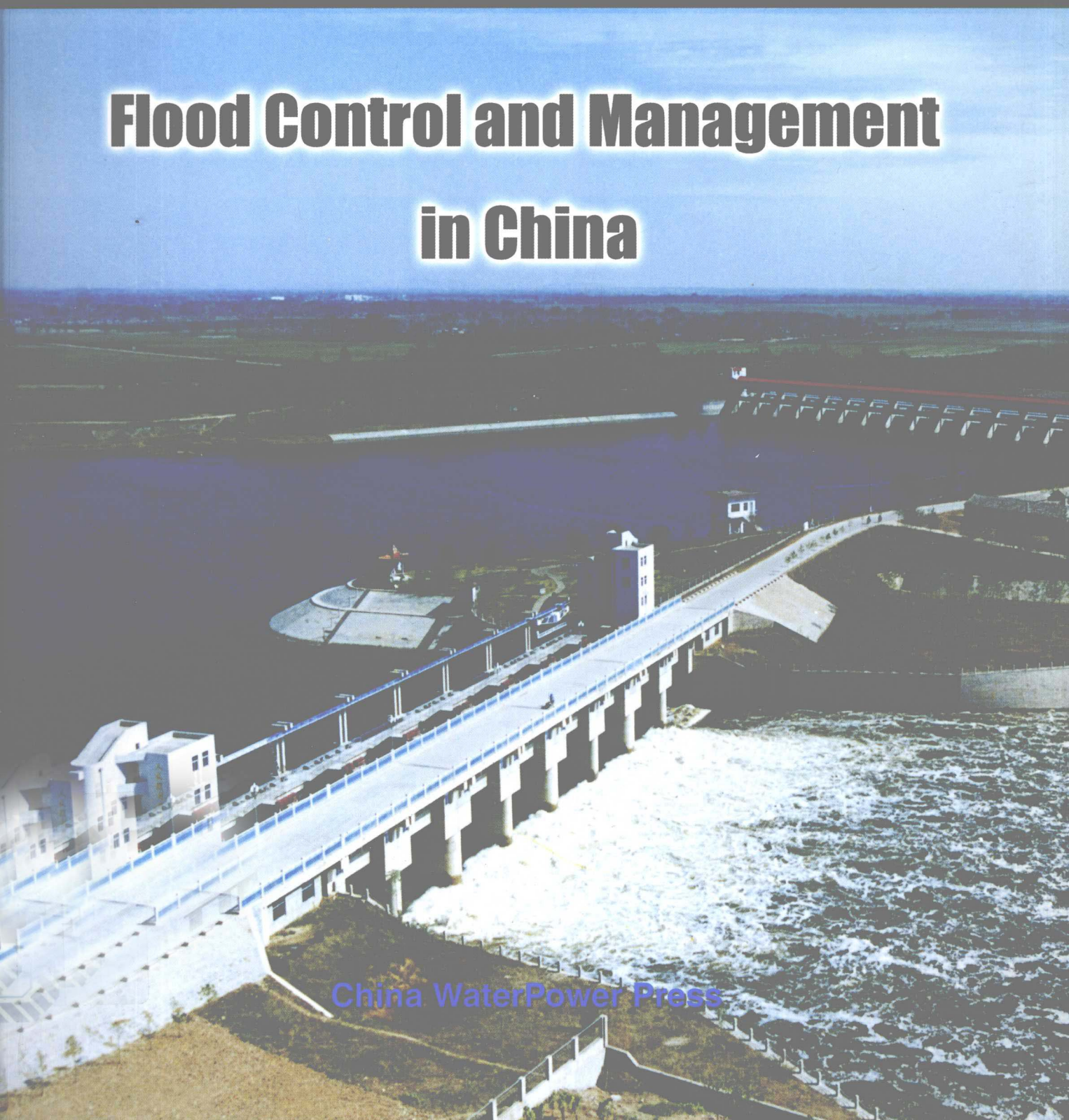
Chinese National Committee on Irrigation and Drainage

(CNCID)

