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# KEY CONCEPTS in WATER RESOURCE MANAGEMENT

## A REVIEW AND CRITICAL EVALUATION

Edited by  
**Jonathan Lautze**

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water towers

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water governance

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water  
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sanitation ladder

multiple use systems

# Key Concepts in Water Resource Management

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 **Routledge**  
Taylor & Francis Group  
LONDON AND NEW YORK

**earthscan**  
from Routledge

First published 2014  
by Routledge  
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

and by Routledge  
711 Third Avenue, New York, NY 10017

*Routledge is an imprint of the Taylor & Francis Group, an informa business*

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*British Library Cataloguing-in-Publication Data*

A catalogue record for this book is available from the British Library

*Library of Congress Cataloging-in-Publication Data*

Key concepts in water resource management: a review and critical evaluation/edited by Jonathan Lautze.

pages cm.—(Earthscan water text)

Includes bibliographical references and index.

1. Water supply. 2. Water resources development. I. Lautze, Jonathan.

HD1691.K526 2014

333.91—dc23

2013050048

ISBN: 978-0-415-71172-2 (hbk)

ISBN: 978-0-415-71173-9 (pbk)

ISBN: 978-1-315-88439-4 (ehk)

Typeset in Goudy

by Florence Production Limited, Stoodleigh, Devon, UK



Printed and bound in Great Britain by  
TJ International Ltd, Padstow, Cornwall

# Key Concepts in Water Resource Management

The vocabulary and discourse of water resource management have expanded vastly in recent years to include an array of new concepts and terminology, such as water security, water productivity, virtual water, and water governance. While the new conceptual lenses may generate insights that improve responses to the world's water challenges, their practical use is often encumbered by ambiguity and confusion.

This book applies critical scrutiny to a prominent set of new but widely used terms, in order to clarify their meanings and improve the basis on which we identify and tackle the world's water challenges. More specifically, the book takes stock of what several of the more prominent new terms mean, reviews variation in interpretation, explores how they are measured, and discusses their respective added value. It makes many implicit differences between terms explicit and aids understanding and use of these terms by both students and professionals. At the same time, it does not ignore the legitimately contested nature of some concepts. The book will lead to greater precision on the interpretational options for the various terms, and for the value that they add to water policy and its implementation.

**Jonathan Lautze** is a researcher at the International Water Management Institute, based in its Pretoria office in South Africa.

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# Foreword

Don't we all need a *water secure* society where *water stresses* are properly dealt with through *sound governance structures*? And if IWRM is hard to implement, can we not then resort to a *Water-Energy-Food Nexus* or *virtual water*? If we are of a certain conviction, soft and *natural infrastructure* solutions can be by definition better than hard, engineering solutions. *Land grabs* are bad, *water grabs* even worse. Better use of *green water* is essential to reducing our *water footprints*.

Packaged concepts can come in handy, and using the same term to convey different ideas is not necessarily a bad thing if the concept is still evolving and an actual conversation is taking place. Nonetheless, there are an unfortunate number of concepts for which discussion has faded away, while confusion on substance has not.

Our "water box" is large enough to accommodate diverse arrays of thought, backgrounds, interests and preferences. Each combination of these results in a different perception of terms. When we step outside our water box and expose our terminology to those in sectors across which water cuts, we face deeper issues. Water terms may be associated with concepts in their respective "boxes". Water governance, for example, a multi-dimensional debatable notion for us water professionals, can be quite a challenge to explain to others. How about land and water governance? Environmental governance and water governance? Global governance for food, energy and water?

What can be additionally complicating—and lead to interesting preludes before real dialogues—is that explanations of fuzzy new terms may themselves contain unclear terms. In other words, terms that define terms may have multiple meanings. Food sector stakeholders may have substantially different perceptions of market and pricing mechanisms from water stakeholders, and safety nets can mean different things in the context of water services than in the context of energy services. And lack of shared understanding impedes our ability to constructively address issues in an optimal fashion.

*Key Concepts in Water Resource Management: A Review and Critical Evaluation* takes a critical and comprehensive approach to evaluating six prominent concepts (or sets of concepts) in water resources management,

i.e. *water scarcity, water governance, water security, water productivity, virtual water and water footprints, and green and blue water*. We learn what they mean, how they originated and evolved, how they are interpreted and if and how we can measure them. Various definitions that exist are presented, with the source clearly spelled out: evolution of the term; concept or paradigm; and key differences between the definitions and how they play out in water management. Points of confusion and skepticism that exist are reported and explained; and uses, limitations and metrics are provided, with examples where applicable.

The book challenges the reader to think critically and rationally—based on evidence—to assess the meaning, role and utility of a concept. The terms covered in the book do not lend them to trivial, default definitions—even if many may think so. Despite frequent portrayal as *silver bullets* for water management, the terms of focus are not free from limitations, underlying assumptions, and sometimes flaws. These realities reinforce the need to gain a better handle on these terms to minimize potential for misunderstandings, misinterpretations, or miscommunication.

The book goes far beyond an annotated compendium of recent, prominent water concepts to clinically dissect six concepts (or sets of concepts) that have become central to the discourse of twenty-first century water management. Lautze and colleagues put such concepts through a fine filter to improve our understanding of them, and to generate broader insights about the process of new term introduction. The book fills a critical gap and will serve as a trusted reference to deciphering meanings and interpretations of major water concepts. I might actually propose the book be nicknamed: *Everything You Always Wanted to Know About Key Water Concepts (But Were Afraid to Ask)*.

