TEO2

FRAC-WECO

Flux-based Risk Assessment of impact of Contaminants on Water resources and ECOsystems

DURATION OF THE PROJECT
Phase 1: 01/01/2007 – 31/01/2009
Phase 2: 01/02/2009 – 31/01/2011

BUDGET
1.091.000 €

KEYWORDS
Hydrology, ecotoxicology, biogeochemical processes, contaminated sites, vulnerability and risk assessment, socio-economical analysis

CONTEXT

In Belgium, many contaminated sites have been reported as resulting from a relatively anarchic economical and industrial development during the 19th and 20th centuries, without environmental considerations. These last years, people have become more and more aware and informed of the risk posed by these sites and by the necessity to optimize land-use in order to respond to economical development needs while preserving and restoring natural resources and ecosystems. These sites have to be managed both from a risk and economical point of view.

This requires: (1) efficient methodologies and norms for screening contaminated sites; (2) evaluation of the possible impact of these sites on the environment; (3) risk assessment for humans, natural resources and ecosystems; (4) development of tools and methodologies for evaluating, ranking and optimizing remediation measures.

PROJECT DESCRIPTION

Objectives

The present project will develop an integrated methodology contributing to a more comprehensive risk assessment of contaminated sites on water resources and ecosystems based on a combination of the 'Source – Pathway – Receptor' approach for conceptualizing the physical system and on the European Environmental Agency (EEA) DPSIR concept (Drivers-Pressures-State-Impacts-Response) for integrating the physical and socio-economical components of the analysis into an efficient decision support system for risk analysis.

Specific objectives are: (1) to develop a modeling approach for accurately calculating water and contaminant fluxes at various scales, from catchment scale to the contaminant plume; (2) to quantify and to model biogeochemical processes affecting the mobility (speciation), retardation and reactivity of various organic and inorganic contaminants in the environment, through water resources; (3) to validate risk assessment methodologies using datasets coming from representative contaminated sites in Belgium and to develop a flux-based risk assessment indicator for evaluating the impact of contaminants on water resources (groundwater vulnerability) and on aquatic ecosystems (ecotoxicological risk) in relation with the management and cleaning of contaminated sites; (4) to evaluate uncertainty in the modeling of contaminant transport caused by spatial variation in subsurface and surface land characteristics and especially to evaluate impacts of uncertainty in the mapping of land-cover characteristics; (5) to develop decision support tools for planning and evaluating integrated management measures aiming at reducing short and long-term impacts of contaminants.

Pilot case studies will be selected in Belgium to apply and to evaluate the developed models and guidelines at various scales.

Methodology

The DPSIR methodology will be considered as a general organizational framework for the project. The DPSIR methodology presents a chain of causal links between Driving forces (economic sectors, human activities), Pressures (emissions, waste), States (physical, chemical and biological state of the resource) and Impacts on ecosystems, human health and natural resources. This leads to Responses such as prioritization, target setting and indicators. The project combines on the one hand process studies contributing to a more comprehensive assessment and modeling of water and contaminant fluxes at various scales (local and catchment) and of biogeochemical properties and toxicity of contaminants, on the other hand impact studies such as risk assessment methodologies so as to propose management tools and indicators for ranking contaminated sites in terms of risks and costs. In the present context, research activities will focus on the P-S-I chain.

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INTERACTION BETWEEN THE DIFFERENT PARTNERS

The various research groups participating to the project are very complementary with respect to the project's general and specific objectives. Researches will be developed through a strong collaboration of hydro(geo)logists, soil scientists, ecotoxicologists, remote sensing specialists and socio-economists.

The project will be structured in 6 work packages: WP1: Project coordination, management and integration (ULg-HG + contributions from other partners); WP2: Catchment scale water and contaminant budgeting and routing (VUB + ULg-HG); WP3: Contaminant behaviour and impact (VITO + ULg-LEAE); WP4: Risk Assessment tools and indicators (ULg-HG + ULg-LEAE + SPAQuE); WP5: Socio-economic analysis to support risk assessment and risk management of contaminated sites (BRGM); WP6: Test sites (all partners).

