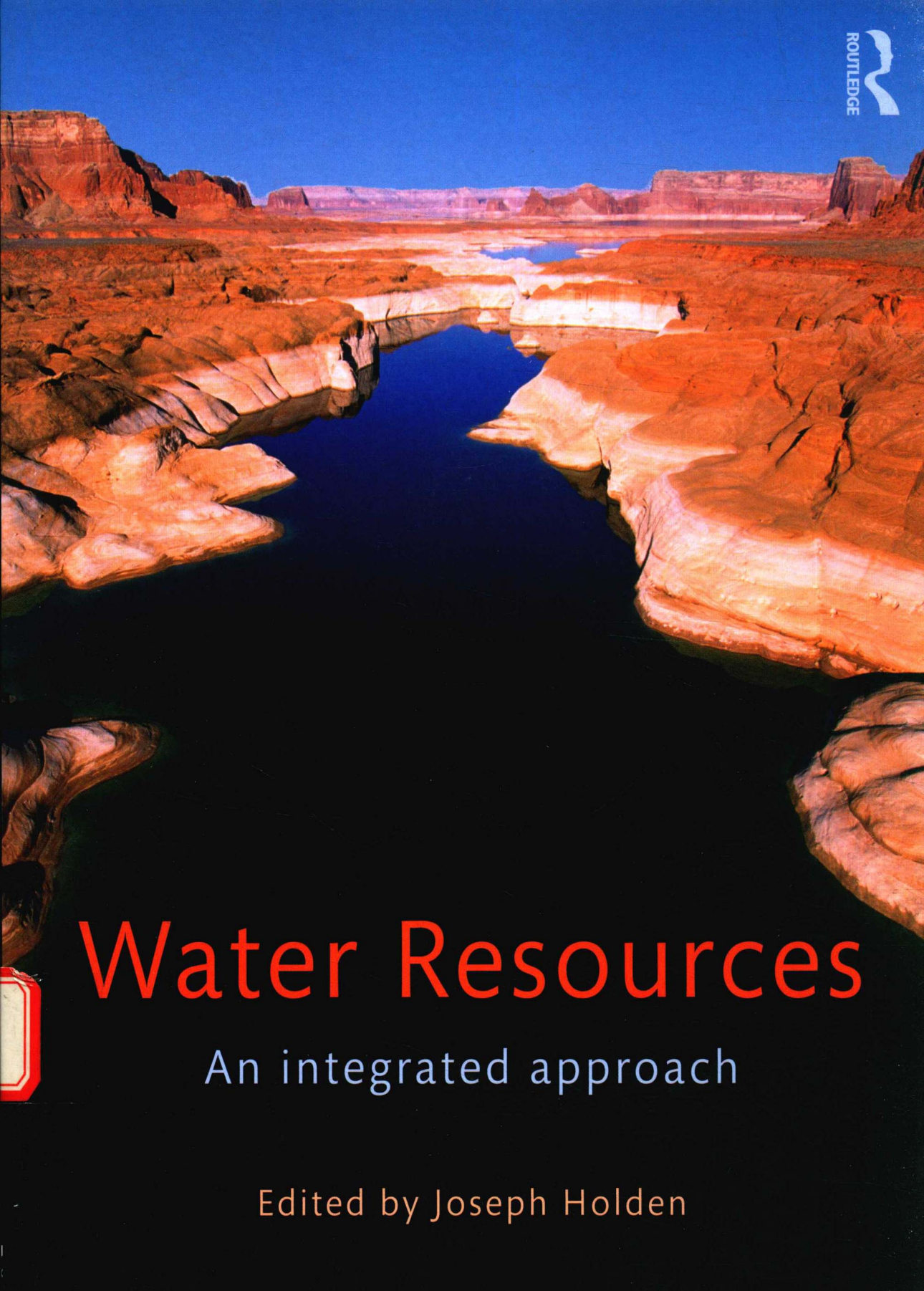
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An integrated approach
Edited by Joseph Holden

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Water Resources

The world faces huge challenges for water as population continues to grow, as emerging economies develop and as climate change alters the global and local water cycles. There are major questions to be answered about how we supply water in a sustainable and safe manner to fulfil our needs, while at the same time protecting vulnerable ecosystems from disaster.

Water Resources: An Integrated Approach provides students with a comprehensive overview of both natural and socio-economic processes associated with water. The book contains chapters written by 20 specialist contributors, providing expert depth of coverage to topics. The text guides the reader through the topic of water, starting with its unique properties and moving through environmental processes and human impacts upon them, including the changing water cycle, water movement in river basins, water quality, groundwater and aquatic ecosystems. The book then covers management strategies for water resources, water treatment and reuse, and the role of water in human health before covering water economics and water conflict. The text concludes with a chapter that examines new concepts such as virtual water that help us understand current and future water resource use and availability across interconnected local and global scales.

