

Taming The Anarchy Groundwater Governance In Sout

"The world water problems are a due to bad governance, not to physical water scarcity." This book is inspired by this statement and explores whether it holds in a specific country, Spain, where climatic conditions – Spain is one of the most arid countries of the European Union - would fully justify saying that water problems are due to physical water scarcity. The metrification of water uses and their monetary value is a first important step in understanding how reallocation of water among users could help mitigating many of current water problems in Spain. However, water reallocation among users or from users to nature is far from simple. Initiatives portrayed as the solution to the water governance ‘ jigsaw ’ – e.g. water trade, improved water use efficiency, users collective action, public participation – are not free of difficulties and shortcomings. The book explores the growing need for maintaining Spain ’ s natural capital and the human component of water governance – people ’ s needs, wishes, (vested) interests, aspirations – that often determine the result of decisions and, sometimes, lead water management to a deadlock. This book takes a step forward in showing a more complex - and also closer to reality - picture of water governance in Spain.

This book addresses groundwater governance, a subject internationally recognized as crucial and topical for enhancing and safeguarding the benefits of groundwater and groundwater-dependent ecosystems to humanity, while ensuring water and food security under global change. The multiple and complex dimensions of groundwater governance are captured in 28 chapters, written by a team of leading experts from different parts of the world and with a variety of relevant professional backgrounds. The book aims to describe the state-of-the-art and latest developments regarding each of the themes addressed, paying attention to the wide variation of conditions observed around the globe. The book consists of four parts. The first part sets the stage by defining groundwater governance, exploring its emergence and evolution, framing it through a socio-ecological lens and describing groundwater policy and planning approaches. The second part discusses selected key aspects of groundwater governance. The third part zooms in on the increasingly important linkages between groundwater and other resources or sectors, and between local groundwater systems and phenomena or actions at the international or even global level. The fourth part, finally, presents a number of interesting case studies that illustrate contemporary practice in groundwater governance. In one volume, this highly accessible text not only familiarizes water professionals, decision-makers and local stakeholders with groundwater governance, but also provides them with ideas and inspiration for improving groundwater governance in their own environment.

Groundwater has provided great benefits to agriculture irrigation in semi-arid OECD countries, but its intensive use beyond recharge in certain regions has depleted resources and generated significant negative environmental externalities.

The book embodies the groundwater issues and challenges in India focusing its sustainable use. It is a compilation of papers presented by the eminent experts from Government departments, academia, research institutes, NGOs and stakeholders who assembled at Kurukshetra on 21st August, 2015 in the event of Bhujal Manthan or “ Churning of Groundwater ” organized for the first time by Ministry of Water Resources, River Development and Ganga Rejuvenation, the apex Ministry of Water Resource under Government of India. India, as a country, is the highest groundwater extractor in the world. Its service towards attaining the food and clean drinking water security is well documented. This volume addresses the issues of aquifer characterization, groundwater contamination, groundwater resource availability and its sustainable management through community participation in pan-India scenario. This book provides a unique opportunity for its readers to understand groundwater domain in India in its entire gamut. The papers included in the volume were selected carefully from the presentations made in the following four broad topics during the Manthan; (i) groundwater quality, (ii) conjunctive use of surface and groundwater, (iii) management intervention and sustainable use of this resource, and (iv) groundwater problems and application of various techniques. The book contains 20 papers including an introductory chapter by the editors. The content of the book is enriched by contributions from eminent researchers and activists in groundwater domain, like Prof. Tushar Shah, Prof. Himanshu Kulkarni, Dr. D. K. Chadha, Dr. Bharat Sharma and others. The recommendations in the individual papers are of immense significance for keeping the groundwater of the country clean and sustainable. The volume will help the readers to understand the groundwater issues of the country and also assist policy makers to prepare strategies for its better governance and management with environmentally sustainable ways.

Issues and Challenges in South Asia

Groundwater and ecosystem services

Irrigation Water Management for Agricultural Development in Uttar Pradesh, India

Living territories to transform the world

OECD Studies on Water Drying Wells, Rising Stakes Towards Sustainable Agricultural Groundwater Use

Clean and Sustainable Groundwater in India

Groundwater is humanity's most vital supply of freshwater. Freshwater resources contained in aquifer systems globally are two orders of magnitude greater than those found in all rivers, lakes, and other surface freshwaters combined. Moreover, approximately one half of the world's population today is dependent on groundwater for its basic needs. While these truisms are widely acknowledged, an additional reality is now recognized – many of these subsurface freshwater reservoirs are actually transboundary formations shared amongst two or more nations. In fact, around 600 transboundary aquifers have been identified worldwide. They underlie the territory of nearly every non-island nation and are found in both humid and arid environments. Surprisingly, though, only a handful of transboundary aquifers worldwide are subject to any type of formal or informal international agreement.

