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Robust facility location problem for bio-waste transportation

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Abstract

The submitted article presents an optimization tool for bio-waste facility allocation. Produced quantity of bio-waste in individual territorial units is a key factor for locality selection for the construction of a new facility. Bio-waste production changes over the course of the year and differs between various types of housing developments. Separation rate is a determining factor for bio-waste production. Readiness to separate the waste reflects the total produced quantity of bio-waste. Predicting the future of bio-waste production is a complex problem and it would be suitable to consider more developed scenarios. The introduced tool takes into the consideration more possible scenarios for production and provides a robust solution from the point of view of a locality suggestion for the construction of the processing facility. The optimization model is based on the two-stage stochastic programming approach. The decision regarding the locality for the construction of a new facility is made during the first stage. This method is called “Here and Now.” The results are presented in a case study for a region in the Czech Republic. Since the change of legislation in 2014, municipalities are supposed to provide a possibility to collect a bio-waste for citizens. This has caused significant growth in production, about 20% annually over the past few years. At this point, it is very complicated to estimate a future trend based on the historical data. Due to this reason, it would be appropriate to consider the future bio-waste production across more scenarios. In order to enable the applicability of the tool on a large area with many nodes, it would be necessary to adapt the computation method according to its computational complexity. The decomposition of individual scenario branches with the existence of binding conditions will be solved by the subsequent development of the tool.