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Review

Hydrological Basis of Ecologically Sound Management of Soil and Groundwater

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Edited by H.P. Nachtnebel and K. Koval

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This state-of-the-art publication forms the proceedings of an International Symposium held during the XXth General Assembly of the International Union of Geodesy and Geophysics (IUGG) at Vienna during 11-24 August 1991, organised jointly by International Association for Hydrological Sciencies (IAHS) and UNESCO. The publication is edited by H.P. Nachtnebel of the Institute fur Wasserwirtschaft, Hydrologie und konstructiven Wasserbau of Austria, and K. Koval of the National Institute of Public Health and Environmental Protection of the Netherlands, who were the convenor and co-convenor of the symposium. The symposium is a contribution to the International Hydrological Programme (1990-1995) "Hydrology and water resources for sustainable development in a changing environment", and in particular to sub-programme M-3.1 : "Hydroecological models and bio-monitoring for environmental evaluation and prediction of impacts of natural and manmade changes and hydroecological classification of fresh water bodies". This proceedings comes in the wake of more than 30 proceedings of the various symposia and workshops published by IAHS recently.

The purpose of the symposium was to bring together leading scientists, engineers and officials of environmental agencies to present state-of-the-art methodologies for ecologically sound management of soil and groundwater. It is envisaged to improve knowledge of the relationships between the hydrological changes in the soil and groundwater system and the effects in ecosystem, and a consequent strengthening of the collaboration between hydrologists, ecologists planners and decision makers, with a view to support the objective of preservation of wetlands and habitats inter-related with the quantity and quality of underground water.

This 385 pages' publication presents the theme through thirtysix papers grouped into the following four sub-topics :

(*i*) Modelling of waterflow and contaminant transport in the saturated and unsaturated zones in relation to ecology;

(*ii*) Physical and hydrochemical processes, especially the dynamic aspects, in interface zones and their implications for ecology;

(*iii*) Methodology for the identification of hydrological and biotic parameters and the design, operation and applicability of field monitoring networks; and

(*iv*) Case studies with respect to ecologically sound management under various land use practices (preservation of wetlands, forestry, agriculture, etc).

The first part has ten papers dealing with : modelling soluble chemical transfer from soil to overland flow and its transport through macropores to groundwater; modelling the ecohydrological consequences of peat extraction from a Scottish raised mire; sensitivity analysis of the surface water acidification model ILWAS (Integrated Lake-Watershed Acidification Study) in the saturated and unsaturated zone; effects of agricultural landuse on contaminant transport in a layered fractured aquifer; irrigation with saline shallow groundwater for wetlands protection; impact of the structure of an agricultural landscape on hydrological characteristics; a multi-disciplinary project for modelling transport processes in a small rural catchment; prediction of vegetation changes under different hydrological scenarios; the relationship between soil piping and changing farming techniques on semi-arid agricultural terraces; and the application of a soil physics model to the management of soil water conditions in wildlife habitats.

Under the second group are eight papers consisting of : soil salinization process in a semi-arid wetland basin : the effect of reservoirs on a shallow aquifer; soil water content and matric head modifications by water table depletion in the Madrid aquifer (Spain); effects of a deposition simulation on the sulphur dynamics of forest soils; modelling flow in natural soil pipes and its impact on plant ecology in mountain wetlands; simulating soil moisture and runoff components to estimate varia-

bility of streamflow chemistry; groundwater quality as affected by managerial decisions in agricultural areas; effect of land development and irrigation with sewage effluents; stability status of a macropore channel under conditions of ponded to nonponded infiltration and interface theory and the base state of fen mires.

The third group on parameter identification and monitoring contains nine papers on : hydroecological parameters for sustainable groundwater management in the region of Kennemerland, the Netherlands; eco-hydrology and fen plant distribution in the Vechtplassen area, the Netherlands; ecological basic research with potential application for groundwater; groundwater management in the city of Vienna after construction of the new hydropower plant on the *Danube* river — a case study; effect of parameter cross-correlation on groundwater sampling design; a case study observing changes in land drainage and management in relation to ecology; design, operation and some examples of field monitoring networks; hydroecological research for water management in the province of Noord-Holland, the Netherlands; and geostatistical assessment of space-time distributed data; application to soil moisture measurements in an experimental catchment.

The last section on case studies has also nine papers on : Amenagement des sols et des eaux dans la plaine semi-aride de Buenos Aires, Argentine; hydrology and ecology in Latin America and the Caribbean; occurrence and distribution of metals and tributyltin in a coastal wetland in northern California, USA; ecologically safe land application of treated waste water — a case study for the sewage farm Karolinenhohe; hydrological basis for the management of soil water budget in a riverine forest; river bank infiltration in the *Upper Elbe* river valley—hydrochemical aspects; case study on the hydrological response of a shallow coastal aquifer to afforestation; groundwater support of stream flows in the Cambridge area, UK; and application of a decision supporting model for agricultural management in drinking water protection areas.

The publication is of much value and relevance in the current context of serious consideration of environmental factors in all aspects of developmental issues even in the developing countries. The history of decision making in water resources development has gone through the various phases, from purely engineering through economic-sociopolitical to environmental and ecological phases. This does not mean that hydrology is being relegated to the back seat, but on the contrary, it is getting a multi-dimensional look, from the detailed small drainage basin concept to the continental and global scale. Such and other issues are clearly brought to focus in this publication.

It should be mentioned on the not-too-positive side that, as is common with all proceedings of seminars, symposia and workshops, the individual papers are the selected ones related to the main theme and therefore the book lacks the necessary continuity and systematic development of the theme as one sees in study reports and monographs. The IAHS could, perhaps, consolidate several of the proceedings into treatises or monographs on various themes, which then will have much more value in a global sense.

— K. D. NAMBUDRIPAD