Transboundary groundwater resources are now receiving growing attention among the international community. Questions are being raised about how they should be managed, allocated and protected, what rights aquifer riparians can enjoy, and what responsibilities these aquifer states might owe to neighbouring aquifer riparians. This book considers all these various aspects of the management and regulation of transboundary groundwater resources. It also presents case studies and explores recent efforts to engage the international community on best practices and global standards for governing transboundary aquifers. As communities and nations continue to expand their reliance on these critical sources of freshwater, they will have to address such issues and

develop governance regimes for these shared subsurface resources. The chapters in this book were originally published as a special issue of *Water International*.

This book is open access under a CC BY-NC-SA 3.0 IGO license. The book uses an economic lens to identify the main features of climate-smart agriculture (CSA), its likely impact, and the challenges associated with its implementation. Drawing upon theory and concepts from agricultural development, institutional, and resource economics, this book expands and formalizes the conceptual foundations of CSA. Focusing on the adaptation/resilience dimension of CSA, the text embraces a mixture of conceptual analyses, including theory, empirical and policy analysis, and case studies, to look at adaptation and resilience through three possible avenues: ex-ante reduction of vulnerability, increasing adaptive capacity, and ex-post risk coping. The book is divided into three sections. The first section provides conceptual framing, giving an overview of the CSA concept and grounding it in core economic principles. The second section is devoted to a set of case studies illustrating the economic basis of CSA in terms of reducing vulnerability, increasing adaptive capacity and ex-post risk coping. The final section addresses policy issues related to climate change. Providing information on this new and important field in an approachable way, this book helps make sense of CSA and fills intellectual and policy gaps by defining the concept and placing it within an economic decision-making framework. This book will be of interest to agricultural, environmental, and natural resource economists, development economists, and scholars of development studies, climate change, and agriculture. It will also appeal to policy-makers, development practitioners, and members of governmental and non-governmental organizations interested in agriculture, food security and climate change.

This report aims at integrating regional and country experiences and projects with regard to viable groundwater management practices for the future. It compiles and translates best available present scientific and technical knowledge on groundwater resources and their governance, which is often highly specialized, into simpler language and synoptic representations, accessible to a large public of policy and decision makers across development sectors. It serves as a technical basis for the visioning process, and for the definition of the Framework for Action on groundwater governance. This is one of 3 outputs of project GCP/GLO/277/GEF expected to be published under the names of its 5 partner organizations and widely circulated to policy and decision-makers in countries, as well as other stakeholders of groundwater governance and practitioners around the world. This outputs provides the technical basis for the other two: *A Global Vision for Groundwater Governance 2030* and *Global Framework for Action to Achieve the Vision on Groundwater Governance*.

In 1947, British India—the part of South Asia that is today's India, Pakistan, and Bangladesh—emerged from the colonial era with the world's largest centrally managed canal irrigation infrastructure. However, as vividly illustrated by Tushaar Shah, the orderly irrigation economy that saved millions of rural poor from droughts and famines is now a vast atomistic system of widely dispersed tube-wells that are drawing groundwater without permits or hindrances. *Taming the Anarchy* is about the development of this chaos and the prospects to bring it under control. It is about both the massive benefit that the irrigation economy has created and the ill-fare it threatens through depleted aquifers and pollution. Tushaar Shah brings exceptional insight into a socio-ecological phenomenon that has befuddled scientists and policymakers alike. In systematic fashion, he investigates the forces behind the transformation of South Asian irrigation and considers its social, economic, and ecological impacts. He considers what is unique to South Asia and what is in common with other developing regions. He argues that, without effective governance, the resulting groundwater stress threatens the sustenance of the agrarian system and therefore the well being of the nearly one and a half billion people who live in South Asia. Yet, finding solutions is a formidable challenge. The way forward in the short run, Shah suggests, lies in indirect, adaptive strategies that change the conduct of water users. From antiquity until the 1960s, agricultural water management in South Asia was predominantly the affair of village communities and/or the state. Today, the region depends on irrigation from some 25 million individually owned groundwater wells. Tushaar Shah provides a fascinating economic, political, and cultural history of the development and use of technology that is also a history of a society in transition. His book provides powerful ideas and lessons for researchers, historians, and policymakers interested in South Asia, as well as readers who are interested in the water and agricultural futures of other developing countries and regions, including China and Africa.

