SPRINGER BRIEFS IN WATER SCIENCE AND TECHNOLOGY

Yiping Li · Lixiao Ni · Yong Guo · Xu Zhao · Yue Dong · Yu Cheng

Paths to Clean Water Under Rapid Changing Environment in China

Science Press Beijing

Springer

SpringerBriefs in Water Science and Technology

SpringerBriefs in Water Science and Technology present concise summaries of cutting-edge research and practical applications. The series focuses on interdisciplinary research bridging between science, engineering applications and management aspects of water. Featuring compact volumes of 50 to 125 pages (approx. 20,000–70,000 words), the series covers a wide range of content from professional to academic such as:

- Literature reviews
- In-depth case studies
- Bridges between new research results
- Snapshots of hot and/or emerging topics

Topics covered are for example the movement, distribution and quality of freshwater; water resources; the quality and pollution of water and its influence on health; and the water industry including drinking water, wastewater, and desalination services and technologies.

Both solicited and unsolicited manuscripts are considered for publication in this series.

Yiping Li · Lixiao Ni · Yong Guo · Xu Zhao ·
Yue Dong · Yu Cheng

Paths to Clean Water Under Rapid Changing Environment in China

Science Press
Beijing

Springer

Yiping Li
Key Laboratory of Integrated Regulation and Resource Development on Shallow Lake of Ministry of Education
College of Environment
Hohai University
Nanjing, China

Lixiao Ni
Key Laboratory of Integrated Regulation and Resource Development on Shallow Lake of Ministry of Education
College of Environment
Hohai University
Nanjing, China

Yong Guo
Key Laboratory of Integrated Regulation and Resource Development on Shallow Lake of Ministry of Education
College of Environment
Hohai University
Nanjing, China

Xu Zhao
Key Laboratory of Integrated Regulation and Resource Development on Shallow Lake of Ministry of Education
College of Environment
Hohai University
Nanjing, China

Yue Dong
Key Laboratory of Integrated Regulation and Resource Development on Shallow Lake of Ministry of Education
College of Environment
Hohai University
Nanjing, China

Yu Cheng
Key Laboratory of Integrated Regulation and Resource Development on Shallow Lake of Ministry of Education
College of Environment
Hohai University
Nanjing, China

ISSN 2194-7244 ISSN 2194-7252 (electronic)
SpringerBriefs in Water Science and Technology
ISBN 978-981-19-0090-7 ISBN 978-981-19-0091-4 (eBook)
https://doi.org/10.1007/978-981-19-0091-4

Jointly published with Science Press
The print edition is not for sale in China (Mainland). Customers from China (Mainland) please order the print book from: Science Press.

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Introduction

Understanding the nature of China's water resources, distribution, and the extent of pollution is the most certain way to adopt the best strategies for addressing the problems of achieving clean water in a rapidly changing environment. This necessitates a systematic classification of the country's water resources as well as a thorough assessment of the various types of pollution that exist. As a result, bringing together the major stakeholders to consider the overall interest of the country and the best approach is critical. Although different countries may have used different methods to address their water pollution issues, China must conduct a needs assessment and develop its own strategy to address its unique and peculiar challenges.

China has recently made significant strides toward achieving clean water through a collaborative effort by its government and citizens. These commitments are reflected in the strict policies and regulations, as well as their observance. The country has used advanced technologies and exploited problems to create opportunities for innovative programs such as sponge city project, development of public and private partnerships and the expansion of local business.

Contents

Chapter 1
Current Situation of Water Pollution in China

In this book we provide an overview of water resources and water pollution in China. We describe the basic situation of lakes (reservoirs), rivers, groundwater and marine water in China, including the numbers, the sizes, and distributions, etc. On this basis, we summarize the pollution status of the corresponding water bodies. This can provide a background information for the following chapters.

1.1 Overview of Water Resources in China

Freshwater resources in China is 2.8 trillion m^3, 6% of the global total, ranking the sixth in the world, second to Brazil, Russia, Canada, USA and Indonesia [1]. However, China's per capita water resources only records 2,100 m^3, 28% of the world average (Fig. 1.1), making China one of the most water scarce countries in the world.

