

Preface

Water is vital to life but its availability, distribution, and quality has been dwindling over time with population increase, climate change, and emerging new demands driven by economic and population growth. A large area of the globe is water-stressed. The severity and gravity of this issue is even much greater when water, a common good, needs to be shared among riparian countries. The most famous transboundary river for its rich history and service for over 238 million people in the basin in 11 countries is The Nile. The role of The Nile in human history and civilization has been well documented. The upper section of the basin provides nearly all the water and the lower section of the basin with no contribution is the sole beneficiary. This status quo water use is being challenged by the upper basin countries, mainly Ethiopia as economic growth and population pressure forces for the increased use of water for various consumptive and nonconsumptive uses. The sole historical users of Nile water, Egypt and Sudan, would like to see their use of water unchallenged while many upstream basin countries strive to develop various sizes of water resources development projects.

On the supply end, various studies have shown that flows from tributaries and hence Blue Nile River, a source of 62% of the Nile flow, 82% with Sobat (Baro-Akobo) and Atbara (Tekeze-Setit), has been declining due to population pressure in hydrologically sensitive areas, headwater contraction, land degradation as well as changes in rainfall regimes (quantity, timing, and distribution). The decline in the supply and the ever increasing demand of water in the basin calls for a new formula for water sharing as well as a collaborative effort to enhance water supply through watershed protection and management. Although this necessitates a forum for basin countries to take the lead and address the critical water resources issues the basin is facing on both sides of the water budget, the role of scientific information and reliable data for guiding dialogues and discussion to provide tools for informed decision is critical.

The availability of data and scientific studies on various aspects of the basin is scant and limited mainly to the lower section of the basin. The focus and priority for water resources research, especially in the upper basin is very limited and this contributes to the limited knowledge and understanding about the hydrologic processes in the critical part of the basin.

This book, *Nile River Basin: Ecohydrological Challenges, Climate Change and Hydropolitics*, presents results of various scientific studies ranging from state of the hydrology of the basin to land and water degradation, climate change impacts, watershed services, and transboundary water management. Under seven parts: (I) Hydrology and Water Availability, (II) Soil Erosion and Water Quality, (III) Lakes and Watersheds, (IV) Climate Change and Water Resources, (V) Water Accessibility, Institutional Setup and Policy, (VI) Transboundary Rivers, Water Sharing and Hydropolitics and (VII) Watershed Services and Water Management, 33 chapters are presented. Studies on data needed for stream flow simulation, satellite rainfall reliability, monitoring of surface water using remote sensing, surface and groundwater resources, and environmental challenges of drastic land use and ownership change and conversion of hydrologically sensitive areas to large scale commercial farms in the basin are presented. Various experimental and modeling-based studies on soil erosion estimation, sediment dynamics and impacts of land use change and management, and hydro-epidemiology of the Nile basin are also presented. Satellite-based land disturbance index for biomass mapping, lake bathymetry, spatial evapotranspiration modeling using satellite data and rainfall erosivity index are also discussed. The impact of climate change on water availability, adaptation strategies to cope with climate change and the role of indigenous knowledge to adapt, climate teleconnections of flows in the Nile basin and water management is addressed. Local and basin wide water governance and institutional setup in the basin and management of rainwater for resiliency of dryland areas are presented. International laws and norms that are the basis of transboundary river agreements are presented. Transboundary river management and the need for negotiation and dialogues to avoid unnecessary water conflict are covered. The Grand Ethiopian Renaissance Dam basic design features and simulation on its downstream flow impact during the reservoir filling and operation periods are included. Stakeholders' and institutions' engagement, perception, and willingness for the implementation of payment for watershed services are also presented.

The book contains the works of several water resources experts from the Nile basin and other countries. The book, as shown above, covers a wide range of topics that are timely and can be used by students, educators, researchers, policy makers, water and environmental resources managers, and others.

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