

WATER

Resource Augmentation, Management & Policies



H. Sarvothaman



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*This book is dedicated to
those people of my country,
who genuinely cannot afford to
buy the water to drink.*





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FOREWORD

The richest possession that a country can boast of in the twenty-first century is its replenishable water resources. A sizable population of India has attained this awareness in the beginning of this century, if not a few years earlier, on account of the extreme dry weather during prolonged summers and weak monsoons in that period. A few other countries that are not fortunate enough to have adequate replenishable source of water have been gradually resorting to the mechanical means to augment their water wealth. These countries reap the dual benefit of generating adequate water for their needs and demonstrating their technological capabilities. The economic growth achieved by such countries by augmenting the water resources is so stupendous that other countries attempt to emulate them. Now it is India's turn to do so.

In the Indian scenario, a sharp divide exists between those States, which have abundant water resources and those that do not possess adequate water to meet the demands. The attempts to transfer the surplus water from a State to the water-deficient States are fraught with the geographic and socio-political constraints. Weak monsoons and truant rainfall make their own contribution to the constraints. Despite all these constraints, we need to tide over the water crises year after year and provide water to our people and their activities such as housing, agriculture and industries, besides bacteria-free drinking water.

Water resources are national wealth and every citizen has an equal right on it. The efforts to empower this right to its citizens and the management of water resources are already proving to be major issues to the governments. The water supply authorities and numerous other organizations set up both by the Central and the State Governments to look after the equitable water distribution to various segments of the human activities such as irrigation and industries are grappled with the problem of water inadequacy. The

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deficit mounts year after year on account of consistent overdraft of water vis-à-vis insufficient replenishment; the gap between the two widens in the event of the passage of each year of deficit rainfall. The Indian experience in terms of the management of water resources demonstrates that water-equity is difficult for various reasons, the main reason being insufficient annual accretion to the water resources due to the vagaries of the Nature. Should we learn from the experience, our prudence lies in augmentation of our water resources using technological means.

Treatment of hard water to potable levels, wastewater treatment to recycle the municipal and industrial wastewater, and desalting of seawater are proven technologies in augmenting the water resources. The recyclable treated wastewater is an ideal substitute in those human activities in which the quality of water is not critical. Wastewater treatment plants ensure not only addition of usable water for supporting human activities, but also flow of clean influent water into the inland water bodies, thus preserving the sanctity our rivers and lakes. Besides, few desalination plants on the east coast of India would ease the stress on the availability of water in the coastal cities that are plagued by water scarcity and ingression of seawater in the coastal aquifers. This book logically discusses these implications and offers a food for thought to all those concerned in the water resource management in the country.

The author has extensively traveled all over the country to collect the ground truth on the water resources and gather original inputs for this book. The management practices in respect of water resources as discussed in this book are bound to make tremendous impact, though it would need initial investments. The country, of course, is not starved of funds for crucial matters such as water resource augmentation. There is no dearth of talents either in India to invent, innovate and install the facilities for water resource augmentation techniques such as the municipal wastewater plants, filtration plants and membrane-based reverse-osmosis plants to desalinate the seawater. What we need are committed entrepreneurs, civil and mechanical engineers and a large labour force evenly distributed in the whole country to carry out the mission. Above all, it is the will of those who matter that matters most. It is hoped this book will give that spark that is necessary to ignite the thoughts into action in respect of the augmentation and management of the country's water resources.



(E. Badagurusamy)

PREFACE

A nation's water resource is the richest wealth it can be proud of, apart from its heritage, language and culture. The distribution of this wealth in different parts of the Planet Earth is skewed and unequal. Some terrain segments are entirely deprived of water for various reasons. The paucity of the water wealth has affected roughly half of the world population one way or other. This population devotes considerable time and efforts daily to carry water to their homes from long distances. As if it is not enough, the very same water that they bring home after so much of labour often inflicts a host of diseases such as diarrhoea, gastroenteritis, worm infestation and fluorosis to them and their offspring, because they collect this water from a source that is neither protected nor treated. Sometimes that water gets infected during storage. There is no precise current estimate on how many people world over perish daily due to the non-availability of protected water and water-linked infections, but a 1992 statistics say that as much as 25,000 children alone die every day due to water-borne diseases. This rate of mortality is growing with each passing year, and reports of water-related mortality are coming in from those countries where they were not reported earlier. Such statistics and bare facts are indeed depressing, and are the root cause for this book.

I had no idea of water scarcity in my early phase of life. I realized that the water scarcity was a reality as late as around 1970 through the print medium, as there were reports that several districts in Tamil Nadu (such as Ramnathapuram and Tirunelveli) and Rajasthan's desert districts faced water crisis. Between the years 1976 and 1985, I had the privilege of ferrying across the mighty Brahmaputra River several times at different places in the post-monsoon period. I was awe-struck by the vastness of the Brahmaputra River near Guwahati, Tezpur and Dibrugarh. I wishfully thought that if there were one such river in every State of India, there would not be water

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scarcity in the whole country, and that its water would immensely benefit many of our cities and towns. In December 2002, in a scientific meet held at Hyderabad on the theme of Remote Sensing, a young remote-sensing scientist based at Guwahati had told me that he was keen to learn remote-sensing techniques in sustainable development of water resource, as he was trying to find solutions to augment water resources in and around Guwahati. He said that several areas in Guwahati face water scarcity at regular frequency in recent times. The information about the scarcity of water in Guwahati, which is situated right at the left bank of mighty Brahmaputra River, stunned me.

