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## **DESIGN OF AN EFFICIENCY INDEX FOR THE RANK ORDER OF SOIL REMEDIATION TECHNIQUES**

**Tomás Gómez-Navarro\*, Mónica García-Melón**

*Universidad Politécnica de Valencia, Departamento de Proyectos de Ingeniería, Camino de Vera s/n, 46022 Valencia, Spain*

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### **Abstract**

In this paper a methodology based on the Analytic Network Process (ANP) for assessing the overall efficiency of soil remediation techniques is presented. The purpose of the proposal is to rank order the techniques in a reliable way. The methodology is intended for supporting the decision making process of the public administration and involves technical, environmental, legal and economic indicators and the participation of soil remediation experts.

Benefits of the remediation techniques are evaluated by the experts in terms of quality by means of the ANP model, while costs are evaluated by means of pairwise comparison as in Saaty's AHP. Then a Quality/Cost ratio is calculated to aggregate them in an Efficiency Index. This index will indicate the rank order of each alternative according to the experts' opinion.

The method has been applied to the selection of the most appropriate remediation technique for a brownfield located near Berlin that used to be the site of a chemical factory. From an initial set of alternatives, three were selected: Capping, Ex-situ Chemical Washing on-site and Ex-situ Chemical Washing off-site. Sixteen criteria were determined to assess the alternatives and life cycle costs were calculated for each one. As a result, Capping is the most efficient, followed by Ex-situ Chemical Washing on-site. A sensitivity analysis proves the robustness of the results.

*Key words:* ANP, environmental decision support, experts' participation, index design, soil remediation

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\* Author to whom all correspondence should be addressed: e-mail: [tgomez@dpi.upv.es](mailto:tgomez@dpi.upv.es); Phone +34 963 879 860; Fax +34963 879 869