
CITIES UNDER SIEGE: THE FLOOD OF 1931 AND THE ENVIRONMENTAL CHALLENGES OF CHINESE URBAN MODERNIZATION

Zhiguo Ye

Seattle Pacific University

This paper explores the relationship between China's urban modernization and the resultant environmental vulnerabilities revealed in the 1931 flood. One fourth of China's population was affected by this flood, which is believed to be the deadliest such disaster in 20th century China. The conventional view of the flood as a 'natural disaster' mainly caused by bad weather conditions does not persuasively explain why key urban centres along the Yangzi appeared unusually vulnerable and suffered such great losses. The paper takes the worst affected urban region in 1931—Wuchang, Hankou and Hanyang—as its focus. It explores how a new political regime changed the region's economic focus from agriculture to commerce, which led to the urban growth that weakened the traditional flood prevention system. In addition, the birth of 'the developmental state' and social reconfiguration after 1927 created a drastic rupture in water control policy and practices. The concentration of power in the technocratic officials of the revolutionary government led to the decline of organizations and groups that formerly played a key role in water control at the local level.

Keywords

1931 floods, water control, urban modernization, regime change

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INTRODUCTION

The 1931 floods are generally remembered as the deadliest natural disaster ever recorded in 20th century China. Among the worst affected urban regions in 1931 was a metropolis complex called ‘Wu-han’, which consisted of Hankou, Wuchang and Hanyang. Located at the confluence of the Yangzi and the Han River, these three cities served as the commercial, political and industrial centre of Central China. The flood in 1931 turned the region known as ‘China’s Chicago’ into ‘the Venice of China’ with over half a million people losing their homes. The catastrophic result is conventionally believed to have been caused by ‘exceptional natural conditions’—abnormal rainfall over three months, the historic high water record of the Yangzi, and the topographical features of the three cities¹. However, this explanation does not answer why the key urban centres along the Yangzi appeared unusually vulnerable and suffered such unprecedented losses in 1931. With flooding as an ever-present threat the region had developed flood prevention schemes that had proved to be reasonably effective in earlier times but seemed defenceless in 1931. It is ironic that these cities became more vulnerable to the threat of flooding after undergoing their most extensive modernization since the late nineteenth century.

This paper explores the relationship between China’s urban modernization and the resultant environmental vulnerabilities revealed in the three cities of Wuchang, Hankou and Hanyang during the flood of 1931. Tracing the political and economic shifts of the cities over a half century, the paper shows how modern urban development and revolutionary zeal weakened the traditional flood prevention system of the cities, which led to the disaster. The shifting focus of the late Qing regime from agriculture to international trade started an urban developmental pattern incompatible with the traditional flood prevention design. This pattern continued in the Republican era, when the birth of ‘the developmental state’ and social reconfiguration after 1927 created a drastic rupture in the government policy and societal practice of water control. The concentration of power in the technocratic officials of the revolutionary government and technocratic officials led to the decline of organizations and groups that had formerly played a key role in water control at the local level.

URBAN SETTING OF WUHAN’S CITIES BY THE LATE QING

The three cities of Wuchang, Hankou, and Hanyang, which straddle the Yangzi River at a middle course, dominated the economic and political life of the central Yangzi River region for well over a millennium. By the late Qing era each of the cities had developed a distinct identity and function. Wuchang, as the Hubei provincial capital and a seat of the Huguang governor-general, was the most important administrative city of Central China. Across the Yangzi River, Hanyang ranked second in administrative status, serving as both a prefecture and a county capital. Hankou, which became a treaty port in 1861, had grown to be the major competitor to Shanghai for the Yangzi commercial trade. The administrative and economic importance of the three cities lies in their unique geographic location. First, they stood at the confluence of the Yangzi and its largest tributary—the Han River—and served as a gateway to the vast plains of Huguang. More importantly they formed the hub of a gigantic drainage system extending far beyond these plains that constituted a centre of communications for almost three-fourths of the territory of China proper². It is no wonder that China’s revolutions of the twentieth century thrust the three cities onto the centre stage of national politics, as the birthplace of the Republic of China in 1911 and as its temporary capital in 1926-1927 (figure 1).

