

---

# Equity Objectives in Vehicle Routing: A Survey and Analysis

Piotr Matl\*<sup>†1</sup>, Thibaut Vidal<sup>2</sup>, and Richard Hartl<sup>1</sup>

<sup>1</sup>University of Vienna – Austria

<sup>2</sup>Pontifical Catholic University of Rio de Janeiro (PUC Rio) – Brazil

## Abstract

Logistics is multi-objective. The complexity of real-life planning and decision-making often cannot be reduced to cost only. Non-monetary aspects such as service quality, consistency, as well as social and environmental responsibility can be equally important differentiators in developed and competitive markets. A more holistic view of logistics can therefore improve the practical value and effectiveness of decision support systems.

In this contribution we focus specifically on VRP models dealing with equity and balancing objectives. Such models aim to capture the trade-off between cost optimization on the one hand, and equitable workload distribution and balanced resource utilization on the other. Although many contributions are found in the literature, there has been little discussion about how equity or balance should be defined in the context of vehicle routing, and measures for assessing this objective have been proposed and implemented without critical evaluation of their relative merits.

The purpose of our study is to take a step back and provide a more thorough foundation on which equity can be included in multi-objective VRP models. We survey and categorize the literature on equitable vehicle routing and collect the commonly applied inequality measures. Following an analysis of their theoretical properties, we conduct a computational study to examine how different equity objectives impact the properties of Pareto-efficient solutions and fronts. Significant differences are identified, methodological and theoretical implications are highlighted. We conclude by calling attention to some paradoxes of optimizing equity and point to open avenues for incorporating equity and balance criteria into logistics models.

---

\*Speaker

<sup>†</sup>Corresponding author: piotr.matl@univie.ac.at