

# Preface

Our constantly evolving planet has witnessed many biological and geological events in the past, marked by epochs that have altered its functioning in fundamental ways, through major changes in climate regime, tectonics and volcanism or by the mass extinction of species. We know that humans have influenced the environment in many ways in the past, but since the industrial revolution and even more during the “great acceleration in the human enterprise” following World War II, humans have assumed the role of a dominating force in changing the biosphere, geosphere, atmosphere, hydro- and cryosphere and hence affecting crucial functioning of the Earth system. We are exhausting resources, causing multiple changes without understanding their interrelated and complex outcomes. We have accelerated major processes (e.g. erosion, nitrogen applied to the land mass) while decelerating others (e.g. loss in delivery of river water and sediments to the world’s oceans) in a very short period, and rapidly altered our relationship with the environment in the beginning of a new geological epoch, termed “the Anthropocene”. This implies the significant role of human activities in creating a lasting impact on and in codetermining the future evolution of the planet.

Human activities also impact the global water system as part of the Earth system in a significant way and change the way water moves around the globe like never before. Thus, understanding and managing the global cycle of water, an irreplaceable resource vital to all aspects of both environmental and social systems on this planet, is fundamental for achieving global environmental sustainability.

Since its inception, the Global Water System Project (GWSP) has coordinated and supported a broad research agenda to study the complex global water system with its interactions of environmental and social components as a continuum and coupled system, and helped to understand its complex feedback processes. The GWSP Conference “Water in the Anthropocene: Challenges for Science and Governance. Indicators, Thresholds and Uncertainties of the Global Water System” held in Bonn in 2013, synthesized the major achievements in global water research within the last decade. It presented global as well as regional perspectives of the water system’s responses at different scales and explored its management vis-a-vis globally relevant change.

This book is an important outcome of the conference, identifying how research can assist policy and practice of sustainable freshwater management in the era of the Anthropocene. The book covers global, regional and local perspectives and

addresses issues, such as water resource management and governance, variability in supply, increasing demands for water, environmental flows, and land use change.

The book comprises of 28 chapters that are classified into four broad themes:

Global Water System: Current State and Future Perspectives; Dimensions of Change in River Basins and Regions; Ecosystem Perspectives in Water Resources Management; and Governing Water in the Anthropocene.

The chapters under “Global Water System: Current State and Future Perspectives” present assessments of global water resource availability, deal with earth observations and the role of indicators, data and models of the global water system. They discuss aspects of how to account for water and uncertainties globally, covering both physical processes and socially mediated water fluxes, water withdrawals and uses as well as virtual water trade.

The theme “Dimensions of Change in River Basins and Regions” focuses on adapting to global changes at the river basin and regional scale. This part includes contributions about adaptive resource management towards water security in river basins, chapters addressing institutions and governance challenges in water scarce regions as well as chapters bringing in historical perspectives to understand river systems in the Anthropocene.

The third theme “Ecosystem Perspectives in Water Resources Management” presents different approaches to ecologically sustainable water management drawing on various case studies. The part focuses on how to mitigate the negative impacts of anthropogenic activities on the resilience of social-ecological systems.

The fourth part, “Governing Water in the Anthropocene” concentrates on the crosscutting issue of global water governance, acknowledging the fact that the global “water crisis” is in fact a governance crisis. Case studies in water governance and management under global change from different parts of the world are complemented by contributions dealing with issues like water law, ethics and institutions in water governance.



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Challenges for Science and Governance

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