Introduction

A Flow of Water and Power

In 1996, along the Yangtze River in Zigui 秭归, Hubei Province, the villagers of Guilin were in the middle of packing their belongings. Their friends and relatives were helping them to remove tiles, doors, and windows from the soon to be deluged homes. Down the hill, people were loading farm tools, furniture, and other essentials onto boats anchored along the river's banks. Amid the din of firecrackers and farewells from their fellow villagers, the first group of Three Gorges migrants set off for their government-designated places of resettlement. Because of the low-altitude location of their residence, Zhang Bing'ai 张秉爱, together with her disabled husband, and two children, were supposed to be part of the first group of migrants. For years, thanks to the help of her maternal family, Bing'ai had been able to cope with the burdensome farm work during busy seasons. Therefore, she insisted on staying for "moving up" resettlement, requesting a flat area for residential use at a higher altitude above the state designated displacement line, which was at odds with the government's resettlement policy. "I am just attached to this land. With land, you can have everything." Bing'ai refused to cooperate with the government's resettlement plan, but it was to no avail. Her home, along with what remained of those of her fellow villagers, was soon underwater. Her family ended up living in a temporary hut not far from the rising water.[1]

Among the millions of reservoir migrants in China, Bing'ai's struggle was not rare. Her attachment to the land and bond with her relatives were

[1] Feng Yan 冯艳, (dir.), *Bing'Ai* 秉爱(Beijing: Beisen Films, 2007), DVD.

authentic and could be understood intuitively without much infiltration of state rhetoric. A simple yet fundamental question arises: Why did her family have to be displaced? The answer seems obvious; it was for the construction of the Three Gorges Dam. But why did a dam need to be built on the river at the cost of millions of people's homes and livelihoods? Who should be held accountable for Bing'ai and her family's difficult situation? The Three Gorges Dam and its story of displacement are not the focus of this book, yet it serves as a starting point to trace the historical origin of Bing'ai's struggle and that of many others. This book aims to address these questions from a historical perspective by examining the entangled relationships among human beings, nature, hydropower technology, and political change in modern China.

WATER HISTORY

For as long as humans have existed, rivers have been intricately woven into the fabric of the Earth's complex ecosystems. As vital components of the hydrological system, these waterways have sustained a great diversity of flora and fauna and played a crucial role in the formation of alluvial plains and deltas. Rivers have been sources of immense generosity to humanity, providing us with drinkable water, fish (a valuable source of protein), and other essential nutrients. However, these same rivers can also pose a threat to human societies. The widespread adoption of agriculture and sedentary lifestyles in low-lying areas has made populations vulnerable to the unpredictable forces of flooding during rainy seasons. In response, communities have organized to build dikes and to dig irrigation channels to protect themselves and to ensure the preservation of their prosperity.[2]

According to the first national water census released in 2011, China has 45,203 rivers with catchment areas larger than 50 square kilometers. A total of 268,476 sluices and 413,679 kilometers of embankments have been built to regulate the flow of water, and the country operates 46,758 hydropower stations with a combined installed capacity of 333 million kilowatts (kW).[3] Over a long period, the natural river system has been

[2] Chris Courtney, *The Nature of Disaster in China: The 1931 Yangzi River Flood* (Cambridge: Cambridge University Press, 2018).

[3] Zhonghua renmin gongheguo shuilibu 中华人民共和国水利部, Guojia tongjiju 国家统计局, *Diyici quanguo shuilipucha gongbao* 第一次全国水利普查公报 (Bulletin of First National census for water) (Beijing: Zhongguo shuilishuidian chubanshe, 2011).

transformed into a complex human-engineered network. This transformation is the result of centuries of human intervention.

As the environmental historian Donald Worster astutely observes in his study of rivers in the American West, "To write history without putting any water in it is to leave out a large part of the story. Human experience has not been so dry as that."[4] Indeed, water is ubiquitous in our world, essential for life itself. The management of water has played an essential role in Chinese history as well. From the mythical flood mitigation efforts of Yu the Great, the founder of the first Chinese dynasty, the Xia (2070–1600 BCE), to the Zhengguo Canal that facilitated the rise of the Qin empire (221–206 BCE), water management has been indelibly imprinted on Chinese history.

