



12th International UFZ-Deltares Conference on Groundwater-Soil-Systems and Water Resource Management
 16–19 April 2013 | Barcelona, Spain | www.aquaconsoil.org

**AquaConSoil
Barcelona
2013**

WELCOME ADDRESS

As Land and Sustainability Minister of the Generalitat of Catalunya, I am honoured to welcome the AquaConSoil 2013 congress in Barcelona. Barcelona is an important cultural, economic and industrial centre from the Euromediterranean region, which is also characterized by a solid presence of high-level scientific research institutions, and important companies in the various fields related to soil, sediment, groundwater remediation, eco-engineering and, waste management. I am confident that the city will be a magnificent scenario for this foremost event.

Lluís Recoder
 Land and Sustainability Minister | Generalitat de Catalunya

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AQUACONSOIL 2013 THEMES

A. Using functions of soil-water systems

- Soil, sediment and groundwater as resource of valuable materials (and waste cycles)
- Urban (ground)water management
- Thermal energy in soil-water systems
- Role of soil-water systems in climate change adaptation and mitigation
- Eco-engineering

B. Soil and water resources management in water scarcity regions

- Assessment of quantity, quality and vulnerability
- Solutions for salinization of soil-water systems

C. Assessment and monitoring

- Fate, transport and risks
- Developments in site investigation and monitoring
- Effects of climate change and/or groundwater management
- Ecosystem services assessment and monitoring

D. Remediation technologies for soil, groundwater and sediment

- Technologies for (*in situ*) remediation and management of soil contamination
- Costs and management
- Sustainable remediation / Environmental footprint
- Sector specific cases of remediation and soil contamination management

E. Concepts and policies

- Soil-water systems policy and regulation
- Regional management of soil-water systems
- Sustainable use of the subsurface
- Resource efficiency

CONFERENCE SECRETARY

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EXHIBITION

The conference will be complemented by an industrial exhibition. For more information on the AquaConSoil 2013 exhibition, please visit the conference website www.aquaconsoil.org or please contact for any questions:

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If you are interested in sponsoring the event, please contact the conference secretary and ask for funding packages.



AquaConSoil 2013 – List of Papers

C2.3	Foucault	Yann	Marie Jose Durand, Karine Tack, Eva Schreck, Florence Geret, Thibaut Levêque, Philippe Pradère, Camille Dumat	Use of ecotoxicity tests and ecoscores to improve management of polluted soils	Oral
C2.4	Sasso	Simona		Experimental procedure to determine metal background values in contaminated industrial sites. Case study petrochemical site in Brindisi	Oral
C2.4	Sexton	Anna-Maria	James Baldock, Kevin Leahy, Alan Thomas, Simon Tilotson	Integrated use of a combination of high-resolution site characterization techniques to assess a site impacted by Volatile Organic Compounds to reduce the carbon footprint of the site investigation and develop a sustainability-led remedial strategy	Oral
C2.5	Santiago	Noemí	Julio Llorca, Sergio Tejada, Rafael Tortajada	New device for continuous measurement of Volatile Organic Compounds (CFIS)	Oral
C2.5	Tenhu	Hanna	Terhi Helkala	Soil Investigation with a Trained Dog	Oral
C2.6	Honetschlaegerova	Lenka	Petr Beneš, Nina Hnidakova, Martin Kubal, Pavel Špaček	On-line monitoring of key parameters in the subsurface under the conditions of clean-up treatment	Oral
C2.6	Waduge	Anil	Elizabeth Reece, Craig Divine	Practical Tracer Testing for Design and Implementation of Effective IRZ Technologies for Groundwater Remediation	Oral
C2.7	Garcia	Maite		SVE as an investigation, monitoring and remediation deciding tool	Oral
C2.7	Goossens	Gerardus	Fred de Haan	Sediment investigation The Vecht Netherlands: Evaluation of sediment sampling technique	Oral
C4	Dijcker	Rob	Ursula Kirchholtes, Jaya Sicco Smit, Lydia Plant	TEEB-city tool: the next leap in the assessment and valuation of ecosystem services of the subsurface	Oral
C4	Otte	Piet	Jacqueline Claessens, Dienneke Schram-Bijkerk, Piet Otte, Liesbet Dirven-van Breemen	The soil-water system as basis for a climate proof and healthy urban environment	Oral
C4	Pazos	Marta	Luis Eguizabal, Miguel Arangunde, Javier Pesado, Angeles Sanroman, Rafael Verdugo	Development of wireless in situ monitoring system based on MIWI protocol for detection of groundwater pollution	Poster
C4	Volchko	Yevheniya	Magnus Bergknut, Jenny Norrman, Lars Rosen, Tore Soederqvist, Tommy Norberg, Sarah Josefsson	Sustainability Appraisal of Remediation Alternatives with Focus on Soil Functions	Poster
D	Romano	Elena	Sara Dastoli, Alessandra Polettini, Raffaella Pomi, Aldo Muntoni, Barbara Villani, Antonello Zucca	Analytical characterization and lab-scale treatment of dredged sediments from small Italian harbours	Poster
D	Rahman	Aminur	Noor Nahar, Neelu N. Nawani, Jana Jass, Prithviraj Desale, Balu P. Kapadnis, Khaled Hossain, Ananda K. Saha, Sibdas Ghosh, Abul Mandal	Discovery of a novel soil borne bacterium with a potential for arsenic bioremediation from contaminated water	
D1	Baleriola Sanchez	Gaspar	Juan Rico Palma, Cristina Sanchez Caro, Rocío Millan Gomez, Olga Escolano Segovia, Susana del Reino Querencia, Jose Luis Fernandez Gonzalez, Agustín Rubio, Luis Gomez	New Approach on Soil Remediation by Combination of Biological and Chemical Oxidation Processes	Poster
D1	Borggreve	Gerard	Albert Smits	Monitoring Control as the Key to Success in a Full Scale Enhanced Anaerobic Bioremediation of a VOC Contaminated Site in the City of The Hague	Poster
D1	Coletto	Isabel	Manuel Marti, Carlos Suarez	Chemical oxidation treatment of groundwater impacted by chlorinated solvents	Poster