Flood Control and Management in China



China WaterPower Press

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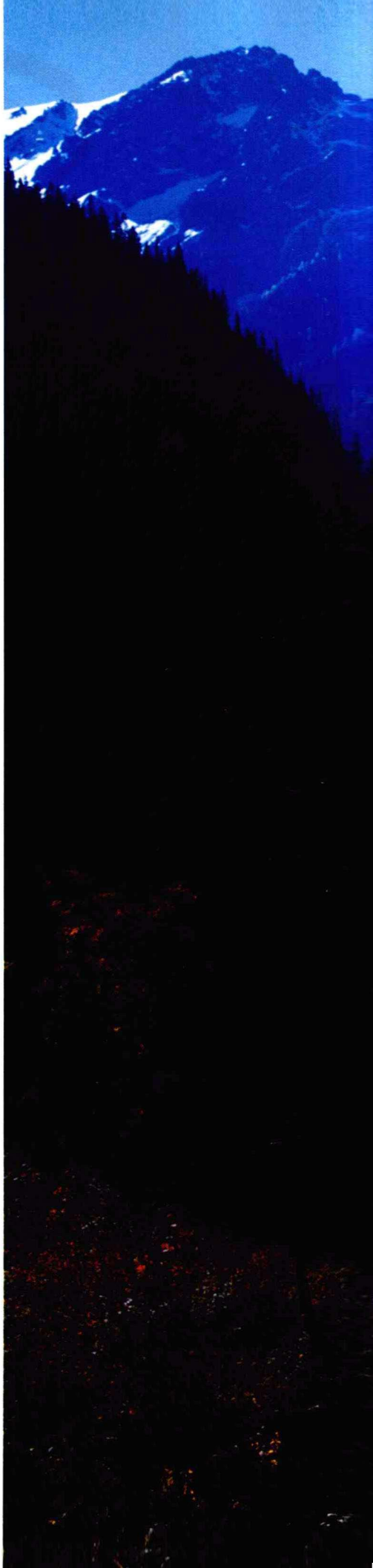
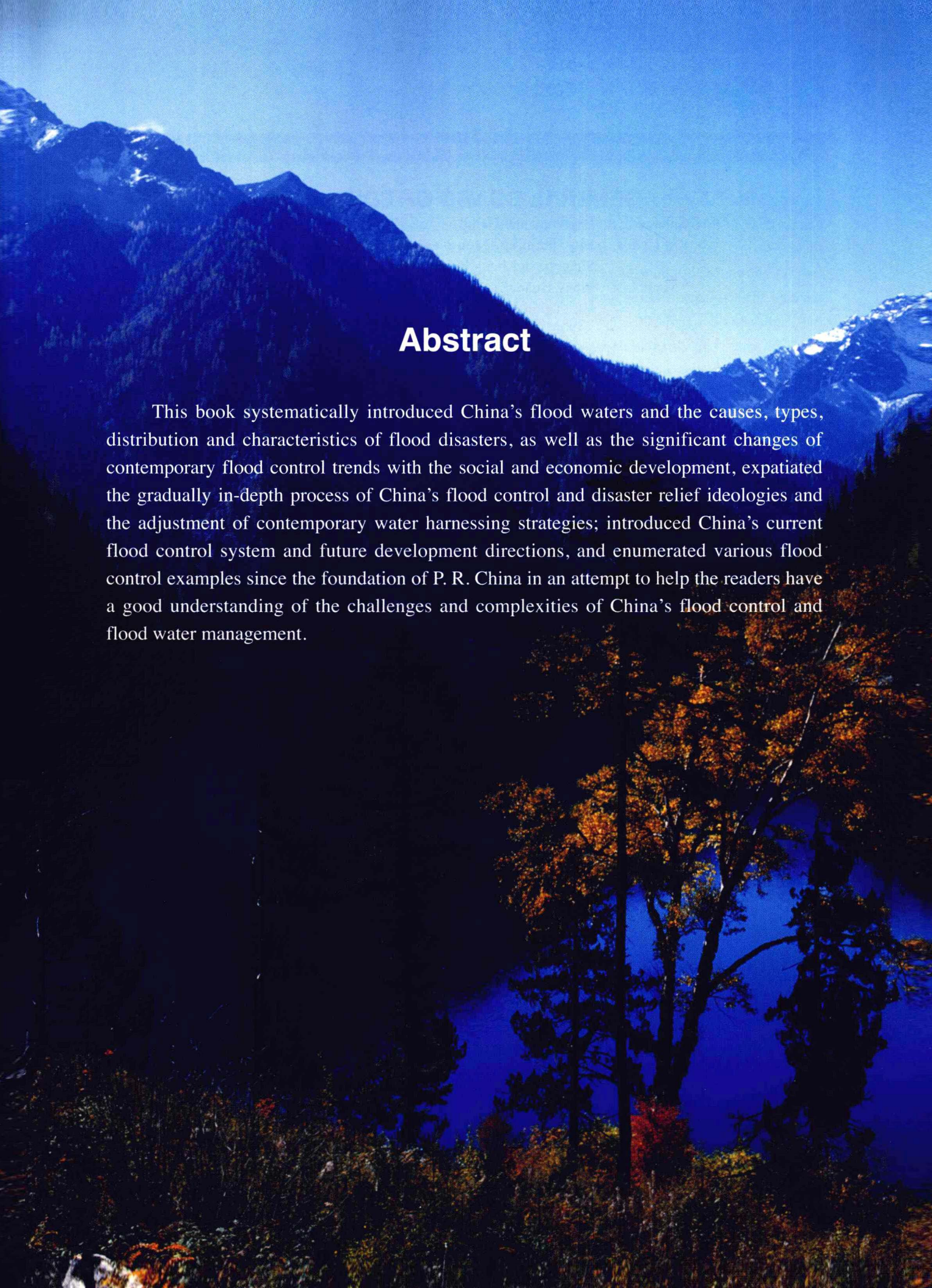




