HYDROLOGY AND WATER RESOURCES OF INDIA

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HYDROLOGY AND WATER RESOURCES OF INDIA

by

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Dedicated to
SKJ: My family, with respect and affection
PKA: My late father
VPS: Anita, Vinay and Arti

Saraswati saryuh sindhurmibhirma ho
maheervasa yantu vakshinih |
Devirapo matarah sudaytnavo
ghravatpayo madhumanno archat ||
Yajur Veda (X,64.9)

Water from wells, rivers, rain, and
from any other source on earth
should be used wisely as it is gift of nature,
for well-being of all.

PREFACE

India is truly a country of continental scale in every respect – topography, climate, culture, and of course water resources. Currently, India is one of the fastest growing economies of the world. Needless to say, the water sector has a crucial role to play in the social well-being and the quality of life.

The need for a book describing India's hydrological practices and water resources, problems in their exploitation, and prospects for their solution has long been felt. A book of somewhat similar nature was published more than three decades ago. During this intervening time a lot of changes have occurred in India not only in the practice of hydrological and water resources technology but also in the environment, society, landscape and land use, agricultural practices, and even climate. Thus, this book attempts to provide a more up-to-date account of water resources of India. It is aimed at students, practitioners, mangers, planners, administrators, and anyone who may be interested in the development and management of water resources in India.

The book is organized in four sections. The first section *Introduction* has one chapter, *Physical Environment of India*, which gives a broad overview of the country. The second section, *Hydrology and Hydrometeorology*, is comprised of five chapters dealing with the major components of the hydrologic cycle for India. *Water Budget and Population of India* are discussed in Chapter 2, followed by a discussion of *Rainfall and Analysis of Rainfall Data* in Chapter 3; *Evaporation and Other Meteorological Data* in Chapter 4; *Runoff and Streamflow* in Chapter 5; and *Groundwater* in Chapter 6. These chapters describe instruments and measurement techniques, and the techniques of analysis that are used in India in order to measure and analyze the components of the hydrologic cycle. Maps,

figures, and tables are extensively used to illustrate the quantities of concern and their spatial and temporal variations.

The third section, comprising 10 chapters, focuses on *River Basins of India.* Beginning with an overview of the various river basins and their water resources in Chapter 7 entitled '*River Basins of India*', it goes on to discuss individual basins or a group of basins. Chapter 8 discusses *Ganga Basin*; Chapter 9 *Brahmaputra Basin*; Chapter 10 *Indus Basin*; Chapter 11 *Narmada Basin*; Chapter 12 *Tapi, Sabarmati, and Mahi Basins*; Chapter 13 *Mahanadi, Subernarekha, and Brahamani Basins*; Chapter 14 *Krishna and Godavari Basins*; Chapter 15 *Cauvery and Pennar Basins*; and Chapter 16 *Other Basins and Islands.*

The fourth section entitled *Water Uses, Projects, Problems and Governance* is the final section of the book and is comprised of 8 chapters. Chapter 17 describes the *Major Uses of Water* in India. It discusses at length the water uses for irrigation, hydropower, municipal and industrial uses, environment flow, recreation, navigation, etc. *Problems Related to Water Resources* form the subject matter of Chapter 18, followed by Chapter 19 on *Reservoirs and Lakes* in India, and Chapter 20 on *Water Quality Related Aspects.* A practitioner should also be conversant with legal aspects and this perspective is presented in Chapter 21 entitled *Constitutional Provisions, Inter-state Water Disputes and Treaties. Inter Basin Water Transfer* is becoming a major initiative in India these days in order to overcome problems due to spatial and temporal mismatch between water availability and demands. A detailed description of the present proposals being debated in India and other related aspects are presented in Chapter 22. A brief discussion of the *Institutions in the Field of Hydrology and Water Resources* in India forms the subject matter of the Chapter 23. The final Chapter 24 is devoted to *Water Governance* in India.

Water Resources of India is a vast subject and despite this voluminous book, several aspects could not be covered here. We hope that the book will be helpful to those who have interest in the water resources of India. For this book, data was compiled from a very large number of sources and at times data from different sources were quite different. We have attempted to present a consistent and the most likely status of things. It is, however, likely that there are some mistakes in the book and we request the alert readers to bring these to our notice.

Sharad Jain
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April 2006
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SKJ, PKA, VPS

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The facts and opinions expressed in this work are those of the authors and not necessarily of their respective organizations.

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