Accelerating irrigation expansion in Sub-Saharan Africa

More Crop Per Drop

WATER ACCOUNTING FOR WATER GOVERNANCE AND SUSTAINABLE DEVELOPMENT

Freshwater Governance for the 21st Century

Collective Aquifer Governance

On target for people and planet

This volume is an analytical summary and a critical synthesis of research at the International Water Management Institute over the past decade under its evolving research paradigm known popularly as 'more crop per drop'. The research synthesized here covers the full range of issues falling in the larger canvas of water-food-health-environment interface. Besides its immediate role in sharing knowledge with the research, donor, and policy communities, this volume also has a larger purpose of promoting a new way of looking at the water issues within the broader development context of food, livelihood, health and environmental challenges. More crop per drop: Revisiting a research paradigm contrasts the acquired wisdom and fresh thinking on some of the most challenging water issues of our times. It describes new tools, approaches, and methodologies and also illustrates them with practical application both from a global perspective and within the local and regional contexts of Asia and Africa. Since this volume brings together all major research works of IWMI, including an almost exhaustive list of citations, in one single set of pages, it is very valuable not only as a reference material for researchers and students but also as a policy tool for decision-makers and development agencies.

This volume covers such areas in the field of soil salinity and water quality as: origin and distribution of salt-affected soils; management of alkali soils; quality criteria of irrigation water; wastewaters as a source of irrigation; and grasses and trees in the management of salt-affected soils.

What resources underpin the development of a territory? What does territorial management of resources mean? What specific characteristics and opportunities does territorial organization offer for agricultural production, regulation of sectors, and services? How are territorial public policies conceived and applied? What methods and tools can be used for territorial development? This book presents a wide range of studies illustrating how actors, scales and scopes of intervention interact in the development of rural spaces in countries of the Global South.

The State of the World's Land and Water Resources for Food and Agriculture is FAO's first flagship publication on the global status of land and water resources. It is an 'advocacy' report, to be published every three to five years, and targeted at senior level decision makers in agriculture as well as in other sectors. SOLAW is aimed at sensitizing its target audience on the status of land resources at global and regional levels and FAO's viewpoint on appropriate recommendations for policy formulation. SOLAW focuses on these key dimensions of analysis: (i) quantity, quality of land and water resources, (ii) the rate of use and sustainable management of these resources in the context of relevant socio-economic driving factors and concerns, including food security and poverty, and climate change. This is the first time that a global, baseline status report on land and water resources has been made. It is based on several global spatial databases (e.g. land suitability for agriculture, land use and management, land and water degradation and depletion) for which FAO is the world-recognized data source. Topical and emerging issues on land and water are dealt with in an integrated rather than sectoral manner. The implications of the status and trends are used to advocate remedial interventions which are tailored to major farming systems within different geographic regions.

Coping with Water Scarcity

Groundwater Irrigation, Energy Use, and Food Production

Managing Systems at Risk

Soil Salinity and Water Quality

Drought-proofing through groundwater recharge

Groundwater Governance in Asia: The Challenge of Taming a Colossal Anarchy, Kyoto, Japan, 17 March 2003.

This book presents recent findings from the South Asian region (SA), broadly including groundwater studies on (a) quantity, (b) exploration, (c) quality and pollution, (d) economics, management and policies, (e) groundwater and society, and (f) sustainable sources. It offers a compilation of compelling, authentic insights into groundwater scenarios throughout the water-stressed South Asia region. Comprising Afghanistan, Bangladesh, Bhutan, India, Myanmar, Nepal, Pakistan, and Sri Lanka, it is the most densely populated region in the world: It occupies approximately 4% of the global land area but supports more than 25% of the global population. The SA region now faces an acute shortage of fresh water due to a rapid rise in water demand and changes in societal water-use patterns. Combining essential advances and perspectives, this book offers a valuable resource for all scientists, planners and policymakers who are interested in understanding and developing the SA and other related areas.

