

Preface

The International Commission on Water Resources Systems (ICWRS) of IAHS has, for many years, embraced Integrated Water Resources Management (IWRM) as the main topic for its research agenda. The need for integrated approaches to deal with the complex water management issues in both the developed and developing world is recognised throughout the world. However, in many places IWRM is still merely a concept and not yet an established approach with practical applications. To promote this, the ICWRS has organised regular symposia on Integrated Water Resources Management, each focusing on a topical aspect of IWRM. The series of symposia on IWRM started in 2000 at the University of California, Davis, USA. The topics of this conference were formulated in a rather traditional way: water resources planning and management, conjunctive surface water – groundwater management, surface water management, flood modelling, ecosystem management and groundwater management. Three years later, in 2003, the second symposium was organized in Stellenbosch, South Africa. This conference was strongly oriented towards institutional and socio-economic aspects of IWRM. Its content was closely related to the new Water Legislation in South Africa. The series has been continued in Europe, at the Ruhr-University, Bochum, Germany, and the contributions of this third IAHS symposium on IWRM are contained in this volume.

What has changed since 2000 or 2003? First of all, the general theme “Integrated Water Resources Management” seems to be widely accepted as a common basis for all water management activities. In most cases the definition of the Global Water Partnership (GWP) is used to describe this strategy: IWRM is “a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.” This statement is widely used, yet it is not indisputable. The third symposium on IWRM strived to not only identify problems, but to provide practical solutions. The very important subject of how to cope with water-related vulnerability of societies formed the overarching theme. This vulnerability relates to many aspects of water resources: environmental risks, floods, droughts, pollution, water logging and options to create resilience against these risks. The subject is highly relevant and it involves considerable scientific challenges to develop practical tools for quantifying and dealing with vulnerability. Considering the challenges of a fast changing world, joint activities to reduce vulnerability against water related risks are a very important point on the international agenda.

The questions that had been addressed with oral presentations, poster presentations, a special session with representatives of international water initiatives and discussions among the 276 participants were “what has to be integrated, how it can be accomplished and what are the options to balance the different views?” There is an extreme heterogeneity of world water problems caused by the different climatic, economic, social, cultural, legal and environmental conditions. Very often specific solutions are needed for specific problems at specific locations. However, if IWRM is

reduced to its basic concept of a general approach to all water problems, one ends up with the same three “E’s” that are found in the definition of sustainability: “Economy, Ecology and Equity”. This means that a joint, but balanced and appropriate consideration of economical, social and ecological aspects is a pre-condition to sustainable water management.

Vulnerability depends on economic developments and *vice versa*. Water management aims to ensure a sustainable growth of economies under consideration, of the need to reduce social conflicts and ecological damages. To protect societies and environment from water-related risks caused by nature or mankind is a necessary condition to ensure that the economic, social and ecological goals can be reached. Vulnerability is often defined as “the degree to which an exposure unit is susceptible to harm due to exposure to a perturbation or stress, and the ability of the exposure unit to cope, recover or fundamentally adapt”. This is at the heart of all technical systems we are planning. Reducing vulnerabilities, especially with technical means, is a main aim of human activities. But one must also be aware that such technical systems can result in an increase of the vulnerability of society. With the definition of vulnerability given above, exposure units affected by perturbations or stress are not limited to man-made structures or social systems. In the call for papers for this symposium the vulnerable interactions between landscapes, water and societies were ranked in the first place of the listed topics. The integrity of ecological systems, which depends on the physical and chemical characteristics of water resources, is one of the basic laws of modern water management in Europe. To realise this, a deeper knowledge about the vulnerability of the interactions of the physical-chemical system, the biological system and the impacts of human induced perturbations is required. At the third symposium on IWRM this was mirrored, in particular in the sessions dedicated to hydro-ecological aspects in water resources management, river basin interdependencies, chemical loads, erosion and sedimentation. Among the water related risks, floods play a major role. A specific focus is given to them with regard to the coming activities initiated worldwide to quantify and to reduce flood risks. The presentations characterising scales of vulnerabilities against flooding, tools to estimate and reduce flood risks and flood risk management at different scales were contributions to this issue. It should be noted that engineering tasks and solutions to mitigate flood risks were also discussed. The presentations on the abilities of hydraulic structures to mitigate flood risk are a crucial part of our interdisciplinary approach to cope with flood problems. Human activities in water resources management are dedicated to solve human problems and to provide benefits. However, history teaches us that in many cases the expected results could not be reached or, even worse, reduced our options to solve water related problems in a sustainable way if we lost degrees of freedom to react to unforeseen developments. There is a basic suspicion against technical solutions, resulting from harmful experiences of failures of technical structures, mostly due to human factors. An assessment of water resources management activities in an objective way demands a consideration of problems caused by water resources management itself, as well as of the many successes which were reached. At this conference both sides were reflected. In the presentations on regional water management, impact assessment and institutions in river basin management, approaches to manage water related problems were addressed. If a broad view on water management is provided one also needs tools to handle these problems. Hence an important section was dedicated to decision support

tools. The future will be very different from the past and this has been addressed in the session on some aspects of future uncertainties related to global and climatic changes.

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Each conference contribution has been reviewed in a two-stage process by two independent referees. The review has been a time-consuming process, but the resulting excellent scientific programme confirms that it has been worth the effort. Our sincere thanks goes to all the referees who supported the organisers in this enormous task: G. Blöschl, J. Bogardi, A. Bronstert, M. Donoso, N. van de Giesen, B. Gumbo, U. Haberlandt, Ch. Heitefuss, A. Jayawardena, T. Kojiri, V. Lakshmi, M. Marino, B. Merz, Y. Mohamed, G. Morgenschweis, M. Pahlow, D. Rosbjerg, H. Savenije, S. Simonovic, G. Schultz, A. Schumann, J. Szilagyi, and P. van der Zaag. We furthermore would like to thank the representatives of the international water initiatives UN International Strategy for Disaster Reduction (ISDR), WMO Associated Programme on Flood Management (APFM), UNESCO International Hydrological Programme (IHP), United Nations University (UNU), Global Water Partnership (GWP), World Water Council (WWC) und International Centre for Water Hazard and Risk Management (ICHARM) for agreeing to participate in a special session and we in particular thank A. Askew, president of IAHS, for organising and chairing this session, which sparked strong interest and a lively discussion on current knowledge deficits and essential future research activities to solve water management related problems among representatives and participants.

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