

## Foreword

On 26 June 2013, the Water Research Horizon Conference was held in Berlin, together with the Awards Ceremony of, the Kurt-Eberhard-Bode Foundation and Rüdiger-Kurt-Bode Foundation, two foundations supporting research on water and its use in a broader sense. These two foundations have spurred from Bode Chemie GmbH, one of the leading chemical manufacturers in clinical environmental use with specialisation in the field of disinfection and hygienic materials. In 1924, the company was founded by Dr. Kurt Bode in which currently is a part of the Paul Hartmann Group. The company has consistently maintained strong interest in the development and use of scientific research and relating results. In its commitment to this initiative, since 2011, the company also has run the Bode Science Center. As an example, scientific developmental application of new chemical products for hospital use include Bacillol® and Sterillium®, two alcohol-based disinfectants.

In 1987, Eberhard Bode, head of the company for many years and son of the founder Kurt Bode, decided to start the Kurt-Eberhard-Bode Foundation in honour of his father's accomplishments. Historically, the foundation has actively supported scientific research within the fields of information technology, biology, bioinformatics, physics, chemistry and medicine. However, one of Eberhard Bode's convictions has been that interdisciplinary science, well beyond the scope of his own company, needed special attention due to its neglect in place of classical funding instruments concentrated primarily within traditional disciplines. For this reason, the foundation has supported many projects and research groups within fields relating to medical applications, medical applications of new materials, bioinformatics and nutrition-based research.

In 2009, the foundation expanded its scope by emphasising the subject matter of “water and sustainable usage of resources” with a principal goal of strengthening water resource research for globally-oriented sustainable development. This decision prompted the foundation to sponsor a number of junior research groups in the development of integrative models for the sustainable usage of such resources from an interdisciplinary and applied-scientific standpoint. The initial group’s focus, “Sustainable water management and wetland restoration in settlements of continental-arid Central Asia (SuWaRest)”, was a joint-cooperation between the Free University of Bozen-Bolzano and the University of Greifswald headed by Prof. Dr. Stefan Zerbe and Dr. Niels Thevs. At the Berlin meeting, a second sponsorship funding period, 2013-2015, was awarded to another junior research group within the area of biodiversity in aquatic ecosystems. The second foundation, Rüdiger-Kurt-Bode Foundation, was established in 2009 by Rüdiger Bode, son of Eberhard Bode, a pharmacist and entrepreneur. The Rüdiger-Kurt-Bode Foundation promotes interdisciplinary research within the fields of life and natural sciences. The foundation’s board of trustees decided to foster the notion for strategies and concepts for the sustainable utilisation of water resources through interdisciplinary approaches and practical applications. The focus of both foundations on interdisciplinary environmental sciences have also been supported by the Stifterverband für die Deutsche Wissenschaft, in particular, the responsible officer and member of the board, Dr. Marilen Macher. She jointly assisted, with the board, in developing the ideas for funding the particulars for much of the water-related research. In addition, the Deutsche Forschungsgemeinschaft (DFG) and in particular Ute Weber, supported the foundations in the context of identifying reviewers. The project SuWaRest followed an innovative approach by integrating the natural sciences and environmental engineering with environmental ethics in order to work out potential best-use scenarios for the extremely important but often scarce vital resources humankind depend upon. Water, in this case, is essential and exemplar for our existence. The research consortium of SuWaRest did implement a strong interdisciplinary and international cooperation as well as promoted young scientists from Germany, Italy and China on their way to highly qualified researchers in their fields, i.e. landscape

ecology, microbiology, environmental physics, environmental economics and environmental ethics. It is this fundamental notion illustrated throughout the research reported in this book that both the Kurt-Eberhard-Bode Foundation and Rüdiger-Kurt-Bode Foundation will continue to support such solutions in the future.

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Arndt Bode (on behalf of the Kurt-Eberhard-Bode Foundation and Rüdiger-Kurt-Bode Foundation)

## Preface

Resource water is a top global environmental agenda. Quantity as well as quality of water has become a problem throughout the world. In particular, in arid and semi-arid as well as in fast growing urban-industrial environments societies face over-utilisation and subsequent decrease of water bodies, water pollution as well as very limited access to drinking water. With our international and interdisciplinary project “Sustainable water management and wetland restoration in settlements of continental-arid Central Asia” (SuWaRest), we address this issue in northern China. China’s economy and population has been most rapidly growing in the past decade, with the consequence of high pressure on the natural resources. In order to feed this growing number of inhabitants, irrigation agriculture has spread in the arid and semi-arid regions of northern and north western China. Traditional land uses have been changed to intensively managed fields and related food industries. In order to find solutions for a sustainable management of the resource water, on the basis of scientific results, it is necessary to integrate various disciplines into the research. Thus, our project bridges landscape ecology, technical physics, environmental microbiology, socio-economics and environmental ethics.

Our book is a compilation of the research from these differing disciplines and the experience of interlinking land-use adaptation, the sustainable use of water, the restoration of degraded ecosystems and sustainability based-thinking. Within our international research team, based out of Italy, Germany and China, we applied a broad range of methodology to derive comprehensive recommendations for water management and wetland restoration in northern China. On principle, we thrive for general approaches, which also can be applied in similar environments throughout Central Asia and, in particular, settlements. SuWaRest has been funded by

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the Kurt Eberhard Bode Foundation within the Stifterverband für die Deutsche Wissenschaft, Germany. Their support, has sponsored young researchers, postdoctoral and Ph.D. students, supervised by an international team, in building this interdisciplinary problem solution strategy.

Appreciation is extended to all our colleagues and friends in China, especially local support in Gansu Province and Inner Mongolia Autonomous Region. We believe the research and investment in the SuWaRest project was well worth it, and that the learning-base for our young researchers will build confident and career-oriented researchers in-and-out of academia. The structure of the chapters are framed within the interdisciplines and overlap accordingly. We hope that our findings could pave the way to a more sustainable development of arid and semi-arid regions in Central Asia.

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