

Study on the Time-Space Distribution of Water Cultural Heritage in Putian

Deng Jun^{1,2*}, Li Yunpeng^{1,2}, Wan Jinhong^{1,2}, Liu Jianguang^{1,2}, Du Longjiang^{1,2},
Yugao³

¹ Institute of Water Conservancy History of China Institute of Water Resources and
Hydropower Research, Beijing, 100038, China

² Research Center on Flood Control, Drought Control and Disaster Mitigation of the
Ministry of Water Resources, Beijing, 100038, China

³ Sandaohu Hydropower Engineering Administration of Xiangyang city, Hubei, 441000,
China

*363412686@qq.com

Keywords. Water Cultural Heritage; Time-Space Distribution; Protection and Management; Putian

Abstract. Water Cultural Heritage is an important part of Cultural Heritage, which is divided into Tangible Cultural Heritage and Intangible Cultural Heritage, and Water Conservancy Heritage is the main part of the Water Cultural Heritage. There is a strong relationship between the development of Putian Water Cultural Heritage and urban in the history, Water Conservancy Heritage is also the main part of Putian's Water Cultural Heritage, and it has derived out the abundant Intangible Water Cultural Heritage. The spatial distribution of Putian Tangible Water Cultural Heritage takes the river as the skeleton, which is divided into five heritage cluster areas mainly. In the time distributions, Qing Dynasty has the most quantity, followed by the Ming and Yuan Dynasty. The water resource in Putian has changed a lot, many features of Water Cultural Heritage also changed or disappeared, so they are desperately needed to protect and manage effectively.

1. Basic information

Putian City (24°59'-25°46' N, 118°27'-119°40'E) is located in the middle part along the eastern coast of Fujian Province. It is between mountains and waters, with overlapping mountains in the northwest, undulating hills in the middle and flat land in the southeast. The water systems in this territory are ample, mainly Mulan River and Qiulu River. Most of the rivers come from the northern mountainous areas. There are 30 rivers with a drainage area of more than 50 km², with steep slopes and rapid flow. The annual discharge varies greatly which features a maximum-to-minimum ratio of 4-6 times, and a great difference between flood and dry seasons within a year, with the discharge in flood season (April-September) accounts for 80-90% of the annual total. Putian City has four districts (Chengxiang District, Hanjiang District, Licheng District, Xiuyu District), one county (Xianyou County), and two administrative committees under its jurisdiction. Putian, a new port city on the west side of the Straits and the world's Mazu Culture center, has been the political, economic and cultural center of central Fujian since ancient times.

Mulan River is the mother river of Putian City, with a total length of 168 km and a drainage area of 1,732 km². It is the largest river in central Fujian and one of the eight main river systems in Fujian Province.

Located in the lower reaches of Mulan River, the Nanbeiyang river network crisscrosses the Nanbeiyang Plain, one of the four major plains in Fujian Province.

Qiulu River, the second largest river in Putian City, converges with Jiulihu River, Ju River, Changling River, Yucang River, etc. and then joins into Mulan River to flow into the sea.

Yanshou River, the largest tributary of Mulan River, has a total length of 189 km with all main and affluent streams counted in and a rainwater-collecting area of 709 km².

2. History of regional water development

Putian County was set up since 568 A.D., with city wall and moat built, water conservancy projects

undertaken and land reclaimed from the sea, forming the layout of Xinghua Plain with Mulan River as the main canal. The water conservancy project in Xinghua was started in Tang Dynasty (618-907), massively constructed in Song Dynasty (960-1279), and broken down in Ming Dynasty (1368-1644) and Qing Dynasty (1616-1912). During the reign of Xianfeng Emperor in Qing Dynasty, i.e. from 1851 to 1861, the project was locally repaired, but fell into disrepair in the period of the Republic of China.

In the history of Putian, water conservancy construction can be roughly divided into three stages: first, from the middle period of Tang Dynasty (618-907) to the Five Dynasties (707-960), featured by pond excavation for water storage; second, from the Northern Song or Earlier Song Dynasty (960-1127) to the Southern Song Dynasty (1127-1279), featured by dam building and ditch digging; third, from the Yuan Dynasty (1271-1368) to the middle period of the Ming Dynasty (1368-1644), featured by ditch system reconstruction and seawall expansion.