In the twentieth century, economists and historians alike have delved into the significance of water management in shaping Chinese political structures. Ch'ao-ting Chi 冀朝鼎, an economist who later became a communist, pointed out the crucial role water control played in political struggles throughout Chinese history.[5] Decades later, Karl Wittfogel proposed the concept of a "hydraulic society," arguing that the need for large-scale hydraulic works had led to centralized, despotic political structures in China and other "oriental" countries.[6] This theory of "oriental despotism" has been challenged, however, by studies that have sought to uncover the high degree of local autonomy in the management of water resources, leading Akira Morita to propose the concept of the "hydraulic community."[7] Of course, the management of major projects like the Yellow River required far more human labor and financial investment than local irrigation systems.[8]

[4] Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (Oxford: Oxford University Press, 1985), 5.

[5] Ch'ao-ting Chi, *Key Economic Areas in Chinese History: As Revealed in the Development of Public Works for Water Control* (London: George Allen & Unwin Ltd., 1936).

[6] Karl A. Wittfogel, *Oriental Despotism: A Comparative Study of Total Power* (New Haven: Yale University Press, 1957).

[7] Frederick W. Mote, "The Growth of Chinese Despotism: A critique of Wittfogel's Theory of Oriental Despotism as Applied to China," *Oriens Extremus* 8, no. 1 (1961), 1–41; Akira Morita, *Qingdai shuili yu quyu shehui* 清代水利与区域社会, trans. Lei Guoshan (Jinan: Shandong huabao chubanshe, 2008); Pierre-Etienne Will, "State Intervention in the Administration of a Hydraulic Infrastructure: The Example of Hubei Province in Late Imperial Times," in *The Scope of State Power in China*, ed. Stuart Schram (Hong Kong: Chinese University Press, 1985), 295–347; Yan Gao, *Yangzi Waters: Transforming the Water Regime of the Jianghan Plain in Late Imperial China* (Leiden: Brill, 2022).

[8] Peter Purdue, *Exhausting the Earth: State and Peasant in Hunan, 1500–1850* (Cambridge, MA: Harvard University Asia Center, 1987), 171.

As these scholars have shown, the history of water management reveals the "inevitable imbrication of human and natural processes."[9] From individual households to the central organs of the state, a wide variety of human organizations have played a role in river management, either voluntarily or involuntarily. The larger the project, the more human labor was required, and with this emerged the need for a more efficient administrative system. However, it is important to note that water management was just one of multiple factors which contributed to the formation of large human organizations. Wars, human reproduction, and other factors have also had a great influence on the process of social stratification and state formation.

China contains two of the world's largest rivers, the Yellow River in the north and the Yangtze River in the south. Their basins have long been the core economic zones of China, and stable and centralized states have sought to control these rivers or to provide relief to communities affected by river-related crises. Failures of the river management system can be a symptom of a struggling state, whether they are due to financial limitations on maintenance, poor engineering, or organized sabotage. This can result in catastrophic consequences for people who live along these rivers. Residents of the Hebei Plain in the eleventh century, for example, or Wuhan in the early 1930s, and Henan in the seventeenth century and the late 1930s, all suffered from drowning, food shortages, infectious diseases, and death because of failed river management efforts.[10] Thus, the history of water makes clear the close relationship between human and natural processes and the crucial role of river management in shaping human societies.

Despite their strengths, the concepts of "hydraulic society" and "hydraulic community" are inadequate to an analysis of water

[9] Peter Purdue, "Is there a Chinese View of Technology and Nature?," in *The Illusory Boundary: Environment and Technology in History*, ed. Martin Reuss and Stephen Cutcliffe (Charlottesville: University of Virginia Press, 2010), 102.

[10] See Roger V. Des Forges, *Cultural Centrality and Political Change in Chinese History: Northeast Henan in the Fall of the Ming* (Stanford: Stanford University Press, 2003); Micah Muscolino, *The Ecology of War in China: Henan Province, the Yellow River, and beyond, 1938–1950* (Cambridge: Cambridge University Press, 2015); Ling Zhang, *The River, The Plain, and the State: An Environmental Drama in Northern Song China, 1048–1128* (Cambridge: Cambridge University Press, 2016); Courtney, *Nature of Disaster in China*; Ma Junya 马俊亚. Beixisheng de jubu: Huaibei shehui shengtai bianqian yanjiu, 1680–1949 被牺牲的局部:淮北社会生态变迁研究 (*The Sacrificed Region: A Study of the Social Ecological Changes in Huaibei*) (Beijing: Beijingdaxue chubanshe, 2011).

