Analysis of the Economic, Environmental and Social Sustainability of Soil Remediation Technologies with AECOM's Sustainable Remediation Tool

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Background/Objectives. A range of different technological solutions for the remediation of saturated and unsaturated soil were evaluated to be applicable to two contaminated sites located in Italy, to reach the remediation goals, based not only on the efficiency of the remedial technologies, but also implementing an Economic, Environmental and Social Sustainability (EESS) assessment in the decision-making process for the selection of a suitable solution.

Approach/Activities. By considering the environmental site-specific context, a wide range of different technological solutions were selected in order to: i) remove the source of contamination (i.e., off-site dig and disposal); ii) treat and reuse the excavated contaminated soil (i.e., soil washing, biopile, landfarming); iii) treat directly the contaminated soil without excavation (i.e., direct soil mixing with ISCO, bioventing, MPE, SVE); and iv) manage the risk posed by the contamination prior to the final remediation project, which follows the decommissioning of the area. The choice of one or more effective technical solutions could not be defined solely on the magnitude of the volume of soil to be treated, but each different remediation scenario (i.e., combination of different technologies implemented together to reach the remedial objectives) was evaluated in terms of the different impact of Economic, Environmental and Social Sustainability. The current increasing awareness in sustainability and sustainable-related solutions is a matter of concern and it must be considered when remediation actions are to be implemented, and public community is involved. Within this framework, an Economical, Environmental and Social Sustainability Assessment was performed to select the sustainable solutions within the environmental remediation procedures for two sites located in northern and southern Italy, one for the remediation of both unsaturated and saturated soil (perched aquifer) and one for unsaturated soil remediation. The study was developed through the application of the AECOM Sustainable Remediation Tool© (SRT). The AECOM SRT© allows for a multi-criteria decision analysis (MCDA) based on sustainability indicators, weights and measurement criteria selected by considering the site-specific attributes. As a decision-making tool, it provides a ranking of the alternatives examined by calculating a sustainability index (or score), which does not represent an absolute value of the individual solution but a relative value, as a result of comparing different remedial strategies in a specific context.

Results/Lessons Learned. The tool allowed us to take into consideration the site-specific attributes of relevance, for the stakeholders, including the local community, such as: 1) site located in a mixed land use area with presence of neighboring residential houses; the redevelopment plan of the site for industrial use; the need to minimize the use of natural resources; 2) part of the site located in a natural reserve area, close to the sea and close to the city; presence of native plant (‘’Macchia Mediterranea’’). The EESS Assessment performed with the *AECOM SRT©* led to the selection of the most sustainable remediation strategy applicable to the sites. These applications confirmed the suitability and the flexibility of the tool that might be readily implemented in a variety of different remedial projects taking into consideration the site-specific constraints and allows us to guide the choice toward the most sustainable one. The value of the sustainability assessment was intended as a support before the Authorities for the selection of the applicable remediation scenario with a qualitative and quantitative measurable approach that could be easily communicated and integrated within remediation projects.