2.1 Flourishing of water conservancy in Tang Dynasty

At first, the west of the Nangbeiyang Plain was salt marsh which could surge up to the Shihua Bridge and Chengdu Mountain in the Beiyang in early Zhenguan period (627-649), or the reign of Taizong Emperor, while the Nanyang was lower in terrain at that time^[1]. At the beginning of the Tang Dynasty (618-907), hills and plains in Putian area had been exploited a lot, and water conservancy projects had been developed one after another.

The Tang Dynasty (618-907) is an important period of social, economic and cultural development for Putian area. In terms of water conservancy construction, it highlighted pond building and land reclamation from the sea at the earliest time and in the largest quantity across Fujian. During this period, the water conservancy projects in Putian area were constructed mainly to meet the water demand for farmland irrigation by digging some small and medium-sized flat ponds. After the reign of Taizong Emperor, the government excavated ponds of different scales on the Nangbeiyang Plain, such as Zhuquan, Yongfeng, Lixun, Hengtang, Guoqing, and Xieyang. The largest pond could irrigate 5,000 mu (15mu=1ha.) of farmland, and the smallest one about 1,000 mu. These ponds were well-known throughout the country at that time, but they were small in scale and limited in water storage capacity, and thus incapable of preparing for drought. In case of drought, the people would still inevitably suffer from displacement.

After the mid-Tang Dynasty, water development in Putian entered a new stage. During Jianzhong period (780-783), Wu Xing, a native of Putian, began to build dikes and reclaimed land from the sea, and stacked stones in the lower reaches of Yanshou River, forming Yanshoubei, which diverted water northward to irrigate farmland in hundreds of hectares. It was the beginning of the construction of dikes to block water flow and the large-scale utilization of rivers to irrigate farmland by Putian ancestors^[2]. It can be seen that Yanshoubei is a relatively complete comprehensive water conservancy and irrigation pivotal project built on the Nangbeiyang Plain in the mid-Tang Dynasty. During Yuanhe period (806-820), Pei Ciyuan, a local government official, built dikes in Nanyang, reclaimed land from the sea, built weirs to store water in Hongquan Palace which was 10 km to the east of Putian, and organized the people to reclaim hundreds of hectares of wasteland, with an annual harvest of millions of kilograms. So far, the Nangbeiyang Plain had taken shape in the Tang Dynasty, during which water conservancy construction was basically focused on pond building and land reclamation, and it was not until the Song Dynasty (960-1279) that the irrigation system was improved.

2.2 Formation of the basic pattern of two Song Dynasties - the initial presence of the plain

During the period of Five Dynasties and Ten Kingdoms (907-979), Fujian had been in a state of feudal separatism and continual wars with frequent taxes and corvee, depressed economy and miserable life, so there was no further development in water conservancy construction during this period. In Putian area, there were few water conservancy projects except for Taihe Pond^[3]. The founder of Taihe Pond was He Yu, the governor of Putian. He mobilized the masses to excavate Taihe Pond for irrigation and it was discarded and reclaimed into land until Taipingbei was built.

In 977, the second year of Taiping Xingguo in Song Dynasty, Chen Hong presented Quan Prefecture and Zhang Prefecture in his charge and 14 counties under the jurisdiction, since then Putian

has been included in the territory of Song Dynasty. In Song Dynasty, the economic focus gradually shifted southwards, and thus the economy and culture in Putian became increasingly prosperous. From 977, the second year of the Taiping Xingguo to 1297, the second year of Xiangxing in Song Dynasty, the ancestors of Putian further exploited the rivers to irrigate farmland through the dams built, and on the basis of their predecessors, they built Nan'an Pond^[4], Taiping Pond^[5], Shihua Pond^[6] and Mulan Pond^[7] on Qiulu River, Yanshou River and Mulan River. On the one hand, the ditches were excavated to draw water from the rivers to irrigate farmland, covering the Nanbeiyang Plain and benefiting thousands of hectares of farmland. On the other hand, many sluices were built in the coastal areas, such as Yangcheng Sluice, Lindun Sluice, Chenba Sluice, Lupu Sluice and Cishou Sluice, through which water could be drained into the sea in case of water logging disaster.

During the 106 years from 977, the second year of Taiping Xingguo to 1083, the sixth year of Yuanfeng in Song Dynasty, the ancestors in Putian built Mulanbei, Sihubei, Taipingbei and Nan'anbei on the three major rivers of Mulan, Yanshou and Qiulu, benefiting farmland of more than thousands of hectares. During Shaoxi period (1190-1194), or the reign of Guangzong Emperor, there were 51 named small ponds in Putian^[8]. According to the Xinghua Fu zhi, there had been 685 dams in Futian County and Xianyou County in the second year of Chunyou (1242). In addition to the ancient dams that irrigated farmland of hundreds of hectares, there were also some famous dams such as Dubei, Baiyebei, Guanyangbei, Suyangbei, and Baicongbei. These water diversion projects are the main water conservancy facilities in the history of Putian, which have played significant roles in reclaiming and cultivating the Xinghua Plain, irrigating farmland in the vast mountainous areas, developing agricultural production and prospering the social economy.