D.1 - Technologies for (in situ) remediation and management of soil contamination

POSTER PRESENTATION: NEW APPROACH ON SOIL REMEDIATION BY COMBINATION OF BIOLOGICAL AND CHEMICAL OXIDATION PROCESSES

Juan Rico Palma *, Cristina Sánchez Caro*, Rocío Millán Gómez**, Olga Escolano Segovia**, Gaspar Baleriola Sánchez***, Susana del Reino Querencia***, José Luis Fernández González***, Agustín Rubio****, Luis Gómez****

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Keywords:

Phytoremediation, Enhanced Natural Attenuation, In-situ Chemical Oxidation (ISCO), microbial remediation.

INTRODUCTION

"New Approach On Soil Remediation By Combination Of Biological And Chemical Oxidation Processes – BIOXISOIL" (LIFE11/ENV/ES/505) is funded under the LIFE+ programme, the EU's funding instrument for the environment and is set within the Soil Thematic Strategy (COM(2006)231, 22.9.2006) framework, which aims to protect and ensure the sustainable use of soil by preserving soil functions, preventing threats to soil, mitigating their negative effects and restoring degraded soils.

Therefore, BIOXISOIL is aimed at attaining a new concept on soil and groundwater remediation. Sustainable, cost effective and integral solutions are more and more desired when dealing with contaminated land, especially when sensible users are involved.

BIOXISOIL is bound to combine biological processes such as phytoremediation and biodegradation with in-situ chemical oxidation (ISCO) in search of synergies that can improve remediation performance and to produce positive side effects such as soil edaphic properties and parameters improvement, groundwater quality improvement and rapid land restoration to a level that can support sensible uses without compromising current activities at industrial and military sites.

OBJECTIVES

The main objective of the project is to combine well-known soil remediation technologies in a new way to produce a robust, efficient and environmentally friendly solution to organic contamination. Therefore, the following specific objectives are envisaged for the Project:

- Provide a real scale demonstration of the capabilities of such a new solution by having it implemented on an existing contaminated military site.
- Provide decision makers, regulators and the industry with new rationales and goals so as to have them included in future land remediation protocols, and more specifically, to prove that integral solutions are feasible and therefore should be desired by the industry and promoted by the authorities.
- Set up the concepts to assess the technical and economical feasibility of these new type of solutions and to issue relevant protocols and methodologies on integral land restoration.
- Improve the existing know-how on soil remediation as a CO₂ mitigation process and to establish innovative added value to this type of actions.
- Pave the way for future innovative applications of these technologies to a wider range of site conditions and contaminant types, and more specifically, to military and industrial sites located near to or within natural areas.

ACTIONS AND MEANS INVOLVED

The Spanish Navy is pioneer in environmental protection at military sites in Spain and has provided a key site located within a natural area of prime environmental interest to implement the demonstration project in.