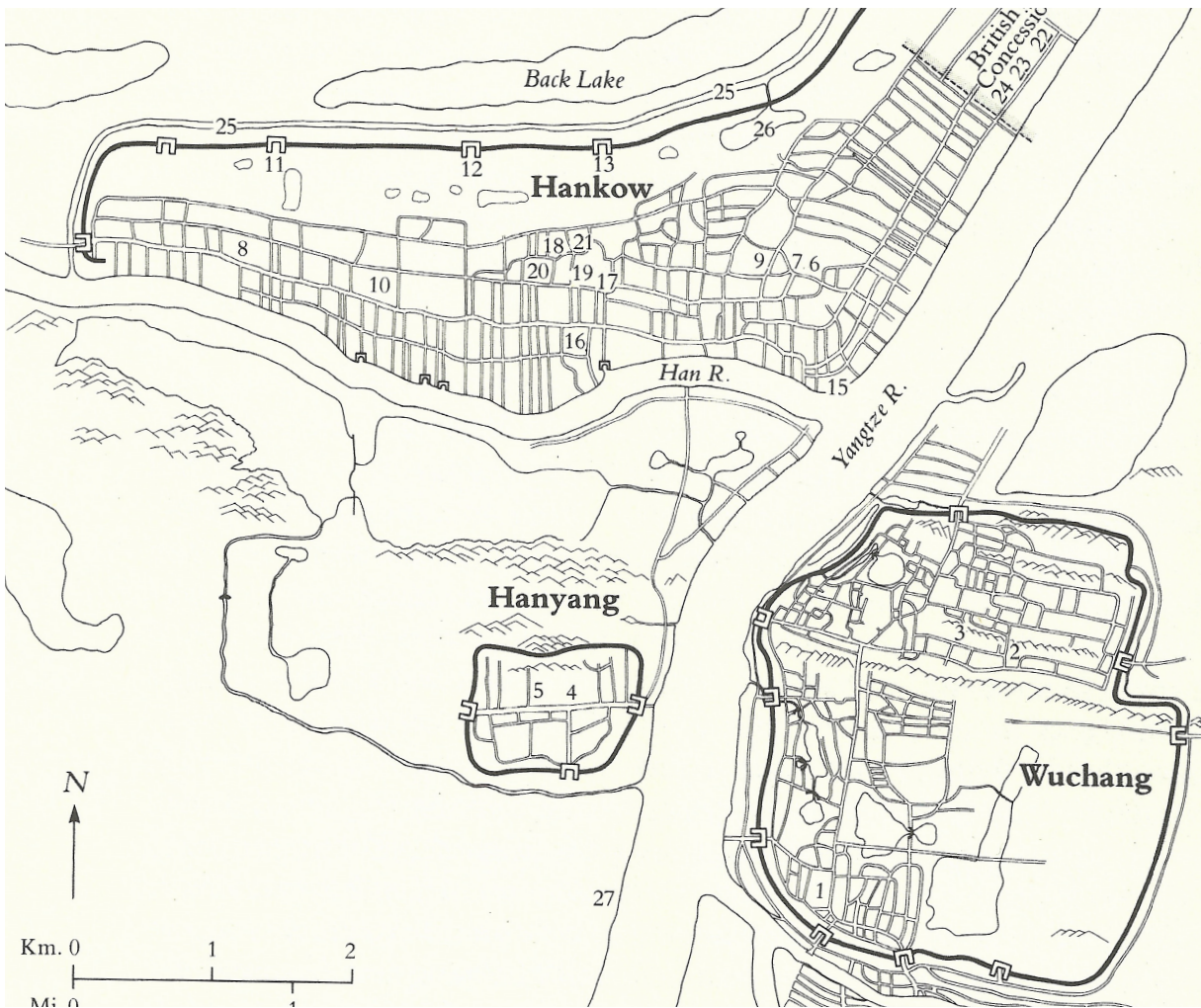


FIGURE 1 Map of Wuchang, Hankou and Hanyang in The Late Qing Era

A combination of broad flat plains and powerful waterways was the chief topographic feature of the region (figure 2 and figure 3). The threat of rising waters inundating the cities had led to the development of various measures to prevent and mitigate the impact of floods. In Wuchang and Hanyang the key structural measure was the construction of the city wall and moat system³. The rectangular city walls of the two cities were built in the early Ming period with waterproof clay and brick⁴. Floodgates were installed under the city walls to allow water to flow out into a surrounding moat⁵. The moats were composed of both natural waterways and artificial canals that connected the lakes and ponds within the cities to the networks of local waterways outside the walls⁶. Surprisingly large proportion of the urban land inside the walls were covered by lakes and ponds in Wuchang. A old saying described Wuchang as the city of ‘three mounds, eight springs, nine lakes’⁷. The numbers were inaccurate but they give a sense of the great scale of the reservoirs maintained by the city for the purpose of water supply and drainage. During emergencies the wall and moat system allowed water to be released into large lakes outside the walls and into the Yangtze downstream from the city.

