

Initial steps towards a close co-operation between Canada and The Netherlands in soil and groundwater remediation issues.

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In May 2008, a Canadian Brownfields Trade Mission traveled to the Netherlands to find out what meaningful opportunities could be forged between the two countries. This initial Trade Mission focused on soil and groundwater remediation policies and practices in the Netherlands and across Europe.

Canadian brownfield innovations have benefited from the experiences of densely populated nations like the Netherlands since 1985, where integrated remedial, area-wide, and risk-based approaches have been verified to reap tremendous economic, social, and environmental benefits.

With both countries steering aggressively towards the restoration of their contaminated sites in various jurisdictions, the Ontario government recently announced reforms that would help clear the way for more brownfield redevelopment in the province, hosting multi-sector workshops in June on brownfield reform.

The Holland In-situ program (HIP) project was started in The Netherlands, because in 10 years from now all contaminated sites needed to be remediated. This setting is quite unrealistic because many more contaminated sites like gas factories, laundry shops, land fills, and industrial areas in old parts of town left their legacy. The government of The Netherlands estimates around 450.000 polluted sites of which 15.000 need urgent treatment. This requires a different approach and needs the co-operation of government, knowledge centers and industry. The HIP could serve as blue print for setting up demonstration projects. The scope, however, needs to be widened with policy and legislation. Experience could serve in more than the two countries involved.

To support the cooperation from Canadian and Dutch side a partnership has been set up: the Netherlands Soil Partnership (NSP). The NSP is a network organization of companies, knowledge centers and the government focused on the public-private co-operation in the area of function oriented area-wide soil / groundwater management.

Green policy and technologies for clean soils

Policy

The remediation requirements were made dependent on the actual and or planned use of the (mega) site. Concerning the spreading of mobile pollutants with the groundwater the local stakeholders got more possibilities and responsibilities to find regional environmental sustainable solutions. Risk Assessment in management plans is taken a more prominent place which is excepted as long the threshold value are not passed for the (planned) use of soil and groundwater. The Port of Rotterdam with more than 8.000 hectares of industrial area is an example of this approach.

Technologies

- R&D institutes like Deltares focus on improving in-situ remediation and monitoring techniques, developing different kind of instruments, if possible, in combination with other uses. The most frequent used in-situ remediation techniques are the chemical, biological and extractive in-situ remediation in combination with ex-situ treatment and Natural Attenuation.
- The most recent developments of the technologies are that these techniques can be used jointly with steam injection, electricity to fasten the process of remediation. The monitoring systems are crucial in this process. To give some examples of the recent developments where Deltares can add their part in this collaboration are:
- Research on large scale application of aquifer thermal energy storage (ATES) and the opportunities, its impact and influence on the quality of soil and groundwater. A patented concept of a combination of cold –heat storage and soil remediation is being investigated.
- Smart remediation and monitoring technologies to lower the cost, adjust and fine-tune the remediation technique and fastens the remediation

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time for the source and plume. The smart coupling of technologies to optimize remediation with automatic targeting of injection of the remedial agent that preferably react with the contaminant and not with the soil matrix.

- Probes like the Camera Probe which makes images of the subsoil and can be used detect polluted soil and the different soil layers with advanced image recognition.
- BioSealing is a technique that is developed by SmartSoils®, which seals leaks in water retaining constructions easily and efficiently. BioSealing also works in natural water retaining layers like peat and clay layers. BioSealing is a natural method that enables soil permeability to be influenced on site. To do so, the growth of micro-organisms that occur naturally in the soil is stimulated by the addition of a complex combination of nutrients. This results in the formation of bioslime and mineral deposition, so blocking the micro channels between the soil particles and slowing down the flow of groundwater.

Implementation

Deltares has developed a number of innovative and cost effective in-situ remediation techniques and associated monitoring approaches in the previous years. The demonstration of these techniques in demonstration projects helps to convince that techniques are ready for application on large scale. This is the case in the Holland-In-situ-Program.

The project is aimed at removing the identified bottlenecks in the application of in-situ technology by the realization of:

- Technical Pilots: Demonstration and validation of in-situ techniques will be performed through real case examples (demonstration projects). The practical results aims at decreasing uncertainties related to the monitoring and aftercare operations, the management of the source plume spreading, the definition of the remediation goals (risk based approach vs. target values);

- Decision support tool: The practical results from the pilots should form the core of an interactive, experience based decision support tool for the demand side of the market (problem owners, authorities), and at the same time as a marketing tool for the contractors, where they can show the technique's performances and results.
 - Cases until date
 - Acoustic Remediation
 - Recirculating Wells
 - Modeling of LNAPL Remediation
 - Innovative Monitoring of Enhanced Natural Attenuation (ENA)
 - Innovative Monitoring and stable end situation for ENA
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 - Optimization of ISCO application of Permanganate and Fenton's Reagents

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