Abstract

This book systematically introduced China's flood waters and the causes, types, distribution and characteristics of flood disasters, as well as the significant changes of contemporary flood control trends with the social and economic development, expatiated the gradually in-depth process of China's flood control and disaster relief ideologies and the adjustment of contemporary water harnessing strategies; introduced China's current flood control system and future development directions, and enumerated various flood control examples since the foundation of P. R. China in an attempt to help the readers have a good understanding of the challenges and complexities of China's flood control and flood water management.

PREFACE

China is among the countries in most severe shortage of water resources with per capita water resources being no more than 2,220 cubic/meters. Although a climate featuring simultaneous arrival of rainfall and heat creates favorable conditions for agricultural development, China has always suffered from frequent floods and draughts due to concentration of precipitation, uneven temporal and spatial distribution of water resources plus non-matching between population, arable land and water resources.Historical records indicate that during the 2,155 years from 206 BC to AD 1949, China was caught in 1,092 major floods and 1,056 severe draughts. Particular national conditions determine the extremely important role and status of flood control, irrigation and drainage in Chinese socioeconomic development and eco-environmental protection.

China has a long history of water training. Da Yu's Water Training is a legend handed down for more than 4,000 years. 2,200 years ago, Li Bing and his son built Dujiang Weir enabling the Chengdu Plain to become "a land of plenty" where "floods and draught are subject to human will and hunger unknown". Thanks to effective maintenance through the ages, Dujiang Weir still yields huge returns and is known to the world as a cultural heritage.

The Chinese government attaches high attention to water conservancy. Regarding water resources as an important strategic resource for sustainable development of China, the government has adopted a series of policies and measures to promote the development of flood control, irrigation and drainage in China. Over the past five decades, China has completed 278,000 kilometers river dikes and 85,000 reservoirs, bringing regular floods along major rivers under preliminary control. For the same period, China has expanded the area of irrigated farmland from 1,500 hectares to 5,600 hectare with annual grain and cash-crop outputs from such farmland reaching 3/4 and 90% respectively of national aggregates. It is such enormous achievements of irrigation and drainage that have enabled China to feed and clothe 22% of the world population with 6% of the world's renewable water resources and 9% of the world's arable land and has safeguarded agricultural production, grain security and stable socioeconomic development in China.