China's water resources are unevenly distributed in time and space, and experience substantial intra-annual and inter-annual variations. Precipitation in the flood season accounts for 60–80% of the annual total, which makes China very prone to spring draughts, summer floods and continuous flooding and draught. Moreover, the distribution of water resources doesn't match the layout of land resources and productive forces. Whereas North China takes up 63.5% of the total national land area and 46% of the total population but only 19% of the national water resources [2].

China suffers from severe pollution of water bodies: According to the latest *China Water Resource Bulletin*, rivers with a combined length of 245,000 km nationwide were monitored and assessed for their water quality. The findings indicated that in terms of water quality, 78.5% of the total river length met Grade I–III water quality standard, and 8.3%were in categories inferior to Grade V. Compared with the last year, water function zones achieved a better water quality with the rate of Grade

Y. Li et al., *Paths to Clean Water under Rapid Changing Environment in China*,
SpringerBriefs in Water Science and Technology,
https://doi.org/10.1007/978-981-19-0091-4_1

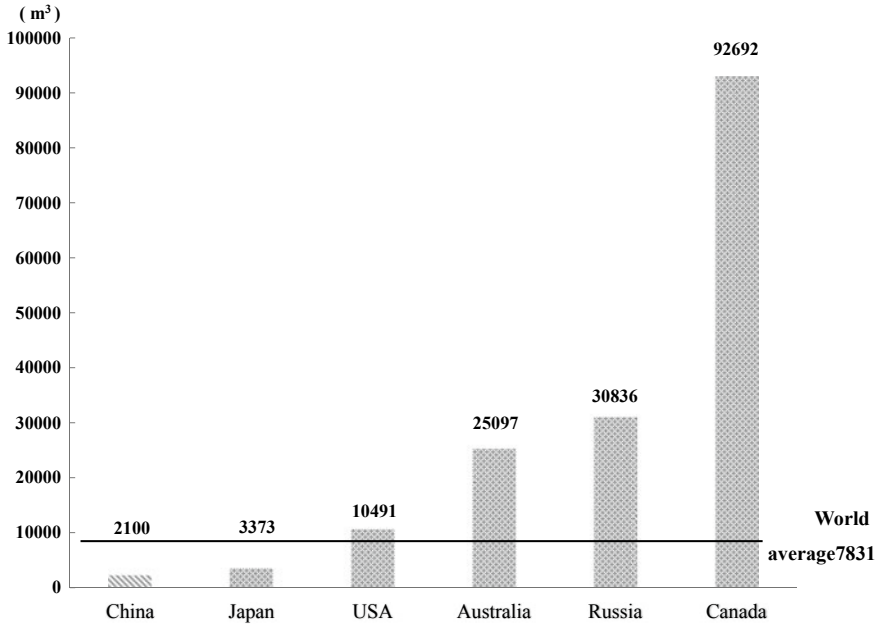

Fig. 1.1 Per capita water resources in China versus that of some other countries and the world average

I–III water quality standard up by2.1% of the total assessed sections and the rate of inferior to Grade V water quality standard down by 1.5% [3].

1.1.1 Lakes (Reservoirs)

China is rich in lakes. There are 2,865lakes that hold more than 1 km^2 of water area all year round and add up to 78,000 km^2 water surface area (excluding the parts of transboundary lakes outside the border of China) (Table 1.1). Among these lakes, 1,594 are freshwater lakes, 945 saltwater lakes, 166 salt lakes and 160 others. Boyang Lake, Dongting Lake, Taihu Lake, Hongze Lake and Chao Lake are the five most famous fresh water lakes in China, whereas Qinghai Lake is the largest salt water lake in the country. Inter-annual water storage of lakes is in a dynamic state. By the end of 2017,statistics carried out by the *China Water Resource Bulletin* on 56 lakes indicated that the total water storage was 136.10 billion m^3, which was 250 million m^3 more than thatin early 2017 [3]. Among them, the storage capacity of Qinghai Lake increased by 1.63 billion m^3; the storage of Taihu Lake and Hongze Lake is reduced by 530 million m^3 and 450 million m^3 respectively.

According to the *Bulletin of First National Census for Water,* the number of reservoirs in China added up to 98,002, with a combined storage capacity of 932.312