In order to achieve the objectives above, a number of actions will be undertaken:

- Preparatory works will be conducted at this site aimed at setting up the baseline or current status as well as selecting the most adequate plant species, choose the best oxidant and gather key data needed at further stages of the project. This action involves limited sampling

and small scale tests. The last stage of preparatory works will be shaped into a technical action plan.

- As one of the core activities of the project, phytoremediation (Figure 1) will be implemented with a dual purpose. First, it is envisaged as the pivotal treatment for this specific site. The other technologies will be combined with it, under different conditions, and the overall performance will be evaluated. Second, it will also be used as an innovative containment action (phytobarrier) aimed at preventing the flux of contaminants out of the current area by groundwater migration. The plants selected will become themselves an interesting object of study, as the mechanisms and pathways for pollutant degradation are essentially unknown.



Figure 1. Native plant species

- The next implementation action involves in situ chemical oxidation (ISCO) as the main soil and groundwater treatment at source areas. The rationale behind this is its cost-effectiveness when dealing with high contaminant mass and its short working period. Once ISCO has finished as a shock treatment, biological processes will take over. To this end, the needed infrastructure will be implemented (injection wells, automated injection device) and several injection events (up to 5) will be conducted, comprising several thousand litres each (figure 2). Also, the existing monitoring network will be augmented and improved by constructing new monitoring wells and logging sensors.

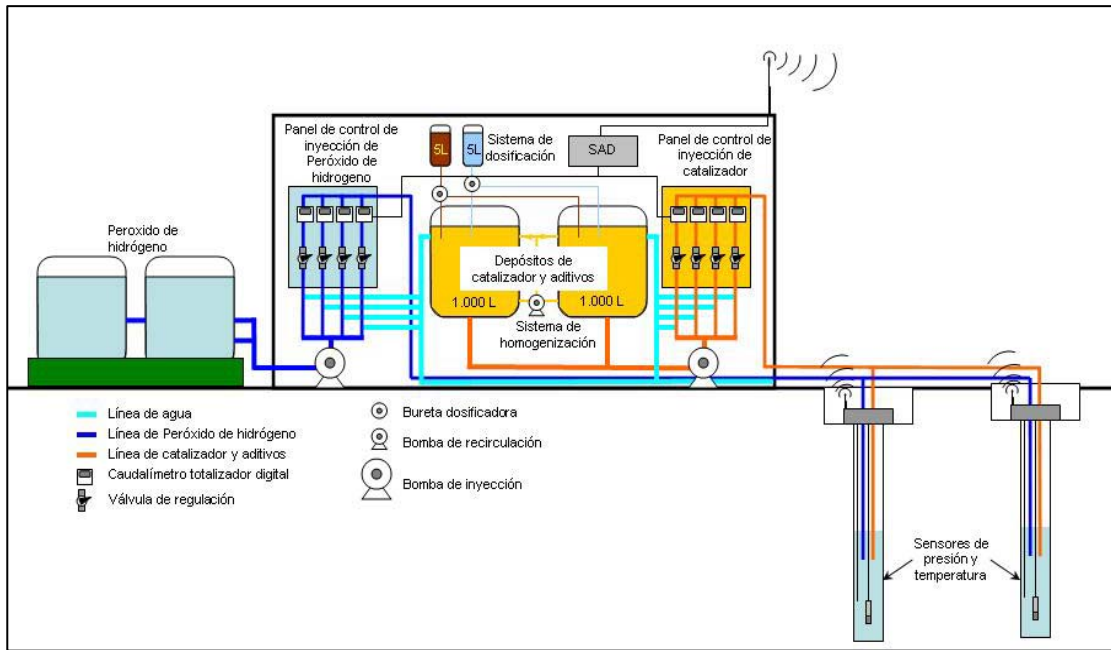


Figure 2. Automatic injection device

- A bioremediation action will be implemented (focused on Enhanced Natural Attenuation through stimulating contaminants biodegradation by native site micro-organisms). The main incentivization measure is the combination with chemical oxidation and phytoremediation as it enhances the contaminants bioavailability, promotes aerobic biodegradation routes and allows the flourishing of degrader autochthonous micro-organisms associated to the rhizosphere. Additionally, through adequate laboratory assays (Figure 3), it will be determined whether on site injection of products such as biocompatible surfactants or biostimulants is viable in order to improve biodegradation rates.

