

## PRESENTATION

Water is one of the most valuable resources available to mankind for sustenance and survival. Thanks to its widespread distribution all over the world, high indices of quality and ease of extraction, groundwater has come to be the most important source of water supply. Nevertheless, the extensive geographic distribution of groundwater together with proximity to land surface may result in alterations of groundwater physical, chemical and biological characteristics if man activities are inappropriate or if accidental contamination occurs. Such alterations may lead to irreversible deterioration, prejudice to human communities and subsequent abandonment of these water resources.

On the basis of the societal importance of groundwater but aware of its fragility and of the delicate equilibrium maintained within modern-day society, various agencies and institutions have promoted scientific and legal frameworks for the study and better understanding of contaminant processes, as a prior step to the protection of water resources. One of the most relevant recent initiatives has that of the International Year of Planet Earth, scheduled by the UN General Assembly for 2008, within which there will be priority lines of action in the field of groundwater contamination. Other related initiatives include the Year of Science sponsored by the Spanish Ministry of Education and Science and the UNESCO International Hydrological Programme, that establishes an instrument for international cooperation in order, among other goals, to improve the scientific and technological bases so as to develop methods for the rational management of water resources, including the protection of the environment. Within closer geographic bounds, the European Union has recently developed, as part of its Water Framework Directive, a directive on groundwater, which lays particular emphasis on the protection of water resources, the maintenance of their quality, and the study and monitoring of contaminant processes, as a prior step to the recovery of natural levels.

In parallel to the work of the above international bodies, the Spanish Geological Survey (IGME), via its Hydrogeology and Groundwater Division, is aware of the importance of water reserves and their quality. This aspect is underlined as one of the priority lines of action of IGME, namely research into hydrogeologic processes aimed at understanding the nature and uses of groundwater resources, and their protection against contamination. Therefore, during its more than 150 years' history, IGME has developed and supported a great variety of scientific activities aimed at improving our understanding of the physical, chemical and biological processes of groundwater contamination, from its transport through the soil and the unsaturated zone to the saturated zone where water resources are to be found. In the light of all the above, IGME cannot pass over the present opportunity of supporting this important scientific event and is pleased to sponsor the publication "Water Pollution in natural Porous media at different scales. Assessment of fate, impact and indicators. WAPO2". This publication promotes and draws the attention of those responsible for activities of national and international agencies as well as professionals in the field, employed by public and private organizations, to the protection of groundwater by further study of contaminant processes.

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## FOREWORD

COST – *European Cooperation in the field of Scientific and Technical research* is a long-running instrument for cooperation among scientists and researchers across Europe. COST now has 35 member countries and enables scientists to collaborate in a wide spectrum of activities in research and technology. The main objective of the COST Action 629 “*Water pollution in natural porous media at different scales: fate, impact and indicators*” was to improve the scientific base for the development of integrated indicators of the environmental risks created by presence of pollutants in water with emphasis on the water body of natural porous media.

Pollution of groundwater resources is amongst the most important environmental problems. The traditional approach to evaluate the risk of soil and groundwater pollution based on measured total concentration of a limited number of contaminants in the soil and water is insufficient. Determination of the availability of a contaminant in the soil, subsoil and aquifer systems for target organisms and determination of its impact on the quality of life (uptake by vegetation, interaction with aquatic and terrestrial life, evaluation of toxic effects, leaching in subsurface water bodies, etc.) gives a better approach. Knowledge of contaminant fate and transport, its bioavailability for target organisms and the bioaccumulation in food chains is partly present, its integration into a coherent framework for assessing the environmental risk has been missing. The “Integrated indicators” COST Action has elaborated on alternatives to “concentration”, as the main indicators of pollution take into consideration the integration of the physical, chemical and biological alteration of the system. The reason for developing a set of integrated indicators to evaluate the pollution status and risk was to aid environmental agencies, administration and regulators considerably and profit the society as a whole. The developed tools should facilitate the implementation of the Water Framework Directive and more recently the Groundwater Daughter Directive, more in connection with the COST Action 629.

Terrestrial and aquatic eco-systems exist in a delicate balance controlled by physical, chemical and biological parameters, which are dynamically responding to natural and anthropogenic influences. Thus we need input of the different disciplines to understand and conceptualise pollutant behaviour in natural porous media. The complexity of process conceptualisation needs further advanced mathematical modelling, in particular numerical models, to develop tools which allow describing these processes in quantitative terms. These considerations are also reflected in the three working groups of COST 629 Action, which correspond to the main topics covered by the WAPO<sup>2</sup> conference.

- *Alternative methods and indicators of water quality in natural porous media*
- *Biogeochemical processes from soil to groundwater.*
- *Numerical simulation of pollutant transport and interaction in soil and subsoil-techniques, problems and case study.*

COST Action 629 was launched in September 2001, and the WAPO<sup>2</sup> conference in Barcelona April 11-13 represents its Final Conference. The WAPO<sup>2</sup> conference is intended as a forum for Scientists, PhD students, authorities and managers concerned with the problem of soil and groundwater contamination. One of the main objectives is undoubtedly the discussion and exchange of new results and ideas in the field, as well as recommendations for a better management of groundwater resources.

We are very proud that the WAPO<sup>2</sup> conference has drawn so many participants of scientists, authorities and managers concerned with the problem of groundwater contamination in porous media. Many of them are from outside the COST 629 action. This fact proves that our action has dealt with scientific and society relevant important problems. This volume of extended abstracts, edited with the