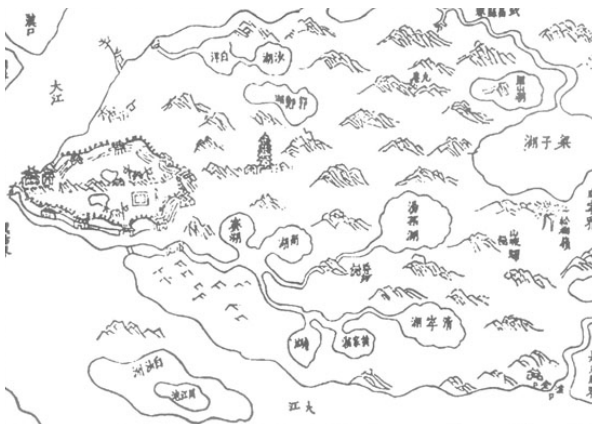


FIGURE 2 Lakes and Waterways Outside The Walled City of Hanyang



FIGURE 3 Lakes Outside The Walled City of Wuchang

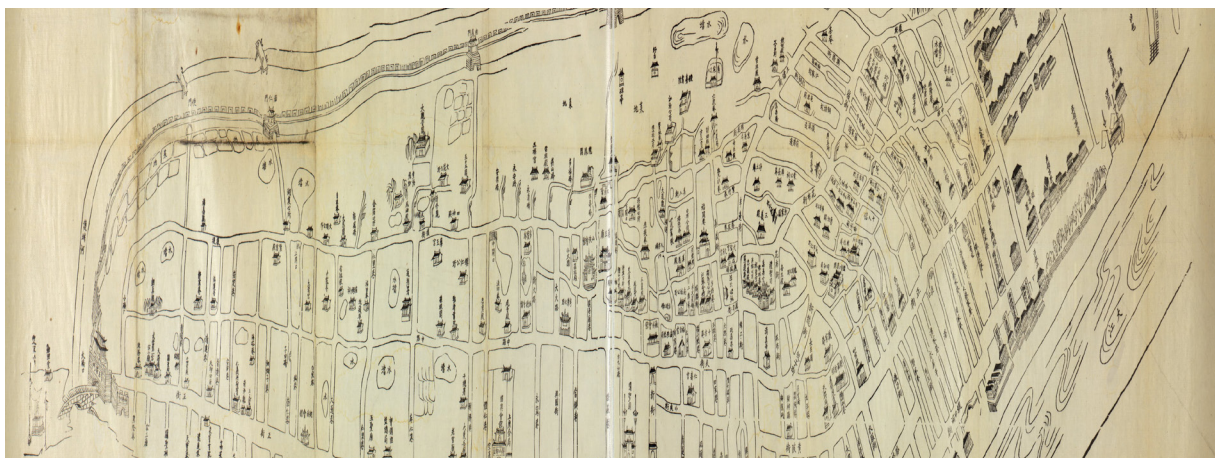


FIGURE 4 Map of Hankou in 1877 showing the city protected by Hankou bao, a flood-prevention wall.

The commercial city, Hankou, was different. As a non-administrative city it was not truly “founded” in any official sense and thus not subject to the rules of classical urban planning and construction. But flood prevention remained equally if not more important to its urban development. The city came into being around 1465 in the Ming dynasty, when the Han River suddenly shifted its lower course and created a liver-shaped sand island that later became Hankou. In high water seasons the town was bounded on all sides by water. The Han lay to the south and the Yangzi to the east. On its landward side the town was belted by a heavily diked canal and a tributary of the lower Han. Slightly beyond the canal lay the large backwater pool known as Back Lake (Hou-hu), a formidable reservoir capable of overflowing its banks and inundating the town from behind. To protect Hankou and its market, two dikes had been built along Back Lake. One was built by Subprefect Yuan Chang in 1635, stretching 10 miles from Qiaokou along the Han River in the west to Dikou near to the confluence of the Han and the Yangzi in the east. The other one, *Hankou bao*, was built in 1864 after the city was demolished by the Taiping rebellion. This dike was designed to perform the same functions as a city wall—both military defence and flood prevention. The *Hankou bao* had 8 doors, 15 forts and 3 floodgates that worked effectively to protect Hankou from both invasion and inundation (figure 4)⁸.