2.3 Water conservancy construction in the Yuan Dynasty - improvement in Beiyang

In 1315, the second year of Yanyou in Yuan Dynasty, Guo Duo'er and Zhang Zhongyi, the heads of Xinghua, built Wanjinbeimen (an inlet sluice) on the left bank of Mulanbei, and excavated the canal into the Beiyang and joined the Yanshou River, expanding irrigated farmland by hundreds of hectares, and enhancing drought resistance. The waters of Nanyang and Beiyang were connected, so when the north canal of Mulanbei was excavated, the water of Mulan River was conveyed to irrigate the farmland in Beiyang, resulting in the gradual discarding of the ponds in Beiyang. It was regulated that three-tenths of water from Mulan River was used to irrigate Nanyang, and the rest was conveyed to Beiyang. The three major water systems in Beiyang were connected, with the Mulan River converging with the Yanshou River and the canal from Taipingbei on the Qiulu River.

2.4 Construction of seawalls and expansion of ditches in Ming and Qing Dynasties and the period of the Republic of China

The ditches in the Nanbeiyang water systems gradually developed and formed, the farmland system was optimized, and wastelands were reclaimed and cultivated; the coastal areas were extensively reclaimed, thus the area of cultivated land was expanded rapidly. In the Ming Dynasty (1368-1644), a great number of water conservancy facilities were repaired, "Dams are built to store water for drought relief in spring, and are opened for ship sailing in autumn".

Putian City enjoys a long coastline. After the Mulanbei was finished by Li Hong during Xining (1608-1077) to Yuanfeng (1078-1085) in the Song Dynasty, the seawall in Nanbeiyang was gradually completed.

In the period of the Republic of China (1912-1949), the water conservancy in Futian County and Xianyou County was not only in a state of disrepair, but also used by warlords, bureaucrats, and tyrannical as the way to extort wealth from people.

In August, 1949, the Communist Party of China took over the power from the Kuomintang in Futian County and Xianyou County in succession, and the government guided farmers to promote agricultural production and develop water conservancy. During the recovery period of national economy from 1949 to 1952, the five dams (Mulanbei, Nan'anbei, Guandubei, Shaobei and Xinfengbei) were repaired for flood protection, the canals were renovated and the dikes were consolidated by heightening and thickening, restoring the benefits of water conservancy projects.

2.5 Putian water conservancy development in modern times

After the founding of the new China, reservoirs and canals were constructed, such as Waidu Canal, Dongzhen Canal and Dongzhen Reservoir, meeting the demand of farmland irrigation in coastal areas beyond Xinghua Plain. In June, 1958, Dongzhen Canal and Dongzhen Reservoir were constructed. Leading directly to Pinghai and Zhongmen, the Dongzhen Canal System consists of one main canal with a total length of 89 km, and 11 branch canals with a total length of 87 km. Constructed in December, 1971, Waidu Canal (total length: 33km) connects Waidu Reservoir and Dongzhen Reservoir.

3. Investigation on water conservancy heritage and present situation analysis

3.1 Constitution of water conservancy heritage

After a long-term of water conservancy construction and land reclamation from sea, three relatively independent water conservancy systems were gradually formed in Xinghua Plain, namely the Nanyang Water Conservancy System with Mulanbei as the hub, the Beiyang Water Conservancy System with Yanshoubei, Taipingbei and Shihuabei as the hubs, and Jiuliyang Water Conservancy System with Nan'anbei as the hub. According to the local conditions, the three-level water conservancy control system consisting of dams, sluices and culverts connected by canals and ditches was constructed.

The types of water conservancy heritage in Putian mainly include: water conservancy projects, bridges, religious buildings (mainly temples to offer sacrifices to Mazu and water conservancy heroes), domestic water facilities (ancient wells, etc.), inscriptions on precipices, and inscription on tablets.

(1) Dam

Dam—the facilities integrating storage, irrigation and drainage on the river, playing an important role in water diversion. There are a large number of dams in Putian.

