Environmental assessment of treatment technologies for contaminated soils and groundwater

Project acronym: SOLENV
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Project duration: 24 months (started on June 10th)

Project team

Name	Skills
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SOLENV main objectives

The main objective of the SOLENV project is to develop a methodological basis dedicated to the assessment of the environmental benefits of the implementation of contaminated land remediation technologies, integrating the pressures on the environmental components such as air, water, soil, ecosystems and the impacts on the soil functions (degradation or restoration) according to the types of soil uses (agriculture, housing, raw materials resources). The methodology should eventually allow selecting for a given polluted site (geological and hydro-geological context, climate, nature and number of pollutants, presence of underground infrastructure …) the best treatment technology according to the ratio environmental benefits / treatment efficiency or through a multi-criteria analysis.

Technical description of the project

The project is split in four main tasks:

1. *Environmental assessment tools*

State of the art of the existing tools (environmental risk assessment, multi-criteria analysis, cost benefit analysis, impacts assessment used in the life cycle analysis method) will be determined through literature review. Each methodology will be assessed in order to determine the limits of methodology and eventually to select indicators related to i) the environmental impacts (atmospheric emissions of GHG gases, acid gases, etc.) and ii) performance and efficiency of the technologies.

2. *Treatment technologies and assessment of related secondary effects[1]*

The idea is to select two typical case studies of polluted soils and groundwater and best adapted treatment technologies (including *in-situ, on-site* and *ex-situ* processes) for a given treatment objective. Their operation generates pressures (emissions in the air, to water and soil, consumption of non-renewable primary resources, consumption of energy...) on the air, water and soil compartments. For each technology, a list of pressures will be provided and their associated direct impacts (for instance, CO_2 emitted to the atmosphere per year, kWh consumption per year …) and indirect impact (material and product consumption for technology equipment, implementation and operation) will be assessed.

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[1] Secondary effects are defined as direct or indirect impacts of the technology on environmental components with the exception of targeted components of the remediation process.

3. Definition of soil quality index and assessment of the improvement of the soils functions after treatment

In this part of the project, we will elaborate at first a multifunctional soil quality index. The procedure will consist in selecting some key parameters (physical, chemical, biological ones) that are characteristics of the soil (contaminants content, density, porosity, pH, organic matter content, ammonifying bacteria, S-reducing bacteria …) and to define mean values and variations associated to these parameters. Then, these parameters shall be translated in terms of soils properties (contamination levels, organic matter availability, nutrients availability …) which will be used to assess the quality of a soil that is its ability to fulfil specific functions associated with its forecasted use.

Then, the restoration gains of some soil functions (maybe to the detriment of other ones) from the implementation of remediation technologies shall be measured from soils quality indicators assessment.

4. Synthesis

This final task will propose a methodology that enables to select remediation technologies taking into account global assessment of impacts and remediation benefits for human health, environment and ecosystems.