The design of all three cities shows that traditional urban planning often utilized natural resources like rivers, lakes and wetlands as an essential part of water control measures. There were numerous lakes, lowlands and swamps outside Wuchang, Hankou and Hanyang functioning as reservoirs to ‘store the water pumped or siphoned

from the Yangzi⁹. Their importance for flood prevention had long been understood by local officials who had specific responsibilities for managing the system during times of both high and low water. These officials carefully surveyed lakes and kept records on changing conditions. Moreover provincial and local officials limited human activity in the natural storage wetlands between the Yangzi and the cities of Wuchang and Hanyang, routinely banning unauthorized farming and dike construction¹⁰. As the Viceroy E'mida explained in 1744 'I believe the effective water control measure entails the principle of not competing with water for land ... natural lakes and waterways should not be blocked in preventing disasters caused by overflowing¹¹'. In other parts of the Huguang plain rapid population growth led to an increase in land reclamation which dramatically reduced the number of lakes and wetlands. But until the late Qing era, official policies of the three cities at the confluence of the Yangze and the Han were effective in preserving the region's lakes and wetlands and preventing major damage from floods¹².

URBAN DEVELOPMENT UNDER ZHANG ZHIDONG'S MODERNIZATION IN THE LATE QING

However, for the last two decades of the Qing dynasty these traditional urban water control systems were increasingly challenged by reform-minded officials like the governor-general Zhang Zhidong (1837-1909). Zhang arrived in Wuchang in 1889 with the goal of strengthening the interior cities against Western imperial expansion. To Zhang the building of Hankou as a treaty port through the Western technology and design was particularly inspiring. The process transformed a vast unoccupied riverfront into a bustling urban centre that was seen as 'one of the finest examples of the Chinese Bund in the Orient¹³'. Zhang Zhidong launched a series of new urban modernization projects that valued the commercial role of water storage areas rather than their flood prevention function. This was part of a larger post-Opium Wars shift by Chinese governments away from the traditional focus on agriculture to a new emphasis on building a modern industrial economy.

The first project Zhang undertook was building the Hanyang Ironworks, the largest of its kind in Asia, on a vast marshland north of Hanyang. Despite being warned about the danger of floods, Zhang insisted on reclaiming an area of lakes and wetlands twice larger than the city of Hanyang itself¹⁴. Reclamation alone cost over one million silver dollars—one fifth of the total cost of the entire project. In the following years more industrial enterprises were established on the reclaimed land and as a result the city proper extended far beyond the city walls. In 1899 Zhang built two massive dikes along the Yangzi outside Wuchang, which led to the reclamation of more than 60,000 mu (about 9884 acres) of land for Wuchang's future urban development¹⁵. In 1906 Zhang completed another major reclamation project, the Zhanggong Dike in Hankou. It was initially designed to protect the Beijing-Hankou railroad from floods, but Zhang saw it as an opportunity to pursue more space for Hankou's further urban development. The dike drained a vast land of about 20 times larger than the original size of the city¹⁶. Soon after the completion of the Zhanggong dike, the old *Hankou bao* lost its function and was turned into Hankou's first modern road. This new *Zhongshan Road* facilitated major growth in communication and commerce, and the city proper of Hankou grew far beyond its original boundaries.

Zhang's urban projects conflicted with the previous policy and philosophy of flood prevention, the projects drew criticism from local gentry and community leaders. Fu Qihao a low-ranking official of the Jiangxia County, worried that the land reclamation and dike construction would increase the chance of flooding¹⁷. The shrinking of the natural water storage zone and reservoir lakes forced Zhang to rely more upon artificially-constructed measures of urban flood prevention. At Wuchang he first added four floodgates under the two dikes to allow water to move more freely between the Yangzi and its reservoir lakes. He then surveyed the existing drainage within Wuchang, dredged ditches, and repaired and installed floodgates and locks¹⁸. As a result the drainage of northern Wuchang was greatly improved because city water could be released either through floodgates into the Yangzi or through the repaired northern moat to enter into a big reservoir lake in the West¹⁹. Zhang also

worked with local community leaders and social organizations like benevolent halls to ensure effective flood control. They were encouraged to act as policy educators and implementers and took responsibility to report on blockage of key waterways, illegal land clearance, and unauthorized dike construction at the local level²⁰. Some social organizations even participated in community flood prevention activities like annual dike repairs, waterway dredging, and floodgate maintenance²¹.