management in the twentieth century. The advent of electricity produced significant changes in water management, particularly in relation to the generation of power. The installation of the Fourneyron turbine at Niagara Falls in 1895 was a major turning point as it enabled water to be converted into electricity on a large scale. This paved the way for the development of hydroelectricity and the long-distance transmission of electricity.[11] By the beginning of the twentieth century, advances in hydraulics, turbine design, and alternating current technology made the large-scale exploitation of hydroelectricity possible.[12] During the two decades between the world wars, water was responsible for generating up to half of the electrical power in many industrial countries. Hydropower was called "white coal" in Europe due to the abundance of power generated from glacial streams in the Alps.[13] To address high rates of unemployment during the Great Depression, countries such as Nazi Germany and the United States built large concrete dams to generate electricity.[14] The United States was a pioneer in river-basin management and multipurpose dams, as exemplified by the Tennessee Valley Authority and the Boulder Dam on the Colorado River. The development of the concept of multipurpose exploitation, which embraced flood control, irrigation, navigation, and electricity generation, was seen as a way to maximize the benefits of rivers.

In the twentieth century, the capacity to produce electricity became a crucial indicator of a nation's industrial strength. Concrete dams, seen as symbols of technological superiority and productivity, emblematized the modernist state's perspective on water management. Letting rivers run freely without exploiting them was viewed as wasteful by many state leaders. The importance of water management in the generation of

[11] In fact, the first hydroelectric plant on Niagara Falls was built in the 1880s. However, it produced direct current electricity, which had a very short transmission distance. Until Nikola Tesla's development of a poly-phase alternating current system of generator, motor, and transformer in the late 1880s, long-distance transmission of electricity was impossible.

[12] See Louis C. Hunter and Lynwood Bryant, *A History of Industrial Power in the United States, 1780–1930*, Vol. 3: *The Transmission of Power* (Cambridge, MA: The MIT Press, 1991).

[13] See Marc D. Landry II, "Europe's Battery: The Making of the Alpine Energy Landscape, 1870–1955," PhD Dissertation, Georgetown University, 2013.

[14] David Blackbourn, *The Conquest of Nature: Water, Landscape, and the Making of Modern Germany* (New York: W. W. Norton & Company, 2006); Richard White, *The Organic Machine: The Remaking of the Columbia River* (New York: Hill and Wang, 1995).

electricity, coupled with the appeal it held for engineers and political leaders, made it a significant aspect of a modern society.[15]

HYDROPOWER NATION

In this book, I introduce the concept of "hydropower nation" as a way to analyze the multidimensional transformation of rivers in twentieth-century China. Hydropower, harnessed from the natural force of river flows, has been converted into electricity to meet a variety of human demands. This transformation, however, requires not only specific technological innovations but also political and social engineering. In the twentieth century, building a strong and prosperous nation was a shared goal of Chinese elites and the Communist Party after 1949. They believed that the nation and its prosperity were embodied in the country's mountains and rivers, rather than in an imagined community that existed in texts only.[16] Regardless of their size, hydropower projects were integrated into the discourse of national development and became a driving force in propelling and securing the power of the ruling party, despite ideological and geopolitical shifts. In this sense, hydropower projects and political regimes were interdependent and mutually reinforcing. In the twentieth century, the convergence of rivers, hydropower technology, technocratic systems, and nation-state building projects led to the formation of a hydropower nation. It was conducive to an inseparable relationship between river management, energy production, and statist goals. At odds with the narratives of productivism and developmentalism, the hydropower nation brought forth both construction and destruction. The visible and often sublime concrete infrastructures came into existence at the cost of profound social and ecological disruptions.

In the age of great acceleration, China's rivers have been undergoing transformative changes at an unprecedented pace, as the country has embarked on a mission of national reconstruction and industrialization. With an abundance of rivers – more than any other country in the world – China is rich in hydropower potential, due to its mountainous terrain and the changes of elevation from the Qinghai–Tibetan Plateau to the Pacific coast. In a world that still relies heavily on fossil fuels, China has the

[15] John R. McNeill, *Something New under the Sun: An Environmental History of the Twentieth-Century World* (New York: W. W. Norton & Company, 2000), 157.
[16] Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (rev. ed.) (London: Verso, 2016).

largest capacity for hydropower production, far outstripping the second place United States. And this capacity is still growing.