Aquapôle ULg-HG will appoint Dr. ir Serge Brouyère as the project manager, who will be assisted by a management committee made of all the team leaders.

EXPECTED RESULTS AND/OR PRODUCTS

Exploitation of the anticipated results will concern several aspects. Scientific aspects will include publication of peer-reviewed papers, participation in international meetings, organization of a Belgian workshop and specific reports to relevant regional, federal or international authorities. Industrial aspects will provide contaminated site managers with more efficient methodologies and tools for the screening of contaminated sites in terms of both risk and costs. Vulgarization actions will also include the creation of a website presenting the research and its main outcomes.

PARTNERS - ACTIVITIES

Activities: (1) ULg-HG: characterisation of groundwater resources in terms of quantity and quality groundwater vulnerability and risk, groundwater modelling with the use of modern tools for field investigations and desktop computations; (2) ULg-LEAE: assessment of freshwater quality following local point source of pollution, using bioindicator organisms and biochemical exposure, and effects biomarkers; (3) VITO: development of biostimulation and bioaugmentation processes in order to maximize the natural attenuation capacity of soil and groundwater and to decrease the remediation costs; (4) VUB: numerical modelling and computer applications in hydrology and integrated water management at catchment scale; (5) BRGM: specialized in economic evaluation of water resources management.

CONTACT INFORMATION

Coordinators

Serge Brouyère & Alain Dassargues
Université de Liège Aquapôle – Hydrogeology (ULg-HG)
Building B52, Chemin des chevreuils
B-4000 Liège (Sart-Tilman)
Serge.Brouyere@ulg.ac.be
Tel: +32 (0)43 66 23 77
Fax: +32 (0)43 66 95 20

Promoters

Jean-Pierre Thomé
Université de Liège
Laboratory of Animal Ecology and Ecotoxicology (ULg-LEAE)
Allée du 6 Août, 15
B-4000 Liège (Sart-Tilman)
JP.Thome@ulg.ac.be
Tel: +32 (0)4 366 50 60
Fax: +32 (0)4 366 51 47

Ludo Diels, Winnie Dejonghe & Saskia Manshoven
Vlaamse Instelling voor Technologisch Onderzoek (VITO)
Boeretang 200, B-2400 – Mol
Tel: +32 (0)14 33 69 24
Fax: +32 (0)14 32 65 86
ludo.diels@vito.be
Tel: +32 (0)14 33 51 76
winnie.dejonghe@vito.be
Tel: +32 (0)14 33 51 05
Fax: +32 (0)14 58 05 23
saskia.manshoven@vito.be

Okke Batelaan & Frank Canters
Vrije Universiteit Brussel
Department of Hydrology and Hydraulic Engineering
Department of Geography
Pleinlaan 2, B-1050 Brussel
Tel: +32 (0)2 629 30 39
Fax: +32 (0)2 629 30 22
batelaan@vub.ac.be
Tel: +32 (0)2 629 33 81
Fax: +32 (0)2 629 33 78
fcanters@vub.ac.be

BRGM:
Cécile Hérivaux
Bureau de Recherches Géologiques et Minières (BRGM)
Service Eau
3 avenue Claude Guillemin,
BP 36009 45060 Orléans cedex, France
Tel: +33 2 38 64 47 46
Fax: +32 2 38 64 37 19
c.herivaux@brgm.fr

Follow-up Committee

For the complete and most up-to-date composition of the Follow-up Committee, please consult our Federal Research Actions Database (FEDRA) by visiting http://www.belspo.be/fedra or http://www.belspo.be/ssd

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Belgian Science Policy • Wetenschapsstraat 8 Rue de la Science • B-1000 Brussels
Tel. +32 (0)2 238 34 11 • Fax +32 (0)2 230 59 12 • www.belspo.be/ssd
Contact:Dimitri Harmegnies

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