

IT Support for Waste Collection Scheduling in Smart Cities - Enhancing Efficiency and Sustainability*

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Abstract

The paper explores the development of optimization algorithms specifically aimed at generating waste collection schedules in smart cities in Poland. The motivations behind the study stemmed from preliminary research findings regarding the potential for optimizing the processes of selective collection of municipal waste not only in the area of route optimization but also in the resource, time, and financial dimensions. Few publications attempt to address these issues; however, comprehensive approaches that consider the multitude of factors influencing the development of municipal waste collection schedules are seldom encountered. The paper proposes a decision model based on integer programming with the objective function aimed to minimize the peak daily volume of waste to be collected, which we equate with the demand for transportation capacity. The model was implemented in an information system that enables its utilization in cities and municipalities of various sizes. The article provides a brief description of the functionalities of this system and the new opportunities presented by the integration of such decision models with flexible software that facilitates their practical application. In the research the mathematical programming methods were used. The primary criterion for selecting these methods was their practical applicability, defined as the ability to be implemented within an information system characterized by high flexibility and considerable operational speed.

Keywords: waste collection scheduling, smart city, optimization, software development.