This book presents a comprehensive analysis of the existing nature of India's groundwater laws. In the backdrop of the gravity of groundwater crisis that threatens to engulf the country, the book examines the correlation between the imperfections in the law and water crisis and advocates a reform agenda to overhaul the legal framework. It accomplishes this objective by examining how some of the States and Union

Territories regulate and manage groundwater through the legal instrumentality against the backdrop of the two conflicting paradigms: the "elitist" and the "egalitarian." The book's fundamental premise is that despite being an extraordinarily critical resource that supports India's burgeoning population's ever-increasing water demands, groundwater is abused and mismanaged. The key argument that it posits is that the elitist paradigm must give way to an egalitarian one where groundwater is treated as a common property resource. To place this message in perspective, the book's introduction explains the dichotomy between the two paradigms in the context of groundwater. This sets the stage, after which the book is divided thematically into three parts. The first part deals with some of the general groundwater management concerns brought to the fore by the operation of the elitist paradigm. Since water is constitutionally a State subject, the second part analyses the groundwater legislations of different States and Union Territories set against their unique circumstances. As these laws do not dismantle the elitist paradigm that interlocks groundwater rights to land rights, the next part articulates the legal reform agenda where a case is made to re-engineer groundwater laws to reflect a more sustainable basis. The findings and arguments resonate with the situation in many developing countries around the world due to which the book is a valuable resource for researchers across disciplines studying this area, and also for policy makers, think tanks, and NGOs. Groundwater Management-Inter-state Water Conflicts-Aquifers-Water Markets-Water Security-Water Law Reform-Groundwater Law-Water Law-Sustainable Development-Hydrology

This book describes and analyses the diversity of possible approaches and policy pathways to implement sustainable groundwater development, based on a comparative analysis of numerous quantitative management case studies from France and Australia. This unique book brings together water professionals and academics involved for several decades in groundwater policy making, planning or operational management to reflect on their experience with developing and implementing groundwater management policy. The data and analysis presented accordingly makes a significant contribution to the empirical water management literature by providing novel, real world insights unpublished elsewhere. The originality of the contributions also lies in the different disciplinary perspectives (hydrogeology, economics, planning and social sciences in particular) adopted in many chapters. The book offers a unique comparative analysis of France, Australia and experiences in countries such as Chile and the US to identify similarities, but also fundamental differences, which are analysed and presented as alternative policy options - these differences being mainly related to the role of the state, the community and market mechanisms in groundwater management. In 1947, British India-the part of South Asia that is today's India, Pakistan, and Bangladesh-emerged from the colonial era with the world's largest centrally managed canal irrigation infrastructure. However, as vividly illustrated by Tushaar Shah, the orderly irrigation economy that saved millions of rural poor from droughts and famines is now a vast atomistic system of widely dispersed tube-wells that are drawing groundwater without permits or hindrances. Taming the Anarchy is about the development of this chaos and the prospects to bring it under control. It is about both the massive benefit that the irrigation economy has created and the ill-fare it threatens through depleted aquifers and pollution. Tushaar Shah brings exceptional insight into a socio-ecological phenomenon that has befuddled scientists and policymakers alike. In systematic fashion, he investigates the forces behind the transformation of South Asian irrigation and considers its social, economic, and ecological impacts. He considers what is unique to South Asia and what is in common with other developing regions. He argues that, without effective governance, the resulting groundwater stress threatens the sustenance of the agrarian system and therefore the well being of the nearly one and a half billion people who live in South Asia. Yet, finding solutions is a formidable challenge. The way forward in the short run, Shah suggests, lies in indirect, adaptive strategies that change the conduct of water users. From antiquity until the 1960's, agricultural water management in South Asia was predominantly the affair of village communities and/or the state. Today, the region depends on irrigation from some 25 million individually owned groundwater wells. Tushaar Shah provides a fascinating economic, political, and cultural history of the development and use of technology that is also a history of a society in transition. His book provides powerful ideas and lessons for researchers, historians, and policymakers interested in South Asia, as well as readers who are interested in the water and agricultural futures of other developing countries and regions, including China and Africa.

