

## **MULTI-CRITERIA DECISION ANALYSIS: A FRAMEWORK FOR STRUCTURING REMEDIAL DECISIONS AT CONTAMINATED SITES**

I. LINKOV, A. VARGHESE, S. JAMIL  
*ICF Consulting, 33 Hayden Ave., Lexington, MA 02421, USA.*

T.P. SEAGER  
*Center for Contaminated Sediments Research, University of New Hampshire  
Durham, NH 03824, USA*

G. KIKER, T. BRIDGES  
*U.S. Army Engineer Research and Development Center, Environmental  
Laboratory, 3909 Halls Ferry Rd, Vicksburg, MS 39180, USA*

### **Abstract**

Decision-making in environmental projects is typically a complex and confusing exercise, characterized by trade-offs between socio-political, environmental, and economic impacts. Cost-benefit analyses are often used, occasionally in concert with comparative risk assessment, to choose between competing project alternatives. The selection of appropriate remedial and abatement policies for contaminated sites, land-use planning and other regulatory decision-making problems for contaminated sites involves multiple criteria such as cost, benefit, environmental impact, safety, and risk. Some of these criteria cannot easily be condensed into a monetary value, which complicates the integration problem inherent to making comparisons and trade-offs. Even if it were possible to convert criteria rankings into a common unit this approach would not always be desirable since stakeholder preferences may be lost in the process. Furthermore, environmental concerns often involve ethical and moral principles that may not be related to any economic use or value.

Considerable research in the area of multi criteria decision analysis (MCDA) has made available practical methods for applying scientific decision theoretical approaches to multi-criteria problems. However, these methods have not been formalized into a framework readily applicable to environmental projects dealing with contaminated and disturbed sites where risk assessment and stakeholder participation are of crucial concern. This paper presents a review of available literature on the application of MCDA in environmental projects. Based on this review, the paper develops a decision analytic framework specifically tailored to deal with decision making at contaminated sites.