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Synchronized Vehicle Routing for Equitable Resource Allocation in Food Banks

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Abstract : Inspired by a food banks distribution operation for non-profit organization, we study a variant synchronized vehicle routing problem for equitable resource allocation. This research paper introduces a Mixed Integer Programming (MIP) model aimed at addressing the complex challenge of efficiently distributing vital resources, particularly for food banks serving vulnerable populations in urban areas. Our optimization approach places a strong emphasis on social equity, ensuring a fair allocation of food to partner agencies while minimizing wastage. The primary objective is to enhance operational efficiency while guaranteeing fair distribution and timely deliveries to prevent food spoilage. Furthermore, we assess four distinct models that consider various aspects of sustainability, including social and economic factors. We conduct a comprehensive numerical analysis using real-world data to gain insights into the trade-offs that arise, while also demonstrating the models' performance in terms of fairness, effectiveness, and the percentage of food waste. This provides valuable managerial insights for food bank managers. We show that our proposed approach makes a significant contribution to the field of logistics optimization and social responsibility, offering valuable insights for improving the operations of food banks.

Keywords : food banks, humanitarian logistics, equitable resource allocation, synchronized vehicle routing
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