URBAN DEVELOPMENT IN THE REPUBLICAN ERA

Zhang Zhidong did not get a chance to witness the full development of the newly annexed urban lands in the three cities because the Qing dynasty collapsed in 1911. With no strong government regulation Hankou experienced a rapid development, much of it on land previously reserved for flood control. Chinese merchants expanded their businesses. The completion of the Lu-Han railway (China's first South-North line) in 1906 also stimulated the economic development of Hankou, whose trade volume soon exceeded all other treaty ports except Shanghai. The city's population tripled from 1921 to 1931 and the majority of the newcomers occupied newly drained land near the Zhanggong dike. In the first ten years of the Republic there were more than two thousand residential and commercial buildings built between the Zhongshan Road (the dismantled *Hankou bao*) and the Lu-Han railroad²². The drained land thus became a new bustling urban centre of Hankou, where famous Chinese business like the Great Hankou Hotel, the Ye Kaitai Drugstore, and the New Market (an entertainment plaza) and foreign factories like the Mistui leather factory and Jardines were located²³. Some urban projects, such as the Chinese Race Club, the International Race Club, the Hankow Race Club, an airport, the Zhongshan Park, and the Union Hospital were even established beyond the protection of the railroad embankment.

However, the private and profit-driven development of Hankou further weakened its flood prevention capacity. The drained area upon which the new urban centre was established had a much lower altitude than the average land level of Hankou. According to the customs report of 1902-1911, the reclaimed area outside the *Hankou bao* needed to be lifted up at least 20 feet on average to be used for any urban construction. For some low-lying areas a need to raise the land more than 40 feet was not unusual²⁴. But merchants were often concerned more about how to save costs than about making sure they built on safe ground. Moreover, the absence of a strong local government in the early Republic era made it hard for Hankou to have a comprehensive urban plan that focused on the flood control issue. Because of the problematic land configuration and the poor drainage of Hankou the new urban area was notorious for streets 'full of filthy water'—even when there was no rain²⁵.

Further major change occurred in Wuchang and Hanyang after the Northern Expedition in 1926, when the Nationalist government took Wuchang as a temporary national capital on its way to unifying China. The new leaders directed their zealous ambition to break with the imperial past into urban reform projects, which unfortunately led to serious damages to the traditional water control mechanisms of the two cities. In October 1926 Hubei provincial government made a decision to dismantle the city wall of Wuchang because they saw it as 'a relic of the feudal past²⁶'. Two years later the walls of both Wuchang and Hanyang were torn down. The demolition of city walls unavoidably damaged other flood protection systems. For instance, the Qixin floodgate and the Wannian floodgate got clogged due to the wall demolition and became completely broken when a new road was built upon the site of the wall. Meanwhile the Wuchang municipal council ordered that the lakes within and outside the city be filled to make more space for urban construction. From 1927 to 1931 the size of the lakes in Wuchang were rapidly decreased. Comparing maps in 1868 and 1930 it is clear that lakes and waterways that were part of the western city moat were greatly shrunk. One of these, the Chang Lake, nearly vanished (figure 5)²⁷.



FIGURE 5 Wuchang, Hankou and Hanyang in the 1915

Aware of the potential danger of flooding, eighty-four representatives of the philanthropist association of Wuchang wrote a petition letter to the Hubei provincial government. They expressed concern that the revolutionary urban reconstruction would seriously damage Wuchang's flood prevention system, whose function had already been largely reduced by Zhang Zhidong²⁸. The letter was accompanied by a report on the drainage system and official regulation of the late Qing era in order to remind revolutionary officials about local water control practice and history. Unfortunately, this request was ignored by the provincial government. 1927 marked a rapid decline of community influence over local governance and affairs. Much of the autonomy of the local community was taken away by the municipal government which discouraged the community's involvement in flood prevention. The 'developmental state'—a term used by William Kirby to describe the technocratic confidence in national construction during the Republican era—chose to trust centrally appointed and western-trained planners and engineers, not local leaders, for urban water control works. When most new technocratic officials proved uninterested learning about local situations and the collaborating with the local community, it became impossible to preserve or use the traditional water control system. It is no wonder that Wang Baoxin, a local historian, lamented the loss of historical knowledge about the old cities and warned of disastrous consequences from the urban modernization programs²⁹.

