenario. The intention for future works is to use other multi-objective techniques and an expanded version of the database and explore the triple bottom line of sustainability.

**Keywords :** Asymmetric Traveling Salesman Problem, Green Vehicle Routing Problem, Multi-objective Optimization, p-Median Capacitated Problem

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