Preface

Sustainable development is one of the main guiding principles for our modern societies. Water and sustainable development are closely linked since the provision of water in sufficient quantities and of high quality have important impacts on our environment, society and industry as well as the wellbeing of the next generations.

Nowadays, there are several emerging problems and risks that affect the sustainable management of water resources. Pollution trends and impacts of hazardous pollutants remain uncertain. Diffuse pollution from agricultural practices emerges as a major threat. Water resources and water demands remain unbalanced at various levels. Groundwater abstraction and over-exploitation have serious environmental impacts. Reservoirs, for water storage, flood control, recreation and energy production remain controversial. Climate change will impact on both water availability and demands and the occurrence of extreme events. For instance, only in Europe, the occurrence and severity of floods has increased over the last three decades and represents about half of the material damages to be reimbursed by insurance companies. These problems have not only physical, chemical, biological and ecological dimensions but encompass also important socioeconomic issues, such as legal and regulatory frameworks for water resources management, methods to balance conflicting human and ecosystem demand, financial sustainability of water management systems. This shows the complexity water managers face for the sustainable management of water resources and the need to shift from strong traditional, local and regional water resources management approaches to more integrated river basin approaches dealing with uncertainties in environmental conditions, societal development and global change.

Research plays an important role in the development of truly interdisciplinary, integrative and participative research approaches and methodologies in the area of water management. Over the last years, the principles of integrated water resources management have been widely accepted and various methodological approaches have been developed. However, despite all these efforts, there are still outstanding research questions to be tackled. More effort is therefore needed in order to develop methods, tools and data to integrate climate variability and climate change
into integrated water frameworks and to develop qualitative and quantitative techniques and practical tools to incorporate uncertainties and adaptive management into integrated water resources management concepts and practices. Proper attention should be given to sensitivity analysis, uncertainty and vulnerability assessments, institutional and political frameworks, public participation aspects and methods to resolve conflicts in water use between the various sectors. Investigations on the various aspects hampering the linking of specific domain modelling tools which have been developed and used for various purposes, such as different model concept and regimes, scales issues, lack of common data definitions and lack of an appropriate software environment on which various models can be linked, are also needed.

This book constitutes an important contribution to the various concepts, approaches and challenges of integrated management of water resources. It also provides a good insight and understanding of water resources management problems. It is also based on the results of various research projects supported in this field in the context of the European Union’s environmental research programmes, highlighting the importance the European Union gives to knowledge generation and the promotion of innovation for sustainable development.

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