From a long-term perspective, shortage of water remains a serious constraint to Chinese agricultural development. Floods and draughts in China still exhibit an intensifying trend while decline in grain output as a result of such disasters takes up 8% of national grain output during the same period. Growth in urban and industrial water consumption plus severe water pollution intensifies shortage of water for irrigation purpose. The challenges are overwhelming. Our efforts exerted over the recent years in line with requirements of

sustainable development and the concrete achievements thereof, however, have built up our confidence. We believe that so long as we uphold the scientific development concept, insist upon harmonious coexistence between humans and nature, persevere with the principles of comprehensive planning, overall consideration, addressing problems from both the root causes and symptoms and implementing integrated control, and vigorously promote the construction of a water-saving society, we are sure to produce effective solutions to the Chinese issues of water resources, guarantee water-supply security, flood-control security, grain security, and eco-environmental security in China and realize coordinated development of water resources, the economy, the society and the environment.

To help more people understand the history, experiences, achievements and challenges of flood control, irrigation and drainage in China, the Chinese National Committee on Irrigation and Drainage (CNCID) has compiled and published the Chinese and English versions of the collection of books including *Irrigation and Drainage in China, Flood Control and Management in China, and History of Irrigation and Flood Control in China* on the occasion of convening the 19th International Congress on Irrigation and Drainage and the 56th IEC Meeting of the International Commission on Irrigation and Drainage (ICID) in Beijing. The collection reflects the rich connotation and development process of Chinese water conservancy from a variety of perspectives. I am confident that publication of the collection will not only help Chinese readers gain an understanding of water conservancy in China but also bridge China and the world by playing its due role in promoting exchanges and cooperation between China and other countries of the world in the field of water conservancy.

Wang Shucheng

August 2005

FORWORD

Water governance, flood control in particular, is an age-old subject in China. As early as in the pre-Qin period, some 2,500 years ago, our ancestors had realized that, according to *The Book of Guan Zi*, "those who are wise enough to govern the state must be capable of removing 'five evils' before anything else. Flooding is one of them, drought is another, and bad weather (storm, fog, hailstone, frost, etc.) is still another. Plague is the fourth and fire is the fifth. Among these five evils, flooding tops all of them."

This understanding indicates that, under the special geographic and climatic conditions of the country, flooding has been a natural disaster greatly threatening the survival and development of the Chinese nation since ancient times. It also implies that, on the one hand, control of water-related disasters is a duty that the statesmen must fulfill; on the other hand, it is also a touchstone of wise governance whether the governors will give water control top priority or not.

With a vast territory, China is located in the east of Eurasia, the biggest continent in the world, facing the largest ocean — the Pacific Ocean. In the west of the country stands Mt. Qomolangma (Everest), the highest mountain on the earth, or the "roof of the world." The physical and energy interactions between the ocean, land and atmosphere have formed the changeable geology and climate, which in turn form complex circumstances inductive to flooding, waterlogging, tidal surge or mudflow.

Influenced by monsoon and tropical cyclones, precipitation in eastern and central China is quite uneven in terms of time and space, with high density of rainstorms. As the country is covered by almost all the climatic zones from south to north — tropical, sub-tropical, warm temperate and temperate, the characteristics of precipitation and floods of the major river basins vary distinctively from region to region.

The terrain of China, descending gradually from west to east, presents itself as tablelands in

three levels. It gives birth to numerous rivers flowing eastward to the sea; among them the Yangtze River, Yellow River, Huaihe River, Haihe River, Pearl River, Liaohe River, Songhuajiang River, etc. are the most famous ones. There are also a number of middle and small rivers flowing directly to the sea in the southeastern coastal region. Vast alluvial plains are formed at the middle and lower reaches of the rivers, and at the upper streams, valley plains and basins are the main landforms.

