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Route optimization of solid waste collection in Gampaha

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For this study, we have selected Gampaha municipal area. According to the estimates and the enumerated population 2012 (census) in Sri Lanka, among the 25 districts, the highest population is reported from Colombo district. The second highest population is reported from Gampaha district. Even though there are several waste management problems, before a huge disaster due to unsustainable disposal waste in second populated district in Sri Lanka, we propose an optimal waste collecting path. The main objective of this research is to optimize Municipal Solid Waste (MSW) collection routes using mathematical model to maximize collected solid waste amount and minimize the cost and collection time. To use route optimization process, data related in collection process such as type of vehicles used to waste collection and capacity, the amount of solid waste production and the number of inhabitants for each route are essential. Lack of such data leads us to estimate the solid waste production amount per each route by considering the number of houses/buildings in each route. For 10 sections in the Gampaha Municipal area, the modified maximum flow amount technique and the shortest path model were used to optimize solid waste collection process with minimum cost. The Geographic Information System (GIS) and Google map were used to identify routes, count number of houses/buildings in each route, and to find route distance between each connected junctions/intersections. Total traveled distance for the waste collection at each day was calculated as 858 km after finding the optimum routes by proposed model which is more than 10% efficient compared to the current traveled distance. In the current system, 10 vehicles are being used for collection whereas proposed model needs only 8 vehicles. According to this study, 14.2% and 20% thrift can be obtained via distance and vehicle allocation respectively. The consequences of the reductions in travelled time, total time and travelled distance were savings in costs related to fuel consumption.

Keywords: Geographic information system, optimization