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A MULTICRITERIA EVALUATION METHOD FOR CONTAMINATED SITE REMEDIAL COUNTERMEASURES

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ABSTRACT: The evaluation of feasible remedial countermeasures for a contaminated site is often complex, multi-faceted and may involve different stakeholders with different priorities or objectives. Moreover, the selection of an appropriate countermeasure in the remediation planning stage would not only concern with technical dimension but also the social dimension of the problem at hand. This is often a multi-criteria decision making (MCDM) problem characterized by interconnected issues of technological, environmental, economic and societal concerns. Such kind of decision environment involves ill-defined problem in which behavioral decision research shows that humans are typically quite ineffective at solving, unaided. In this paper, we present an evaluation method that could aid the decision makers in providing a transparent, systematic and documented process to measure the relative desirability of each remedial alternative under consideration. A hierarchical network decision model is developed to account a hierarchical evaluation framework that incorporates interdependence among evaluation criteria, as well as, interdependence between the set of remedial alternatives and criteria. The proposed approach is based on the Analytic Hierarchy Process (AHP) priority theory and the Analytic Network Process (ANP) supermatrix. The AHP/ANP is a theory of relative measurement that provides the objective mathematics to process the inherent subjective and personal preferences of an individual or a group in making a decision, and derive the ratio-scale priorities. These priority weights are then synthesized to determine the relative dominance of each element (e.g. alternatives and criteria) throughout the decision structure. A simplified illustrative example is presented to elucidate the process, as it is being applied to evaluate the remedial countermeasures of a contaminated site caused by uncontrolled landfill. Future works should be focus on the application of the methodology to a variety of real-world problems to better assess the practicability of the proposed methodology.

KEYWORDS: remedial countermeasure; multi-criteria decision making (MCDM); analytic hierarchy process (AHP); analytic network process (ANP); supermatrix