In the early-1990s, the World Bank functionaries have observed that if the Indian government did not formulate a sensible Water Policy and also take concrete steps to conserve and develop water resources, India might have to face serious problems in economic slow down and downward trends in the agriculture and industry sectors. Ironically, after a decade, this statement has relevance not only to India, but to the whole world as well. There are instances in many parts of the world, including India, that despite availability of sufficient water and also there is scope to generate potable and/or recyclable water by mechanical means, major population in these countries faces extreme water deficiency. With prudent management of the available water resources and transfer of technologies to the society-related causes and to find practical solutions to augment water resources, such hardships to the masses of the population can be effectively mitigated. This precisely is the central theme of this book.

Dr. A.P.J. Abdul Kalam, the Honourable President of India mentions in his book 'INDIA 2020 A Vision for the New Millennium' that India '*should concentrate on development of key areas, namely agriculture production, food processing, materials and also on the emerging niche areas like computer software, biotechnologies...*'. These should currently be the thrust sectors in the country's activity, which would bring major transformation in Indian economy as also give an impetus to the economy to compete at global levels. Success in two prime sectors identified by Dr. Abdul Kalam, namely Agricultural Production and Food Processing, depends primarily on the availability of large quantities of good quality water. Whereas agriculture in most of the lands is rainfed, the water received from the monsoon source will have to be allocated for irrigation, in which case, the monsoon source water will be scarce for use in other human activities and industry-oriented purposes. The sustainable alternative to augment the water resources is to bank on technologies and start making small but continuous investments annually, both in terms of finances and human resources, in the technological means to water resource augmentation. This exercise should go on at least

till 2025, even while we attempt prudent management of the annually replenishable water resources.

If the summer of 2002 in India was bad in terms of availability of water for daily needs of the people and for agriculture, the summer that succeeded was even worse. Those in the governments, the technologists, entrepreneurs, engineers, policy-makers, agriculturists and general public hoped during those two summers that the monsoon rains would bring plenty of rains and prosperity. Unfortunately, not much groundwork has even been initiated in the country to employ water augmentation technologies in those two difficult years, despite deficient rainfall in many terrain segments of the country. An Austrian mining consultant incredulously asked me in 1988: *"Water scarcity in India? In spite of long sea coasts?"* During the summer of 2003, these questions kept haunting me repeatedly, and gave me the spark to write this book.

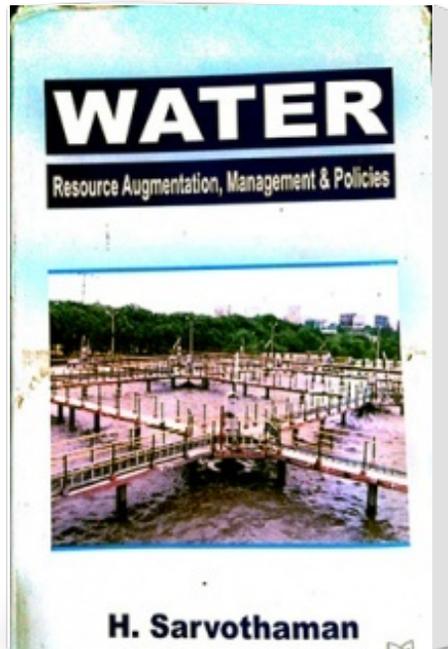
The processes and technologies that are mentioned in this book are not new. Then, why is this book? Volumes of details are entrenched in literature, giving even the minute information on various technologies, their comparative advantages, plant dimension and so on. Such information is in bits and pieces, and probably, is not available in one single bunch. This book attempts achieve that objective by offering overviews of those technologies. At the same time, this book does not answer all aspects on the technologies highlighted. It is recommended that the readers may gain additional insights into the highlighted processes by directly referring to the quoted references.

Our educational institutions train few hundred thousands of technologists and engineers each year with the hope that they would make innovations in various technologies. Currently, the thrust is on the technologies related to Water Resource Augmentation. Through this book, I draw the attention of civil and mechanical engineers to invent, to innovate the designs to suit Indian conditions and affordability, and to install various water technology plants mentioned in this book. I urge all those in the governments to draw sustainable policies, both in terms of augmentation and management of water wealth. The entrepreneurs and investors too can benefit if they recognize water-augmentation technologies and plants as potential new system of wealth creation, both in terms of water resource, and the wealth that can be ploughed back into the country's economy, through the newly generated water resources. I emphasize that every citizen of a country has something to offer to the management of water resources, because management originates at an individual or grass-root level.

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