Christopher Sneddon has called the proliferation of concrete dam technology in the historical context of the Cold War a "concrete revolution."[17] Yet, how this revolution unfolded in modern China remains unclear. My aim in this book is to tell the story of the planning, construction, and operation of China's hydropower projects. I analyze their historical significance and examine the role they played in energy production and the making of a nation-state and a socialist state. State building is a central narrative in the field of modern Chinese history. Scholars have engaged with this narrative from institutional, political, military, and medical perspectives.[18] In recent years, energy production has emerged as another lens through which to view the struggle to build the Chinese state.[19] This study situates itself in this discussion of energy and focuses on hydropower to examine the historical changes that have occurred in modern China. From small-scale private ventures to large state-run operations, hydropower projects have been inextricably linked to the political developments that occurred in China and elsewhere. I explore the complex interplay between energy, politics, and state-building as they have been shaped by these hydropower projects.

In the 1950s, under the guidance of the visionary Communist Li Rui 李锐 and other like-minded revolutionaries and technocrats, the People's Republic of China adopted an energy policy that prioritized hydropower over thermal power to drive industrialization. Instead of developing a carbon-intensive energy system, the country sought to build one based on water. Although it was short-lived, this policy led to the construction of numerous dams. These dams not only transformed China's landscape but

[17] Christopher Sneddon, *Concrete Revolution: Large Dams, Cold War Geopolitics, and the US Bureau of Reclamation* (Chicago: University of Chicago Press, 2015).

[18] Prasenjit Duara, *Rescuing History from the Nation: Questioning Narratives of Modern China* (Chicago: University of Chicago Press, 1997); Hans van de Ven, *War and Nationalism in China, 1925–1945* (London: Routledge, 2003); Klaus Muhlhahn, *Making China Modern: From the Great Qing to Xi Jinping* (Cambridge, MA: Belknap Press, 2019); Mary Augusta Brazelton, *Mass Vaccination: Citizen's Bodies and State Power in Modern China* (Ithaca: Cornell University Press, 2019).

[19] Shellen X. Wu, *Empires of Coal: Fueling China's Entry into the Modern World Order, 1860–1920* (Stanford: Stanford University Press, 2015); Hou Li, *Building for Oil: Daqing and the Formation of the Chinese Socialist State* (Cambridge, MA: Harvard University Asia Center, 2021); Ying Jia Tan, *Recharging China in War and Revolution, 1882–1955* (Ithaca: Cornell University Press, 2021); Victor Seow, *Carbon Technocracy: Energy Regimes in Modern East Asia* (Chicago: University of Chicago Press, 2022).

also became deeply intertwined with the social and political fabric of socialist China. My goal in this book is to describe the relationship between the concrete revolution of hydropower projects and the larger socialist revolution, and to determine how each influenced the other.

Ling Zhang, in her seminal work on the shifting course of the Yellow River, challenges the logic of the "hydraulic mode of production" that underlies much previous scholarship on water management in Chinese history. By exploring the human toll involved in maintaining the Yellow River–Hebei complex from 1048 to 1128, including costs, suffering, and loss of life, Zhang advances a theory of the "hydraulic mode of consumption." This analysis highlights the high cost of preserving a particular water-management system. Zhang's perspective provides a deeper understanding of the relationship between humans and water in China and shows that this mode of consumption continues to be widespread to this day.[20] It is important to note that examinations of the hydraulic modes of production and consumption have primarily been concerned with the (preindustrial) period of imperial China. In an agrarian society, water management primarily focuses on irrigation and transportation for the purpose of production. With industrialization, hydropower emerges as another source of productivity. David Pietz has demonstrated the Chinese state's more or less continuous historical commitment to harnessing the potential of the Yellow River, once called "China's Sorrow" because of its frequent flooding, and to transforming it into a catalyst for both agricultural and industrial growth.[21] The emphasis on production in Pietz's analysis, however, still outweighs that placed on consumption, as can be seen in his adherence to the "hydraulic mode of production" paradigm.

In my examination of the rise of the hydropower nation, I address both sides of the dual nature of hydropower, both as a source of power, in the form of energy and political might, and as a means of destruction, through the displacement of people and environmental degradation. By considering perspectives centered on the state, on local communities, and on the environment, I seek to incorporate both the analysis of power and energy production through the notion of the "hydraulic mode of production" and the evaluation of the tremendous costs incurred in the

[20] Zhang, *River, Plain, and State*, 178–179; 288–290.
[21] David Pietz, *The Yellow River: The Problem of Water in Modern China* (Cambridge, MA: Harvard University Press, 2015).

process of this pursuit of power through the concept of "hydraulic mode of consumption."