I will conclude by warning against underestimation of this book's value and utility. While the authors rightfully convey that the book's primary focus is on water management in agriculture, those interested in other uses and aspects of water management will find the book equally useful. Likewise, those active in the "allied" sectors of water will find the book helpful in understanding a sector and its community that would like to be involved in the major decisions of the readers' respective sectors. We in the water sector often contend that the most important decisions related to water are taken outside the water sector, and that those involved in managing water should therefore inform those who make these decisions. If I were a decision maker in energy, food or the environment, I would certainly appreciate having this book around.

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# Preface

The vocabulary and discourse of water resource management have expanded vastly in recent years to include an array of new concepts and terminology, such as water security, water productivity, virtual water, and water governance. While the new conceptual lenses may generate insights that improve responses to the world's water challenges, their practical use is often encumbered by ambiguity and confusion. *Key Concepts in Water Resource Management: A Review and Critical Evaluation* is the first attempt to systematically examine the value added of a set of new terms in water resources management.

This book applies critical scrutiny to a prominent set of new but widely used terms, in order to clarify their meanings and improve the basis on which we identify and tackle the world's water challenges. More specifically, the book takes stock of what several of the more prominent new terms mean, reviews variation in interpretation, explores how they are measured, and discusses their respective added value. It makes many implicit differences between terms explicit and will aid understanding and use of these terms by both students and professionals. It is hoped that the critical scrutiny contained in this book will lead to greater precision on the interpretational options for the various terms, and for the value that they add to the field of water management.

On a personal level, motivation for my involvement for this book was generated by participation in two projects, one on water governance funded by the United States Agency for International Development (USAID) and another on water security, funded by the Asian Development Bank. I was surprised to find how much time was spent simply trying to understand the central project terms "water governance" and "water security." Subsequent thought and discussion led to the realization that the ambiguity surrounding these two terms is far from unique, and that there are indeed frequent informal rumblings and sarcastic comments in hallways and corridors about the precise meaning and value added of a number of new terms introduced in water management such as water governance, green v. blue water, hydropolitics, etc. This spurred thoughts on why we are creating new terms and devoting substantial time and energy to deciphering

their meanings, instead of tackling water management challenges with the terms and concepts that we already have at our disposal and that have proven their ability to address water management challenges.

To push toward clarity, the idea occurred to me to assemble several of the more prominent new concepts in the water management community in one text, and apply some critical analysis to each of them. When discussing this idea with colleagues, most were quite supportive, yet some questioned whether this idea might conform more closely to a dictionary than a full-fledged book along the lines I was describing—and along the lines you are now reading. After some deliberation, I came to the conclusion that it is relatively easy to achieve agreement on, or at least no objections to, fuzzy definitions to many of the new terms in the international water community, as suited for a dictionary. Challenges and differences of interpretation rapidly arise, however, when the meanings are unpacked to identify central components and applied to measure something.

It is therefore my hope that this book is much more than a dictionary of new water management terms. It does review definitions, but goes far beyond this by addressing divergence in interpretations, differences in methods of calculation when relevant, and highlighting consistencies and inconsistencies in usage. It is my hope that this will make many implicit differences between terms explicit, and foster progress by improving their use. It is also my hope that this will lead to greater clarity and precision on the interpretational options for the various terms, and for the value that they add.

This book is focused mainly on water management related to agriculture. The main chapters of the book examine a set of terms that have risen to prominence in agricultural water management. The book's target audience is people active in water management discussions, who make use of terms examined in this book. It is hoped that improved use of such terms by those actively involved in water management dialogues, will lead to improved use and interpretation of such terms more widely (e.g., by general public).

# Acknowledgments

I would like to acknowledge several colleagues who have given their time to review chapters of this book and express my sincere appreciation for their efforts. Such colleagues, some of whom are also authors on chapters that they did not review, include Upali Amerasinghe, Xueliang Cai, Mark Giordano, Bruce Lankford, Doug Merrey, Bharat Sharma, Vladimir Smakhtin, Charles Thompson, Richard Vogel, Kai Wegerich, and Dennis Wichelns. In addition, I would like to extend my sincere thanks to the authors who authored or co-authored chapters of the book. Finally, I would like to thank Charlotte Hiorns (Senior Project Manager at Florence Production) and Ashley Wright (Routledge) for their editorial expertise during the production of this book and also Sumith Fernando (IWMI Layout and Graphic Specialist) who designed and finalized the cover.

Jonathan Lautze



# Abbreviations

ADB	Asian Development Bank
AfDB	African Development Bank
AWBA	Arizona Water Banking Authority
CAADP	Comprehensive African Agricultural Development Program
CARP	Council for Agricultural Research Policy
CGIAR	Consultative Group on International Agricultural Research
ET	evapotranspiration
FAO	Food and Agriculture Organization
GIAM	Global irrigated area mapping
GWP	Global Water Partnership
IDRC	International Development Research Centre
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IUCN	International Union for Conservation of Nature
IWMI	International Water Management Institute
IWRM	Integrated Water Resource Management
MDG	Millennium Development Goal
MUS	Multiple Use Systems
NGO	Non-Government Organization
SEEAW	System of Environmental Economic Accounting for Water
SIDA	Swedish International Development Agency
TFP	Total Factor Productivity
UNDESA	UN Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNU	United Nations University
USAID	United States Agency for International Development
US EPA	US Environmental Protection Agency
USGS	United States Geological Survey