A FUZZY MULTI-CRITERIA DECISION MAKING APPROACH FOR EVALUATING THE HEALTH-CARE WASTE TREATMENT ALTERNATIVES

Ramin Nabizadeh1, Amir Hossein Mahvi1, Mohammad Khazaei2*, Mirzaman Zamanzadeh1,3, Ahmad Reza Yari4, Ali Jafari5

1School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
2Department of Environmental Health Engineering, School of Public Health, Research Center for Health Sciences, Hamadan University of Medical Sciences, Iran
3Department of Civil and Environmental Engineering, University of Waterloo, 200 University Avenue West Waterloo, Ontario, N2L 3G1 Canada
4Research Center for Environmental Pollutants, Qom University of Medical Sciences, Qom, Iran
5Department of Environmental Health Engineering, Lorestan University of Medical Sciences, Khorram Abad, Iran

Abstract

Hierarchical distance-based fuzzy multi-criteria group decision making (DBF–MCDM) was applied to evaluate the health-care waste (HCW) treatment alternatives for Qom hospitals. A list of aspects consisting of 6 criteria and 21 sub-criteria were evaluated based on a linguistic term set by five decision-makers. Also, four HCW treatment alternatives including “incineration”, “steam sterilization”, “chemical disinfection” and “controlled landfill” were evaluated according to these aspects. Data were aggregated and normalized to obtain Performance Ratings of Alternatives (PRAs). Then, the PRAs were aggregated again to achieve the Aggregate Performance Ratings (APRs). After renormalization, the weighted distances (WDs) from ideal solution (Di*) and anti-ideal solution (Di-) were calculated. Finally, the proximity of each alternative to the ideal solution (Ωi*) was computed. The alternatives were ranked according to the magnitude of (Ωi*) values. Results demonstrated that “controlled landfill” was the most appropriate alternative for the HCW treatment of Qom hospitals and “steam sterilization” was the second acceptable treatment option. A novel configuration of criteria and sub-criteria was proposed based on the public health and occupational health risks. The criterion “Occupational Health” was added to the list of criteria to distinguish the health risks on public and those related to the healthcare waste management workers. Also, a new concept of “land requirement” was presented. The limitations of high-tech alternatives were also considered according to the level of dependency on overseas.

Key words: fuzzy logic, health-care waste, hospital, MCDM, treatment alternative

Received: December, 2013; Revised final: February, 2015; Accepted: March, 2015; Published in final edited form: December 2018

* Author to whom all correspondence should be addressed: e-mail: m-khazaei@razi.tums.ac.ir; Phone: +982537732668; Fax: +982537745265