CITIES UNDER SIEGE: THE FLOODING OF HANKOU, WUCHANG AND HANYANG

The process by which the three cities were flooded in the summer of 1931 revealed that their vulnerability was the result of urbanisation and political shifts. The first sign of flooding in Hankou occurred on drained lands near the Zhanggong dike when residents reported water coming out of a lake that had been filled in. Then on July 28th the dike along the Yangzi burst, flooding the drained land where Chinese Race Club, the Union Hospital, the International Race Club, and the Recreational Ground were located. A new commercial centre located on drained land between the old market of Hankou and the foreign concession remained dry at first because of its relatively high level and the protection of the railway embankment. However, because of the reduced water storage capacity of Back Lake, water eventually broke through the railway embankment on August 2nd, inundating the entire area. By this time all the land drained since the late Qing era was completely restored to its original state as part of the Back Lake. In contrast both the old market of Hankou and the foreign concessions were able to keep the water out until August 19th when the river reached its historical peak at 28.28 meters in Hankou. At this point all the foreign concession and most of the old market town were flooded. As the focus of urban development and investment after the late Qing the new urban district contributed to the severity of the loss in Hankou. The damage was worst in the new commercial district, where floodwaters ripped up residential and industrial buildings, damaged roads and smashed bridges. The fact that the district was built upon low lying ground with no effective drainage system prolonged its suffering. It took over three months to completely get rid of the water.

As for Wuchang, in late July the failure of the Wutai dike allowed the water of the Yangzi to enter the suburb of Wuchang, increasing the water level of most nearby lakes³⁰. Outside the city walls the Kuaizi Lake, which had been decreased in size and capacity in the 1927 urban reform, finally overflowed in mid-August. Floodwater broke the Kuaizi dam and entered into the northern city moat, parts of which had been blocked and thus could not direct water into the storage area behind the city. Wuchang literally became a besieged city surrounded by floodwater. Ironically the last line of defence consisted of the relics of the old city wall and its damaged foundation. On August 21st the Hubei provincial government formed the City Wall Flood Defence Committee to 're-build' the city wall with bricks and sand bags. This was hard to carry out because the wall foundation was found to be too 'loose' and 'fragile'³¹. In the late August floodwaters finally broke through the city wall defence and inundated two thirds of Wuchang³².

In Hanyang the first flooded area was the industrial zone constructed by Zhang Zhidong on the lakes and swamps near the Han River. By the middle of August all the factories including the Hanyang Iron Works and the Hanyang Arsenal were fully underwater, about 6 chi (2 meters) to 2 zhang (6 meters) in depth.³³ The financial loss was severe, for the industrial zone of Hanyang was the most expensive investment of the late Qing government.

This was soon followed by the inundation of the city centre of Hanyang, whose flood defence capability was largely lost with the demolition of the wall and moat system. Except for its north corner, the entire city was submerged under 4 chi (1.3 meters) of water³⁴.

CONCLUSION

A historical review of the urbanisation of the three riverine cities along the Yangzi shows that their inundation during the 1931 flood was more a human-created disaster than a natural one. It was caused by disregard for the natural environment and damage to traditional flood prevention systems. This reveals major flaws in the modernist urban vision that began in the late Qing era and continued through the Republican era. This vision centered on the rise of a centralized governmental structure and policy, a shift of economic emphasis from agriculture to trade, and a blind confidence in using modern technology to gain mastery of nature. Since China's current vision of urban modernity continues to break with tradition and concentrate power in the central state rather than in society, the flood of 1931 has a continuing relevance for today.

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Disclosure Statement

No potential conflict of interest was reported by the author.

Notes on contributor(s)

Zhiguo Ye is assistant Professor of history at Seattle Pacific University. Her research interests include the socioeconomic and cultural history of modern China, Chinese urban history, and environmental studies.

