



**Dr. Banu ÇALIŞ USLU**

**Title: A comparative analysis of the location optimization of solid waste bins using simulation and GIS: A case study of Maltepe Municipality**

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### **Abstract**

The rapidly increasing solid waste is among the socio-economic problems caused by population growth, making the supply of sustainable living standards difficult and complicating solid waste management. An inadequate solid waste management system can lead to garbage accumulation, traffic congestion, excessive fuel consumption, and, eventually, social unrest and excessive carbon dioxide emission, thus attaching great importance to systematic solid waste management both for developed and developing countries. This research aims to compare two well-known solution methodologies, namely GIS and simulation, which are used to design, analyze, and optimize the solid waste management system based on the locations of the garbage bins. For this purpose, GIS-based and simulation-based models were created based on highly correlated parameters and the results of the models were compared. A significant finding of the study was that the application of the simulation methodology for a geographical area of a size of 278 km<sup>2</sup> was challenging in that the addition of the geographical conditions to the developed model proved to be time-consuming. On the other hand, the simulation model that was developed without adding geographical conditions revealed that the number of bins could be reduced by 60.3% depending on the population size and garbage density. However, this model could not be implemented since the required walking distance was higher than 75 meters, which is greater than the distance the residents could be reasonably expected to travel to reach a bin. Thus, using a cutoff value of 75 meters, the total number of bins can be reduced by 30% on average with regard to the result obtained from the GIS-based solution. This can lead to an annual cost reduction of 930.069 TL on average in the collection process and a carbon dioxide release reduction of 18% on average.

### **Biography:**

Banu Çalış Uslu received the B.Eng. degree in Industrial Engineering from the Sakarya University in 2000, the M.Eng. degree in Engineering Management from the Institute of Pure and Applied Sciences, Marmara University, in 2008, and the Ph.D. degree in Industrial Engineering from the Institute of Pure and Applied Sciences, Marmara University, in 2015. She was a Postdoctoral Researcher at the Sheffield Hallam University from 20016 to 2017. Her research interests include optimization theory, simulation, scheduling, and IoT.