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Aravossis, Konstantin G.

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A NEW METHODOLOGY APPROACH FOR THE TECHNICAL-ECONOMICAL EVALUATION OF ALTERNATIVE WASTE DISPOSAL METHODS BY USE OF MULTICRITERIA ANALYSIS

K. Aravossis, P. Anagnostopoulos, Ath. Koungolos, S. Vliamos

Land Planning & Regional Development Engineers Department
University of Thessaly
Pedion Areos, 383 34 Volos

ABSTRACT

This study focuses on the development of a new methodology for the selection of the best solution for municipal solid wastes disposal, after evaluating all the important factors, including economical, social and environmental ones. The outcomes of the developed model include a data combination of these factors and of the degree to which each involved group of people may influence the decision making. The main purpose of this methodology is to minimise the subjectivity of choosing the best solution, which is achieved by making sensitivity analysis, at the only variable element in the procedure of decision making, which is the relative weight of each involved group's influence. The methodology application shows that the relative weight given to each involved group has a direct influence on the total grading of the suggested solutions.

1. INTRODUCTION

Finding an effective solution for waste disposal has become a major problem for the modern societies. Particularly in the recent years that has generally become acknowledged that the almost exclusively applied method of waste disposal by landfilling, is not corresponding to the many changes that have resulted in the quality and quantity of solid waste as the time passed. This also accords with the spirit of taking into account a variety of criteria and parameters such as society, economy environment etc.

To this effect, a variety of multicriteria methods has been used in dealing with environmental problems, some of them have focused particularly on the management of various kinds of waste.

Merkhofer and Keeney (1987) have employed a traditional multiattribute in determining sites for the disposal of nuclear waste. Leschine, Wallenius and Verdini (1992) have worked on locating ocean disposal sites using the Pareto Race method. Briggs, Kunsch and Mareschal (1990) have made practical use of the PROMETHEE and GAIA methods within nuclear waste management. It is a multicriteria method which appraises the result in economical terms. Dyer, Edmonds, Btler and Jib (1998) suggest a multicriteria model for the selection of a technology for the disposal of plutonium arms.

Working on solid waste, Caruso, Colorni and Paruccini have developed a regional planning model for the planning of an urban solid waste management system and some heuristic methods for the solving of the problem. Benson (1998) develops a decision support system for an effective planning and management of household recyclable solid waste. Very important are the studies of Hokkanen et al (1995) and Hokkanen and Salminen that have applied the ELECTRE II and ELECTRE III methods, respectively. The latter has been proved useful, particularly in environmental problems in which many decision makers are involved, and in which the quality and quantity of the data is not sufficient.

A remarkable contribution to the Greek bibliography has been made by the studies of Skordilis (1989) who suggests a strategy evaluation in the planning of household waste disposal using the Heuristic Method. Diakoulaki et al (1993) suggest a combination of an expert system and a MCDA model for the appointment of the most suitable disposal method.