A Method Development for Improving the Efficiency of Solid Waste Collection System Using Network Analyst

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Abstract : Municipal Solid Waste (MSW) collection in a city is performed in less effective manner which results in the poor management of the environment and natural resources. Municipal corporation does not possess efficient waste management and recycling programs because of the complex task involving many factors. Solid waste collection system depends upon various factors such as manpower, number and size of vehicles, transfer station size, dustbin size and weight, on-road traffic, and many others. These factors affect the collection cost, energy and overall municipal tax for the city. Generally, different types of waste are scattered throughout the city in a heterogeneous way that poses changes for efficient collection of solid waste. Efficient waste collection and transportation strategy must be effectively undertaken which will include optimization of routes, volume of waste, and manpower. Being these optimized, the overall cost can be reduced as the fuel and energy requirements would be less and also the municipal waste taxes levied will be less. To carry out the optimization study of collection system various data needs to be collected from the Ahmedabad municipal corporation such as amount of waste generated per day, number of workers, collection schedule, road maps, number of transfer station, location of transfer station, number of equipment (tractors, machineries), number of zones, route of collection etc. The ArcGis Network Analyst is introduced for the best routing identification applied in municipal waste collection. The simulation consists of scenarios of visiting loading spots in the municipality of Ahmedabad, considering dynamic factors like network traffic changes, closed roads due to natural or technical causes. Different routes were selected in a particular area of Ahmedabad city, and present routes were optimized to reduce the length of the routes, by using ArcGis Network Analyst. The result indicates up to 35% length minimization in the routes.

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