The four large dams (Mulanbei, Shihuabei, Nan'anbei, Taipingbei) in the Xinghua Plain irrigated 138,000 mu (about 9,204.6 hectares) of farmland, accounting for 66% of the area of irrigated farmland in the original Putian County, and 45% of the total irrigated farmland in Putian City.

(2) Sluice

Sluice: it is used to drain off the water in the ditches and control the water surface elevation by shutting down for water storage.

Culvert: for assisting sluice to drain off the water at narrow places, including wood-made culvert and stone-made culvert, of which the former is smaller than the latter. Culvert construction norm was set in ancient times.

Ditch: It is invented and regulated in Zhou Dynasty. For the dam built to store water, ditches were excavated to convey water for irrigation.

Culvert: it is the threshold of water conservancy system, and a facility causing ownership disputes and water stealing. One main responsibility for the officers was to confirm the official culverts to prohibit water stealing.

3.2 Investigation on water conservancy heritage

Through the screening of the third national survey of cultural relics in Putian, combined with the water conservancy annals and historical materials of Putian in all previous dynasties, a total of 157 relevant water conservancy heritages in Putian were selected:

Classification according to district and county: 39 in Xianyou County, 18 in Chengxiang District, 54 in Hanjiang District, 20 in Licheng District and 26 in Xiuyu District.

Classification according to the categories: 30 water conservancy projects, 41 bridges, 60 religious buildings (mainly temples to offer sacrifice to Mazu and water control heroes), 22 domestic water facilities (ancient well, etc.), 3 inscriptions on precipices, 1 inscription on a tablet.

Classification according to the protection level: 2 national key cultural relics protection units (Mulanbei and Zhenhai Dike), 4 provincial cultural relics protection units (Yanshou Qiao, Gongxi

Palace, Ninghai Bridge, Pinghai Tianhou Palace), 57 municipality and county level cultural relics protection units, and 94 heritages without rating.

Classification according to the time: 8 in Tang Dynasty, 32 in Song Dynasty, 5 in Yuan Dynasty, 17 in Ming Dynasty, 78 in Qing Dynasty, 4 in the period of the Republic of China, and 13 in modern times.

4. Conclusion and suggestion

Water conservancy development is the main line of urban development in Putian. The water conservancy project system, represented by Mulanbei, is the embodiment of the supreme civilization and wisdom on water control of the Chinese ancestors. The geographical pattern of “80 percent of the lands are mountains, 10 percent water and the rest 10 percent farmland” forced Fujian ancestors to reclaim wasteland from the mountains for food, and from the coastal shoals for land. The large-scale development of the coastal plain in Putian began in the middle of the Tang Dynasty and was basically completed by Yuan and Ming Dynasties. This development process was mainly marked by the construction of water conservancy and land reclamation from sea. The construction of water conservancy constituted the main line of the development history of Putian Plain.

The type and time-space distribution of Putian water cultural heritage are confirmed by the course of historical development.

Acknowledgments

This work was supported by IWHR Research& Development Support Program (JZ0145B572016).

References:

- [1] WANG Shao-hong, ZENG Cong-sheng, et al. The genesis and paleogeographical environment of the Xinghua Plain in Fujian Province [J]. *Journal of Geographical Sciences*, 1991, 46 (3): 341-342.
- [2] Fujian Local Chronicles Compilation Committee. *Bamin Tongzhi* [M]. Fuzhou: Fujian People's Publishing House, 1990: 493
- [3] Fujian Local Chronicles Compilation Committee. *Bamin tongzhi* [M]. Fuzhou: Fujian People's Publishing House, 1990: 495.
- [4] CHEN Yang-chi. *Putian shui li zhi* [M]. Taipei: Cheng Wen Publishing Co., Ltd., 1974: 265
- [5] CHEN Yang-chi. *Putian shui li zhi* [M]. Taipei: Cheng Wen Publishing Co., Ltd., 1974: 249
- [6] ZHOU Ying & HUANG Zhong-zhao. *Chong kan Xinghua fu zhi* [M]. CAI Jin-yao & DIAN Xiao. Fuzhou: Fujian People's Publishing House, 2007: 1358
- [7] CHEN Yang-chi. *Putian shui li zhi* [M]. Taipei: Cheng Wen Publishing Co., Ltd., 1974: 124
- [8] CHEN Kang, ZHONG Wen, & ZHANG Chen-shi. *Yongle dadian fangzhi jiyi: Volume 1* [M]. Beijing: Zhonghua Book Company, 2004: 1116-1122