This book provides a novel interdisciplinary approach to water in a changing world, from an environmental change perspective and interrelated social, political and economic dimensions. It includes global examples from both the developing and developed world. Each chapter is supplemented with boxed case studies, questions, project ideas and further reading, as well as a glossary of terms. The text is richly illustrated throughout with over 150 full-colour diagrams and photos.

Joseph Holden holds the Chair of Physical Geography at the University of Leeds. He is Head of water@leeds, the largest interdisciplinary water research centre in the UK, and he is also Director of Research for the School of Geography.

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Preface

Water is of fundamental importance to life on Earth. It also has huge economic and cultural significance. This book examines water and water resources from scientific, economic and social perspectives. It is aimed at university students of all levels and water practitioners and policy makers who want to obtain a good grounding in the subject of water across the disciplines. The world faces grand challenges for water as population continues to grow, as emerging economies develop and as climate change alters the global and local water cycles. There are major questions to be answered about how we supply water in a sustainable and safe manner to fulfil our needs, while at the same time protecting vulnerable ecosystems from disaster. These grand challenges require an interdisciplinary approach to address them because there are scientific and technological issues to be addressed, there are economic and political issues to be addressed and there are social and cultural issues to be addressed and these all interconnect. Solving a technological problem on water supply may be futile if there is no political or social will, nor the economic means to utilise that technological advance.

The team of twenty authors who have contributed their knowledge and understanding to this book have compiled their experiences from around the world. This book begins by outlining the nature of water, some of its unique properties, the challenges for water resources and the role of water in society. It then moves in Chapter 2 to examine the global water cycle and the importance of water in moving energy around the planet and how climate change is affecting the water cycle through a series of feedback mechanisms. Chapter 3 covers the water cycle at a more local scale, looking at processes within river basins, including water movements through and over soils and in rivers. The pathways for water through river basins and the way we manage the landscape affect both water quality in rivers and lakes and such surface water quality issues are covered in Chapter 4. The discussion is supplemented by a detailed treatment of groundwater processes, water supply and groundwater quality in Chapter 5. Water bodies form an important part of ecosystems and also host a diverse community of organisms. Aquatic ecosystems and their modifications through human action are given attention in Chapter 6.

The demand for water needs to be managed and the supply of water to people, industry and agriculture needs to be planned for. Thus, Chapter 7 provides an overview of issues around water resource management. The quality and quantity of water both for drinking water supply and within the local environment has a fundamental role to play in human health. Droughts and periods of water scarcity can lead to famine and death. Too much water through flooding can kill not only by drowning but through the spread of disease, food shortages, loss of shelter and livelihood disruption. Infectious diseases associated with water and chemicals carried within water can have huge impacts on human health and therefore these topics are covered in Chapter 8. Techniques for providing clean water for consumption and for treating wastewater (and utilising the resources that wastewater provides) are described in Chapter 9.

Water is an economic good and is crucial for agriculture, industry and many other things from which we derive benefit. It is therefore essential, as described by Chapter 10, to examine the principles of economics and different types of valuation techniques which might be applied to water in order to understand some of our water problems and potential water solutions. Because water is so fundamental to life, is in such demand by humans and has economic value, it is also a cause of conflict around the world. Determining who has the rights to access, extract and use water, a substance that is fluid and mobile, is a complex issue with different traditions operating in different parts of the world. Chapter 11 looks at different types of water conflict and water rights issues from around the world and how these conflicts can be managed. Finally, in Chapter 12, the book looks at new concepts that can help us to understand current and future water resource use and availability across interconnected local and global scales, including the water footprint and 'virtual' water flows.

Each chapter contains some boxed features, which are grouped into one of four themes: case studies, contemporary challenges, techniques or the future of water. These boxed features allow interested readers to study more detail on the selected topics, should they wish. As you read the book you will also notice some words that are typeset in bold within the text. These words are highlighted the first time they appear in each chapter and can be found in the glossary with an explanation of their meaning. Each chapter also contains reflective questions and some project ideas.

The book's interdisciplinary nature reflects my own personal role as head of water@leeds, which is the largest water research group in any UK university. water@leeds members work together as scientists, social scientists and humanities experts to tackle water challenges facing the world. Research is often in partnership with external bodies such as government bodies, NGOs, industry and practitioners to ensure that the research is applicable to societal needs. The water challenges we face are crucial to the survival of the human race, stability and peace around the world and to the sustainability of the Earth's ecosystems. It is therefore vital that around the world we improve understanding of water resource issues from an interdisciplinary perspective. This book is part of that mission and I hope that you will feel inspired to join us in trying to make a real difference to people's lives through sharing an understanding of water resource issues with others.

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