Throughout the twentieth century, Chinese states attempted to make China's rivers more productive through hydrology and hydraulic engineering. Despite substantial investments in large concrete dams, however, these efforts often produced unanticipated problems (such as silting) that diminished the anticipated gains in productivity. When the financial, social, and environmental costs of these dams are taken fully into account, it becomes difficult to argue that they have brought lasting benefits to either the environment or humanity. The relationship between the "hydraulic mode of production" and the "hydraulic mode of consumption" is complex and interdependent. Hydraulic engineering, technocratic ideas, social mobilization, the displacement of populations, and environmental degradation all played crucial roles in the emergence of China as a hydropower nation. It is clear that the two modes cannot be easily divided. They must be considered together to fully understand the impact of these projects.

The creation of a hydropower nation is a complex and multifaceted process that involves a variety of technological, political, social, and environmental factors. This book will examine these elements in detail, exploring the relationships between state, rivers, and people as they have evolved in modern China. By examining both small and large hydropower projects, I aim to provide a nuanced understanding of the evolution of state–river–people relationships. Rather than categorizing these projects as either successes or failures for the political regimes that enacted them, they are viewed instead as products and reflections of the natural, technological, and political systems in which they occur. Such an approach can provide a more complete understanding of the challenges and opportunities inherent in the making of a hydropower nation.

The making of a hydropower nation in China was influenced by the ideology of "high modernism." This ideology, as described by James Scott, is characterized by a strong belief in the power of scientific and technical progress, increased production, the mastery of nature, and the rational design of social order.[22] Despite China's technological limitations in the twentieth century, the Communist regime, with Soviet help, still made tremendous efforts to implement its ambitious river engineering projects. This was a localized manifestation of global high modernism,

[22] James Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1999), 4.

where Maoist radicals combined technical and political ambitions in a "war against nature" to realize the environmental and social engineering goals of the revolutionary state.[23] The result was a major role for mass participation, in the form of laborers, the incorporation of indigenous technologies, and involuntary displacement, all of which became prominent features of the Chinese form of the hydropower nation.

ENERGY POLITICS

In the industrial age, the capacity of human beings to produce energy has vastly surpassed that of any previous form of society, as if the sun were the only limit. With the emergence of the climate crisis, energy has become a focal point in global debates and collaborations. The shift toward an energy-intensive society and an anthropocentric environment was largely guided by scientists, engineers, entrepreneurs, and capitalists. Historians have a responsibility to critically examine the ways in which the increasing demand for energy has transformed human–nature and human–human relationships.[24] The study of energy has interested scholars for several decades, with experts such as Vaclav Smil and Alfred Crosby exploring the major sources of energy in human history, from grains to fossil fuels.[25] Both scholars express deep skepticism about the sustainability of our current energy-intensive form of society.[26] As the evolution of water management has demonstrated, energy and political power are inextricably related.[27] The development of hydropower in China is intricately linked to its political ecology. While recent research in modern China studies has largely focused on fossil fuels, the rapid rise of hydroelectricity in the twentieth century and its continued growth demand

[23] Judith Shapiro, *Mao's War against Nature: Politics and the Environment in Revolutionary China* (Cambridge: Cambridge University Press, 2001).

[24] One excellent example is Victor Seow's work on the history of Funshun colliery. Seow's critique of productivism behind the rise of carbon technocracy and modern industrial state in East Asia is intriguing. See Seow, *Carbon Technocracy*.

[25] See Muscolino, *Ecology of War in China*.

[26] Vaclav Smil, *Energy in World History* (Boulder: Westview Press, 1994); Alfred W. Crosby, *Children of the Sun: A History of Humanity's Unappeasable Appetite for Energy* (New York: W.W. Norton & Company, 2006); Vaclav Smil also wrote an overview of energy in modern China, see Vaclav Smil, *Energy in China's Modernization: Advances and Limitations* (Armonk: M. E. Sharpe, 1988).

[27] Timothy Mitchell argues that coal-centered socio-technical systems opened space for democracy, while oil led to the closing off of that space. See Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (New York: Verso, 2011).