China has a large population, distributed mainly in the alluvial plains and valleys of major rivers. These locations, often used for flood water discharge or retention, are where mankind and water contend for land since time of old. The area under flood threat is only 11.2% of China's total land, but 66% of the population and 80% of the assets of the country are concentrated in these regions. It is therefore a fundamental requirement for the survival and development of the Chinese nation to remove water-related disasters and generate benefits out of water. Flood control and disaster mitigation are an important undertaking for safeguarding the life and property of the people and securing social stability and sustainable development.

A river basin is a geographical unit formed by the catchment of the main stream and tributaries of a river system. As large rivers flow across a lot of administrative regions, and competing interests related to water between the upper and lower reaches, between the left bank and the right bank, between the main stream and the tributaries, and between urban and rural areas have existed for a long time, the concept of overall planning, coordination, taking measures specific to local conditions and integrated management took shape at a quite early date in China. It is also interesting to note that, in history, while the Yellow River was frequently hit by flooding, but the most affected were the Haihe River and Huaihe River basins. The "great river culture", formed by the commonality and peculiarity of the nation's rivers, has exerted profound impacts on the maintenance of the central authority and social and economic development. It has also fostered the national awareness of being prepared for any eventualities and the fine tradition of "when

disaster strikes, help comes from all sides."

"Those who govern the state must first control water." From the efforts to fight the flood pioneered by Da Yu, which opened up the history of the Chinese nation, to the large scale construction of modernized flood control works and systems in the People's Republic of China, numerous heroic and courageous deeds of fighting water disasters have been recorded and will go down as glorious pages in the annals of Chinese history.

Over the past half century since the founding of the People's Republic of China, flood control engineering systems have been established for all major river basins, with reservoirs, dikes and flood detention and storage basins as main structures. More than 270,000 kilometers of dikes up to different standards have been built, renovated or reinforced, and over 10,000 kilometers of seawalls have been built, protecting more than 400 million people and 340 million *mu** (23 million hectares) of cultivated land — about one-third of the country's total, from flooding threat. About 85,000 reservoirs have been built, with a total water storage of 518.4 billion cubic meters. Among these, 397 are large-sized reservoirs, with a storage capacity of 326.7 billion cubic meters. Ninety-seven flood detention and storage basins have been opened up on the Yangtze, Yellow, Huai, Hai and other major rivers, with a total area of 30,000 square kilometers and a retention capacity of 97.07 billion cubic meters, which can effectively protect the safety of the prime locations along the middle and lower reaches. Efforts have been made in dredging and harnessing all the major river systems and expanding the seaward outlet of the Huaihe River and Haihe River to the sea. Protective embankments for some cities and low-lying areas in southern China have been rebuilt or renovated, and drainage facilities of 41,570 kW have been installed extensively in those areas, greatly lifting the capacity of waterlogging removal. Some 700,000 square kilometers of eroded land has been brought under preliminary control, reducing sediment into rivers. It can be said that China has basically established the engineering system of flood control and waterlogging removal for large rivers and lakes over the past 50 years, which is a guarantee for national economic

* 1 mu=0.0667 hectares

development, for people to live and work in peace and contentment, for maintaining social stability and for improving the ecology and environment.

In the meantime, China has also made remarkable progress in institutional development for flood control planning, project examination and approval, design, construction, management, etc. Relevant systems for education and scientific research have also been established. With respect to non-structural measures, the chief executives of people's governments at all levels are required to assume main responsibilities for flood control, and a series of laws and regulations, including the Water Law, the Flood Control Law, Regulations on Flood Control, Regulations on River Channel Management, Regulations on Dam Safety Management, Guidelines on the Safety and Construction of Flood Detention and Storage Basins, Preparedness Plans for Severe Flooding on Major Rivers, and Provisional Rules on Compensation for the Use of Flood Storage and Detention Basins, have been formulated. Governments at all levels have reserved special funds for flood control. A national hydrological monitoring and forecasting system has been established. In fighting a flood, specialized teams work together with the masses of people; servicemen work together with civilians. Specialized task forces are in place for rescue and reconstruction purposes. The flood control system of China has played a tremendous role in minimizing losses incurred by all severe floodings.