Strengthening Cooperation over Transboundary Groundwater Resources

Water Governance and Management in India

Scaling Up Multiple Use Water Services

Handbook of Catchment Management

Sustainable Groundwater Management

Indian and International Perspectives

The book is the first of its kind to deal with almost the entire swath of water resources assessment, development and sustainable management. The idea of the book crystallized during the long journey of the Editors on various facets of water issues in India and abroad during their extended

association, at all levels with the Ministry of Water Resources, River Development and Ganga Rejuvenation, as well as International Organizations dealing with water. Currently water-stressed, India is likely to become water scarce in not too distant a future. The global freshwater supply and its sustainable use for human consumption, and conservation of the ecosystem have never come under such a rigorous scrutiny before. The unplanned and reckless exploitation of this precious resource have led to a crisis situation, compounded by a real threat of climate change. This book is, therefore, timely and of particular relevance not only to India but the entire world. The book contains 20 chapters, beside the lead article by the Editors. The chapters are contributed by the eminent professionals, researchers, academicians and civil society representatives having an in-depth understanding of the issues. The contents of the chapters have been chosen to represent all aspects of water. The assessment of water resources using satellite data and in-depth analyses of groundwater sector like, the Aquifer Mapping Programme initiated by Government of India, application of gravity satellite data to assess the resource build up, artificial recharge of aquifers and its contamination, are dealt with by eminent experts. The articles on sustainable management of water through good governance by community participation and involvement of civil society are placed. Flood management both through a basin level approach as well as by building resilience in vulnerable areas is discussed. Other critical issues like water bodies management, constitutional provisions, water governance and financial issues, hydro-power and need of research and development in this sector are also dealt with aptly. In view of emerging crisis and complexities in this sector the future pathways and the paradigm shift that is required in administrative and policy level is also discussed.

This volume advances the scientific understanding, development, and application of geospatial technologies related to groundwater resource management, mapping, monitoring, and modelling using up-to-date remote sensing and GIS techniques. The book further provides a critical analysis of the debates and discourses surrounding groundwater resources and society, illustrates the relationship between groundwater resources and precision agriculture for societal development, and describes novel, region-specific management strategies and techniques for sustainability with case studies. The book is organized into three parts: (I) Groundwater resources and societal development; (II) Groundwater availability, quality and pollution; and (III) Sustainable groundwater resources management. Each section begins with a short introduction that includes an overview of the papers in that section. Individual chapters focus on the core themes of research and knowledge along with some topics that have received lesser attention. The book will be of interest to water resource planners and decision-makers, academic researchers, policy makers, NGOs, and academic researchers and students in Geography, Geophysics, Hydrology, Remote Sensing & GIS, Agriculture, Soil Science, and Agronomy.

This book, the second volume in the series, continues to raise contextual issues and presents perspectives regarding multifaceted challenges in management and governance of water in India. This volume attempts to broad base and expand the dialogue started in the first volume and would touch upon issues that need immediate discussion but have been left unattended like politics and management of groundwater, efficient utilization of water in agriculture (irrigation) and improving water use efficiency and building resilience. As in the first volume, this book presents a set of suggestions and recommendations in each chapter that can help frame policy guidelines in the country.

The objective of this book is to broadly illustrate the key aspects of water governance, mapping the spectrum of decision-making from techno-centric and eco-centric approaches, to hybrid concepts and people-centric approaches. Topics covered include the challenges for water-governance models, the polycentric model, the integration challenge, water in the decision-making hierarchy, and the rise of water-sensitive design, while also taking into account interdependencies between stakeholders, as well as the issue of scale. The book's content is presented in an integrated and comprehensive format, building on detailed case studies from around the world and the authors' working experiences in the water sector.

Combining essential insights with accessible, non-technical language, it offers a valuable resource for academics, technicians and policy-makers alike.

Groundwater Law and Management in India

Climate Smart Agriculture

A Comparative Study of Institutional and Legislative Frameworks

Issues and Perspectives, Volume 2

Groundwater Governance in South Asia

Environmental Governance in Europe and Asia

"In the 20th Century, water use has increased at more than twice the rate of population growth, to the point that in many regions overall demand for water can no longer be satisfied. Agriculture uses 70 percent of global freshwater withdrawals and is probably the sector where water scarcity is most critical. Under the joint pressure of population growth and changes in dietary habits, food consumption is increasing in most regions of the world, and it is expected that by 2050 an additional 60 percent of food will be needed to satisfy global demand. Future policy decisions will increasingly need to reflect the tight linkage between water and food security, and be based on a clear understanding of opportunities and trade-offs in managing water for agricultural production. In order to guide its action in support of its member countries, FAO has recently embarked on a long-

term programme on the theme "Coping with water scarcity -- the role of agriculture". Based on an expert consultation, a conceptual framework has been developed to help address the question of food security under conditions of water scarcity. This report presents the conceptual framework, reviews a series of policy and technical options, and establishes a set of principles that should serve as a basis for the development of effective food security policies in response to growing water scarcity."--Back cover.

