

Risk ranking of mine wastes by the combination of fuzzy multi-criteria decision making methods

Abdalreza Yazdani Chamzini*
MSc student of Tarbiat Modares University, Iran
a.yazdani@modares.ac.ir

Mohamad Hosein Basiri
Assistant of Tarbiat Modares University, Iran
mhasiri@modares.ac.ir

ABSTRACT

Risk ranking of projects is one of the most important parts of the complicated risk management procedures. Recognizing the riskiest criteria enable the managers to plan for risk reduction. The first stage for meeting this aim is defining the risky parameters and then establishing an order between them. There are variety methods for risk ranking. The Fuzzy TOPSIS method is one of the best among the multi criteria decision making methods. In this paper with implementing the fuzzy TOPSIS, the risky parameters in the Sari Gunay gold mine are being ranked. The weight of every Criterion is earned by fuzzy AHP. The result of this research presents that effect on the underground waters is located in the highest rank. Effect on the surface waters, healthy, instability, flora and fauna, foundation condition, Reclamation risk, and repose angle stand as the second to eighth respectively. Safety is placed in the last positions.

Keywords: Risk ranking, mine waste, fuzzy AHP, fuzzy TOPSIS, Sari Gunay gold mine.

INTRODUCTION

The main drawbacks of industrialized world, are still keeping their importance because of their potential hazard to human health and environment when improperly treated, stored, transported and/or disposed [1]. Risk is a traditional manner of expressing uncertainty in a system's life-cycle, in quantitative terms, it is the probability by which the predicted goals cannot be achieved with the available resources and refers to the joint probabilities of an occurrence of an event and its consequences [2].

The wastes which are one of the most important parts in mine design must be managed and controlled from the point of generation to ultimate disposal [1]. The objective of hazardous waste management is to ensure safe, efficient and cost effective collection, transportation, treatment and disposal of wastes, selection of the treatment and disposal facilities and routing of hazardous wastes and waste residues involve economic as well as social concerns, increasing pressure on resources such as land, energy and finance coupled with strict environmental regulations have made the hazardous waste management problem more complex [3].

The techniques of risk analysis are powerful tools to help people manage uncertainty, thorough risk analysis estimation and evaluation can provide valuable support for decision making, there are many risk analysis techniques currently in use that attempt to evaluate and estimate risk [4].

These techniques can be either qualitative or quantitative depending on the information available and the level of detail that is required [5]. Quantitative techniques rely heavily on statistical approaches, which include Monte Carlo Simulation [6, 7], Fault and Event Tree Analysis [5, 6], Sensitivity Analysis [6], Annual Loss Expectancy [8], Risk Exposure [9], Failure Mode and Effects Analysis [6, 10], etc. On the other hand, qualitative techniques rely more on judgment than on statistical calculations such as Scenario Analysis [8], fuzzy set theory [8, 11], etc. Quantitative and qualitative techniques have their own advantages and disadvantages [4].

The accurate estimation of risk for a specific receptor depends on the methodology used as well as on a number of factors such as number of surface and in depth samples, sampling period, presence of hot spots, varying composition of disposed wastes, varying climatic conditions and mechanisms of contaminant solubilisation and migration [12].

Risk ranking may conjure up images of an ordered list in which the highest risks are followed by the lowest risks on a simple numerical scale; however, there are many difficulties in simplifying and using such an approach [13].

Risk-based decision making and risk-based approaches in decision making are terms frequently used to indicate that some systematic process that deals with uncertainties is being used to formulate policy options and assess their various distributional impacts and ramifications, the risk prioritization