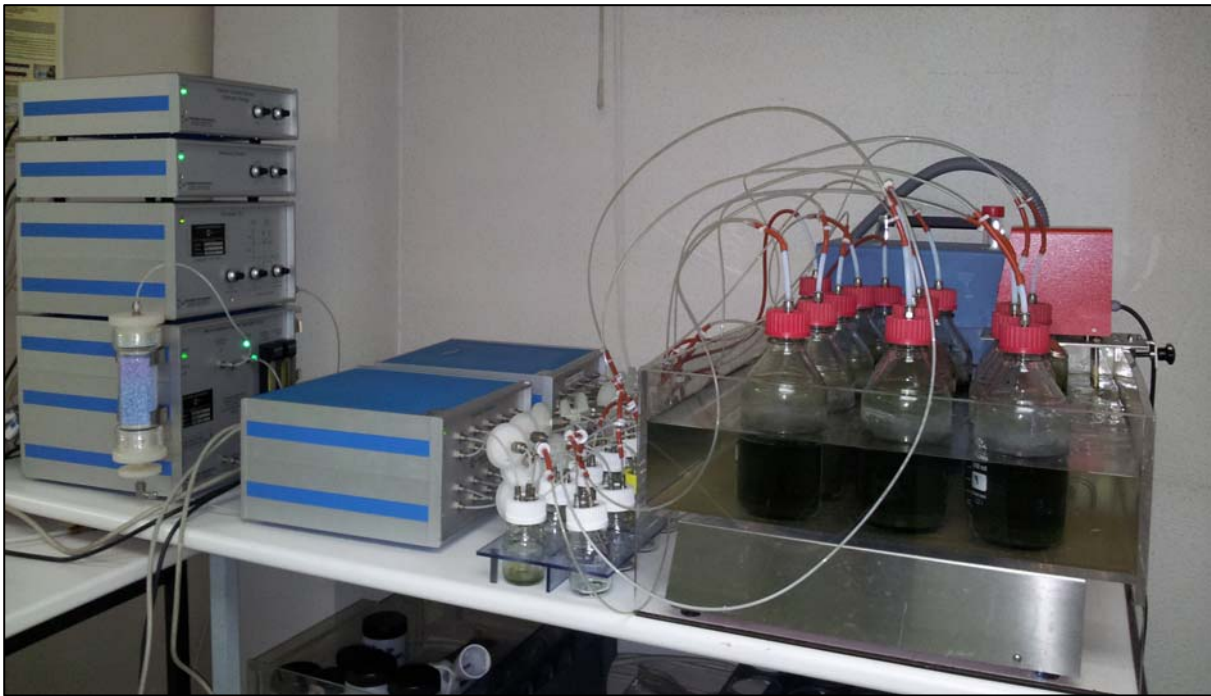


Figure 3. Bioremediation laboratory tests.

- The environmental remediation and landscape recuperation is planned to be carried out after the decontamination actions. This task includes the study of the soil after the techniques are applied. Furthermore, it will be considered if the species used in phytoremediation will be complemented with natural vegetation of the area and then, integrated in the landscape of the zone.
- The last action involves the combination of the three aboved mentioned remedial actions (phytoremediation, ISCO and microbial remediation). Implementing this action will take some time, as phyto- and bio- processes progressively take over the blunt of the remedial actions. The main feature of this step is a combined methodological protocol aimed at providing answers to items such as: when is the right moment for switching from ISCO to phytoremediation? How much extra contaminant mass has been depleted by the synergic effects of these technologies? How can this experience be extrapolated to other sites and contaminants?

EXPECTED RESULTS

As a direct produce of the actions envisaged within BIOXISOIL, the main results to be attained can be summarized as follows:

- Identify the best strategy to attain a sensible reduction of contamination levels at selected areas within the site so as to demonstrate that a real scale project is feasible combining these technologies (phytoremediation + bioremediation + ISCO).
- Construct and set up a prototype of a new automated injection device aimed at improving the ISCO process by a better control of reagent fluxes into the subsoil and added monitoring data recording.
- Issue a feasibility study and protocol so as to document the key aspects of the practical implementation of the combined technologies, with special focus on the costs, control procedures, materials needed and progress indicators.
- Achieve integral restoration of the target areas within the selected site, in the sense that the resulting soil will be brought to a similar status prior to affection.
- Carry out dissemination actions including several joint publications in scientific journals as well as communications in international congresses or workshops, among others. At least one international meeting will be organized within the frame of this project.