The aim of this book is to document for the first time the dimensions and requirements of effective integrated groundwater management (IGM). Groundwater management is a formidable challenge, one that remains one of humanity's foremost priorities. It has become a largely non-renewable resource that is overexploited in many parts of the world. In the 21st century, the issue moves from how to simply obtain the water we need to how we manage it sustainably for future generations, future economies, and future ecosystems. The focus then becomes one of understanding the drivers and current state of the groundwater resource, and restoring equilibrium to at-risk aquifers. Many interrelated dimensions, however, come to bear when trying to manage groundwater effectively. An integrated approach to groundwater necessarily involves many factors beyond the aquifer itself, such as surface water, water use, water quality, and ecohydrology. Moreover, the science by itself can only define the fundamental bounds of what is possible; effective IGM must also engage the wider community of stakeholders to develop and support policy and other socioeconomic tools needed to realize effective IGM. In order to demonstrate IGM, this book covers theory and principles, embracing: 1) an overview of the dimensions and requirements of groundwater management from an international perspective; 2) the scale of groundwater issues internationally and its links with other sectors, principally energy and climate change; 3) groundwater governance with regard to principles, instruments and institutions available for IGM; 4) biophysical constraints and the capacity and role of hydroecological and hydrogeological science including water quality concerns; and 5) necessary tools including models, data infrastructures, decision support systems and the management of uncertainty. Examples of effective, and failed, IGM are given. Throughout, the importance of the socioeconomic context that connects all effective IGM is emphasized. Taken as a whole, this work relates the many facets of effective IGM, from the catchment to global perspective.

The catchment area of the Mekong River and its tributaries extends from China, through Burma/Myanmar, Thailand, Laos, Cambodia and to Vietnam. The water resources of the Mekong region - from the Irrawaddy and Nu-Salween in the west, across the Chao Phraya to the Lancang-Mekong and Red River in the east- are increasingly contested. Governments, companies, and banks are driving new investments in roads, dams, diversions, irrigation schemes, navigation facilities, power plants and other emblems of conventional 'development'. Their plans and interventions should provide some benefits, but also pose multiple burdens and risks to millions of people dependent on wetlands, floodplains and aquatic resources, in particular, the wild capture fisheries of rivers and lakes. This book examines how large-scale projects are being proposed, justified, and built. How are such projects contested and how do specific governance regimes influence decision making? The book also highlights the emergence of new actors, rights and trade-off debates, and the social and environmental consequences of 'water resources development'. This book shows how diverse, and often antagonistic, ideologies and interests are contesting for legitimacy. It argues that the distribution of decision-making, political, and discursive power influences how the waterscapes of the region will ultimately look and how benefits, costs and risks will be distributed. These issues are crucial for the transformation of waterscapes and the prospects for democratizing water governance in the Mekong region. The book is part of the action-research of the M-POWER (Mekong Program on Water, Environment and Resilience) knowledge network. Published with IFAD, CGIAR Challenge Program on Water & Food, M-POWER, Project ECHL-EAU and HEINRICH BOLL STIFTUNG

There is growing interest in water accounting, why it is needed, what benefits it brings, and equally important, how it can be put into practice. Water accounting is not a new idea, yet it is an alarmingly simple one. It is about quantifying water resources and uses of water, much like financial accounts provide information on income and expenditure. Interest in water accounting is based on the premise that 'We cannot plan and manage what we do not measure' – a statement that few would disagree with. However, given the current focus on water as a precious and limiting resource, the risks of extreme floods and droughts, and water's central role in the 2030 Agenda, it is difficult to understand why so little attention is given to water accounting and to making sure we have enough water. Indeed, estimates suggest that by 2050, if we continue with our current approach to water management, global water demand will exceed supply by over 40%, which would put at risk 45% of global GDP, 52% of the world's population, and 40% of grain production (WWDR, 2016). This concern is supported by the World Economic Forum that consistently ranks water crises as a top global risk (WEF, 2015). Reports from South Africa (January 2018) suggesting that Cape Town may be the world's first major city to face the prospect of running out of water following severe drought, is a timely 'wake-up call' for everyone to focus on accounting for water.