Endnotes

- 1 This view dominated official flood reports in 1931, such as Xie, 1931Hankou dashui ji, the Hubei disaster relief committee, Hubei 1931 shuizai dang'an xuanbian, and many other government reports in the republican era. Extensive current scholarship on the flood in China continues to share the same view. See in Li, *zhongguo jindai shida huangzai* and Zhu, "1931nian Hankou shuizai shulun," 104-111.
- 2 Rowe, *Hankow: Commerce and Society in a Chinese City*, 17.
- 3 China's traditional urban water control and flood prevention design has been carefully explored by the studies on imperial cities like Beijing, Chang'an, and Nanjing. See Wu, *Zhongguo gudai chengshi fanghong yanjiu* (*zhongguo jianzhu gongye chubanshe*, 1995); and Feng, "shuitang shiqi chengshi paishui xitong jiangou jiqi dangdai jiazhi," 66.
- 4 Due to different standing in official hierarchy, Wuchang had a longer wall (about 10 kilometers) and enclosed a bigger area. Hanyang's city wall was only about 2.5 kilometer.
- 5 There were nine floodgates installed under Wuchang's city wall and three under Hanyang's.
- 6 The moat of Wuchang was about 11000-meter-long, 9-meter-wide and 7 meter deep.
- 7 Pu, "Wuchang chengqu hutang zhi yanbian," 11.
- 8 Pi. *Hankou Wubai nian*, 68.
- 9 See 'lake survey' in Hu, *Jinchu xiushu zhiyao*, 257.
- 10 Yu, *Chubei shuili difang jiyao*, 162.
- 11 *Ibid.*, 107
- 12 Yin, *Mingqing lianghu pingyuan de huanjing bianqian yu shehui yingdui*, 79. And Yin, "cong mingdai hebo suo de zhifei kan hupo fenbu ji yanbian," 27-39.
- 13 Möllendorff and Li, *jindai wuhan jingji yu shehui: haiguan shinian*, 197.
- 14 Yuan, "Sheng Xuanhua yu hanyang tiechang zhi zai buju," 124-127.
- 15 Zhang, *Zhang Zhidong quanji*, vol. 56, 1478.
- 16 Wuhan shi wenshi xuexi weiyuan hui, *Wuhan wenshi ziliao wenku* 武汉文史资料文库, vol. 3, 457.
- 17 Zhang, *Zhang Zhidong quanji*, vol.166, 4804-4805. Zhang, *Zhang Wenxiang gong quanji*, vol. 4, 2175.
- 18 Zhang, *Zhang Zhidong quanji*, vol. 154, 4379.
- 19 Hubei Archive, *Hubei sheng 1931 shuizai dang'an xuanbian*, 249.

- 20 Zhang, Zhang Zhidong *quanji*, vol. 154, 4382.
- 21 Zhang, Zhang wenxianggong *quanji*, vol. 3, 1998 and vol.4, 2222, 2223.
- 22 Pi, Hankou Wubai nian, 127.
- 23 Möllendorff and Li, *jindai wuhan jingji yu shehui*, 131.
- 24 *Ibid.*, 103.
- 25 Hankou Municipal Government, *Hankou shi zhengfu jianshe gaikuang*, 33.
- 26 Hubei provincial government, *Hubei zhengfu gongbao*, 13.
- 27 Pu, 'Wuchang chengqu hutang zhi yanbian', 11-17.
- 28 Hubei Archive, *Hubei sheng 1931 shuizai dang'an xuanbian*, 249.
- 29 Wang, Xu *Hankou Congtan*, vol. 2, 9-10.
- 30 Hubei Archive, *Hubei sheng 1931 shuizai dang'an xuanbian*, 3.
- 31 *Ibid.*, 266. See telegraphs from the Bureau of the Construction on August 18th in 1931.
- 32 *Ibid.*, 4.
- 33 *Ibid.*, 291.
- 34 Pi, *Wuhan tongshi*, 213.

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Image sources

Figure 1: William Rowe, *Hankow: Commerce and Society in a Chinese City*, 22.

Figure 2: Wuhan shi, *Wuhan lishi ditu ji* 武汉历史地图集 (The Historical Atlas of Wuhan), (Beijing Shi: Zhongguo di tu chu ban she, 1998), 10.

Figure 3: Wuhan shi, *Wuhan lishi ditu ji*, 19.

Figure 4: Library of Congress Geography & Map Division digital ID (g7824h.ct003066)

Figure 5: From an Official Guide to Eastern Asia, Volume IV: China. Published by The Imperial Japanese Government Railways. Tokyo, 1915. Available online at Perry-Castañeda Library Map Collection (http://www.lib.utexas.edu/maps/historical/history_china.html)