A mathematical model for the industrial hazardous waste location-routing problem

ABSTRACT

Technology progress is a cause of industrial hazardous wastes increasing in the whole world . Management of hazardous waste is a significant issue due to the imposed risk on environment and human life. This risk can be a result of location of undesirable facilities and also routing hazardous waste. In this paper a biobjective mixed integer programing model for location-routing industrial hazardous waste with two objectives is developed. First objective is total cost minimization including transportation cost, operation cost, initial investment cost, and cost saving from selling recycled waste. Second objective is minimization of transportation risk. Risk of population exposure within bandwidth along route is used to measure transportation risk. This model can help decision makers to locate treatment, recycling, and disposal centers simultaneously and also to route waste between these facilities considering risk and cost criteria. The results of the solved problem prove conflict between two objectives. Hence, it is possible to decrease the cost value by marginally increasing the transportation risk value and vice versa. A weighted sum method is utilized to combine two objectives function into one objective function. To solve the problem GAMS software with CPLEX solver is used. The problem is applied in Markazi province in Iran.

Keyword: Mathematical model; Location-routing problem; Facility location; Hazardous waste management; Routing; Industrial hazardous wastes