Concepts, Approaches and Challenges

Sustainable Development in India

Advances in Groundwater Governance

Lessons from Chief Ministers' initiatives in four Indian states

"Hydropower, Livelihoods and Governance"

Groundwater Development and Management

This book looks at environmental governance in both Asia and Europe and offers a comparative analysis of the two regions in order to provide a better understanding of the concept of 'environmental

governance' and its status in Europe and Asia. The book assesses the legislative, institutional and participatory mechanisms which affect the overall development of environmental governance, and analyses current issues, concerns and strategies in respect of environmental governance at the local, national, and international levels. The rapid changes in economic, social and political life have had an enormous impact on Asia's ecosystems and resources. Asian countries, in the name of economic development, are following the same environmentally destructive path their European counterparts followed in the past. The key to the environmental future of these two regions lies in the evolution of the character of governance - the ensemble of social ethics, public policies and institutions which structure how state actors and the civil society interact with the environment. This book will be valuable to scholars and students of environmental politics, EU and Asian studies, public policy, environmental law, and to decision makers and policy analysts.

This book examines the relationship between natural resource management, sustainable development, and governance with case studies from India and other places covering disaster risk reduction, conflict resolution, capacity building, climate change adaptation and resilience, citizen engagement and ecological conservation. Though the studies focus mostly on cases in India, the volume discusses how governance can be employed to help develop and implement sustainable practices globally through the lens of the United Nations Sustainable Development Goals (SDGs) framework. Readers will learn how to integrate concepts of resource management, sustainable development, and governance to improve human resilience to global environmental change, and to assess the proper development approaches to assist economically stressed and resource-deprived individuals. The book will be of use to graduate students and academics, policy makers, planners, and nonprofits.

Urban water conflicts manifested first in Europe in the 19th century and are observed nowadays in various forms throughout the world; in particular, in developing countries. Main causes of these conflicts are characterized by complex socioeconomic and institutional issues related to urban water management. The debate about public water services ver

Poor people in developing countries need water for many purposes: for drinking, bathing, irrigating vegetable gardens, and watering livestock. However, responsibility for water services is divided between different government agencies, the WASH (Water, Sanitation and Hygiene) and irrigation sub-sectors, with the result that people's holistic needs are not met. Multiple use water services (MUS) is a participatory water services approach that takes account of poor people's multiple water needs as a starting point of planning, and the approach has been implemented in at least 22 countries in Africa, Asia and Latin America. Scaling up Multiple Use Water Services argues that by designing cost-effective multi-purpose infrastructure MUS can have a positive impact on people's health and livelihoods. It analyses and explains the success factors of MUS, using a framework of accountability for public service delivery, and it also examines why there has been resistance against scaling up MUS. A stronger service delivery approach can overcome this resistance, by rewarding more livelihood outcomes, by fostering discretionary decision-making power of local-level staff and by allowing horizontal coordination. This book should be read by government and aid agency policy makers in the WASH and agriculture sectors, by development field workers, and by academics, researchers and students of international development.

Contested Waterscapes in the Mekong Region

Water Governance: Challenges and Prospects

The State of the World's Land and Water Resources for Food and Agriculture

Urban Water Conflicts

Groundwater and Society

UNESCO-IHP

This book deals with the challenges for efficient groundwater management, with a focus on South Asia and India, providing a balanced presentation of theory and field practice using a multidisciplinary approach. Groundwater of South Asia is increasingly confronted with overuse and deteriorating quality and therefore requires urgent attention. Management of the stressed groundwater systems is an extremely complex proposition because of the intricate hydrogeological set-up of the region. Strategies for sustainable management must involve a combination of supply-side and demand-side measures depending on the regional setting and socio-economic situations. As a consequence, the challenges of efficient groundwater management require not only a clear understanding of the aquifer configuration, but also demand for the development of a comprehensive database of the groundwater occurrences and flow systems in each hydrogeological setting. In addition, drilling and well construction methods that are appropriate to different hydrogeological formations need to be implemented as well as real-time monitoring of the status of the groundwater use. Also corrective measures for groundwater that is threatened with depletion and quality deterioration need to be installed. Finally, the legal framework of groundwater needs to be rearticulated according to the common property aspect of groundwater. These challenges should revolve around effective groundwater governance by creating an atmosphere to support and empower community-based systems of decision-making and revisit the existing legal framework and groundwater management institutions by fostering community initiatives. This book is relevant for academics, professionals, administrators, policy makers, and economists concerned with various aspects of groundwater science and management.