In 1998, extraordinary floods occurred in the Yangtze River, Nenjiang River-Songhuajiang River, Minjiang River, and the Xijiang River of the Pearl River system. In the wake of that severe flooding, flood control system development reached a new height in China. Governments at all levels increased manyfold their capital input to water control. People in this country have started to probe into the issue of flood control and disaster mitigation from a broader perspective, in relation to society, economy, ecology, environment, population, resources and land security, etc.

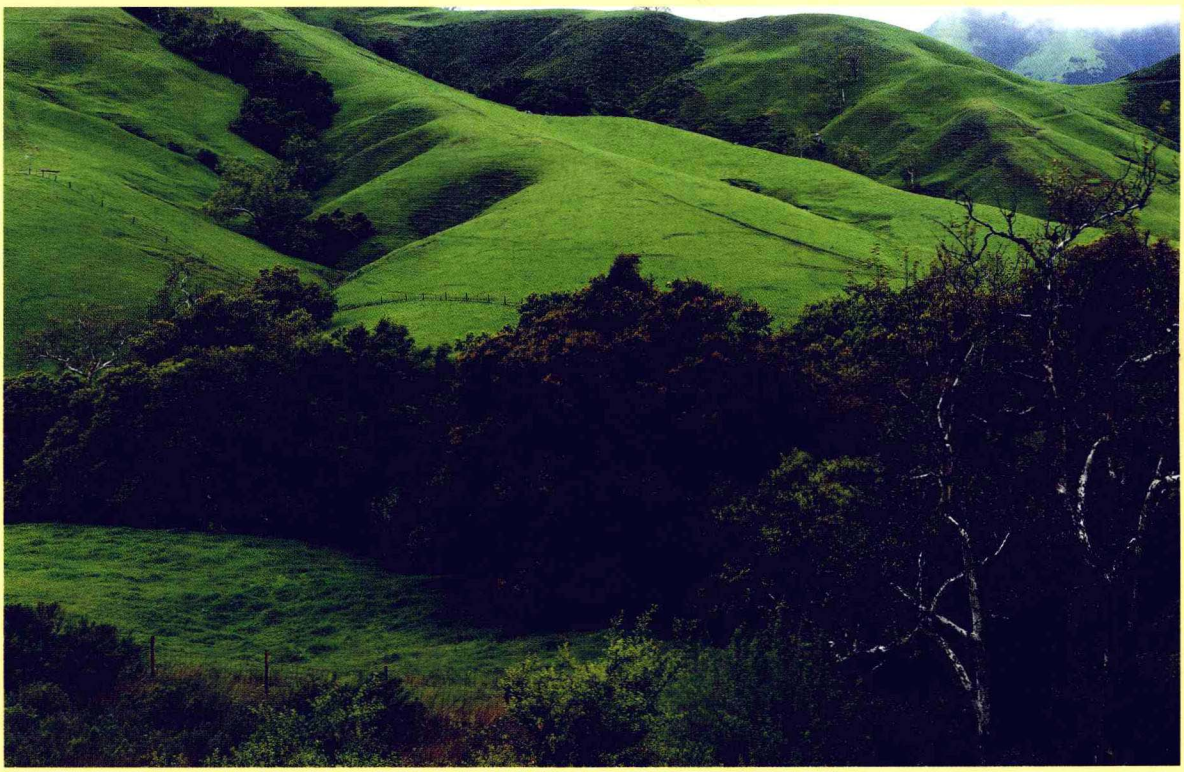
This book gives an introduction to the characteristics of China's floods and flood disasters,

together with the development of modern institution and system for flood control and management. It also presents case studies of several severe floodings occurred after the founding of the People's Republic of China. We sincerely hope that the book could help our readers better understand the flood situation of China and its experience in flood control and water governance.

The Editors

December 2004

Beijing



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