This book focuses on irrigation sources together with water management for agricultural development in Uttar Pradesh state of India. Being the most populous state of the country, it bears a burden of feeding about 199 million people of which major section relies on agriculture for their subsistence. This study makes comparison in the growth trends in the irrigated area, crop land use patterns and crop productivity at the district level in different periods of time. The book emphasizes on irrigation water management to optimize crop yields in order to increase Water Productivity of crops in low productivity regions of the state applying suitable technology. This book appeals to researchers and students in geography and planning working on the topics of agriculture as well as irrigation and water management aspects.

HANDBOOK OF CATCHMENT MANAGEMENT In 2010, the first edition of the Handbook of Catchment Management provided a benchmark on how our understanding and actions in water management within a catchment context had evolved in recent decades. Over ten years on, the catchment management concept is entering a new phase of development aligned to contemporary and future challenges. These include climate change uncertainty, further understanding in ecological functioning under change, the drive for a low-carbon, energy efficient and circular society, multiple uses of water, the emergence of new pollutants of concern, new approaches to valuation, finance and pricing mechanisms,

stewardship and community engagement, the integration of water across the Sustainable Development Goals (SDG) and the link between water, energy and food. These developments are framed within an increasingly data rich world where new analytics, sensor technology and processing power are informing increasingly real-time decision making. The challenge is also to increase cross-compliance and policy integration to meet multiple stakeholder objectives, and to link actions to achieve cost-effective outcomes. In addition, there are a number of new and exciting city, region and basin-scale real-world examples of contemporary and new catchment thinking; integrating science, technology, knowledge and governance to address multiple drivers and complex problems from across the globe. The time is now right, to capture the new challenges facing catchment management and water resources management globally. This revised and updated edition of the Handbook of Catchment Management features: Thoroughly rewritten chapters which provide an up-to-date view of catchment management issues and contexts New case study material highlighting multi-sectoral management in different globally significant basins and different geographical locations Up-to-date topics selected for their resonance not only in natural sciences and engineering, but also in other fields, such as socio-economics, law and policy The Handbook is designed for a broad audience, but will be particularly useful for advanced students, researchers, academics and water sector professionals such as planners, consultants and regulators.

Current models of groundwater governance focus principally on the allocation of water, rather than taking a holistic approach incorporating valuable storage space in the aquifer, as well as the transformative changes in managed recharge of manufactured water, storm water, and carbon. Effective implementation of a more modern approach now calls for rethink of both scale and jurisdictional boundaries. This involves linking public and private aspects of water quantity, water quality, geothermal regulation, property rights, subsurface storage rights, water marketing, water banking, legal jurisdictions, and other components into a single governance document. This style of agreement stands in contrast to the siloed approach currently applied to aquifer resources. Using case studies, and an activity inspired by gaming concepts to explore the incentives, and challenges to aquifer governance approaches, this book demonstrates how application of the principles of unitization agreements to aquifers could provide a new approach to aquifer governance models.

policy lessons from the global revolution in farmer-led smallholder irrigation

Groundwater of South Asia

Applications of Geospatial Technology

Towards Sustainable Agricultural Groundwater Use

Accountability in Public Water Sector Performance for Health and Wealth

Resource Management, Sustainable Development and Governance

This book explores and interrogates the food–water–energy nexus, arguably the most crucial factor in sustaining India’s economic development. The book sheds light on different experiences faced in states across India, including the consequences of electricity tariff reforms and related policies on irrigated agriculture. Part 1 focuses on the historical development of agriculture and social change in India, with special reference to the mode of responses and adaptations in social systems against the inherent low and erratic rainfall and resulting water stress in India during the pre-colonial period. Additionally, it investigates how colonial development destroyed social systems and discusses future development prospects. Part 2 discusses contemporary issues of agriculture and social change in India. A comprehensive examination of various important issues related to South Asian agricultural development in the past and in the present, this book will be a valuable reference for researchers of Asian development, sustainable development, environmental policy, South Asian Studies and Development Studies.

From an Elitist to an Egalitarian Paradigm

Water, Agriculture and the Environment in Spain: can we square the circle?

Taming the Anarchy

A Comparative Analysis of French and Australian Policies and Implications to Other Countries

Integrated Groundwater Management