



## Interaction between Water and City: Historical Legacy and Transformation of The City of Ji'ning

Lu Guo\*,

\* Assistant Professor, School of Architecture, Tsinghua University, Beijing, China, guo\_lu@126.com

Ji'ning is a famous historic city with a long history and deep cultural accumulation in Shandong Province, China, which was facing serious environmental problems and cultural crisis due to large-scale industrial production and coal mining in recent decades. It is necessary to study the historical legacy of Ji'ning in a scientific way, to excavate its context and characteristics, and furthermore to learn from the legacy and explore the way of urban transformation and development. Firstly, the historical context of the city development of Ji'ning is teased out to excavate its driving force. Secondly, the mechanism of the interaction between city and water is excavated with Canal Cultural Period as an example. Based on this, the enlightenment from the historical legacy to the sustainable future of the contemporary city is declared as a conclusion.

**Keywords:** Legacy, Transformation, Sustainable future, Water, the Grand Canal

### Introduction

The city of Ji'ning is located in the southwest of Shandong Province, China. Governing 2 administrative districts, 2 functional areas, 2 county-level cities and 7 counties, it covers an area of 11,187 square kilometers with the population of 8,354,400. The "Ji'ning" discussed in this paper refers to Rencheng District where the administrative center locates, which is also the site of ancient Ji'ning County. Rencheng District covers an area of 651 square kilometers with the population of 1,010 thousand and it's the core region of the city of Ji'ning (Figure 1). People have lived in Ji'ning since Paleolithic period. (Figure 1) After the opening of the Grand Canal in the Yuan Dynasty (1271-1368), it has been an industrial and commercial city with prosperous economy and social culture because of the unique position as the center point of the canal. Ji'ning is a city with long history and profound civilization accumulation. However, in recent decades, a large-scale of industrial production and coal mining have been conducted in Ji'ning, which cause severe problems such as environment pollution and aging industry. The regional cultural characteristic that is accumulated and formed in history is blurred gradually and the urban development is facing the transformation. In 2014, the whole application for world inheritance of the Grand Canal got a success. The value of Ji'ning's history and culture, on the one hand, has been fully affirmed and highlighted. On the other hand, higher requirements have been raised in terms of legacy protection and transformational development of city. That inspires us to study further the historical legacy of Ji'ning with scientific methods to explore the historical context and analyze the characteristics of the development of the city. Based on this, we could get further reference from historical legacy for the development of modern city and then explore the path of city's transformational development.

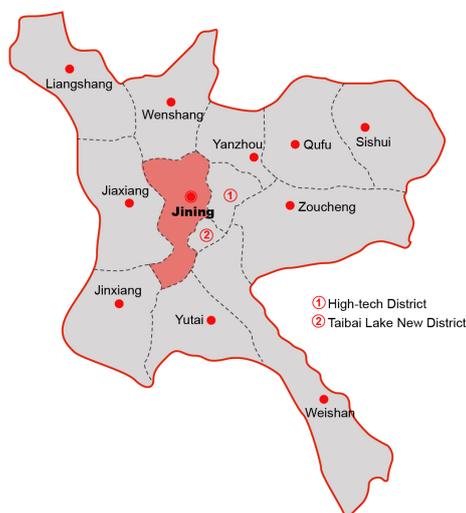


Figure 1 Location of Ji'ning and administrative division of the city of Ji'ning



### **The urban development historical context of Ji'ning: motivated by interaction between city and water**

The history of urban development of Ji'ning could be divided into four stages broadly: prehistoric culture period, Lu culture period (Western Zhou to Song Dynasty, about 11<sup>th</sup> century BC - 13<sup>th</sup> century AD), Canal culture period (Yuan Dynasty to Qing Dynasty, about 13<sup>th</sup> century - 19<sup>th</sup> century) and Industrial civilization Period (20<sup>th</sup> century-). People have lived in Ji'ning since Palaeolithic period. A large number of early settlement sites had been founded in Ji'ning and surrounding areas, including several cultural types including Beixin, Dawenkou, Longshan and Yueshi. Tales of several legendary tribal leaders and sovereigns such as Chiyou[蚩尤], Shaohao[少昊] and Great Yu[大禹] are also spread widely nowadays in that region. Started early, the culture there was prosperous and highly diverse. Ji'ning was Rencheng State in the Pre-Qin Period. After the unification of China in Qin Dynasty (221-207BC) this area was divided into Rencheng County and Kangfu County. That was kept basically until the Southern Song Dynasty (1127-1279). During this period the main functions of Ji'ning was politics and military. It was an important part of Lu Cultural Region that took Qufu as the core. Respecting Confucianism, valuing rite and observing order were highly appreciated. After Yuan Dynasty (1271-1368), with the opening of the Grand Canal, Ji'ning, as the center point of the Grand Canal, entered its meridian period of urban development. The commercial economy was more and more flourishing, "The goods and money from Yangtze River and Huaihe River areas are all gathered there". The social culture became richer and more diverse, "Different culture from different regions is converged", "People don't depend on the agricultural production but commodity. They speculate and earn money"<sup>1</sup>. The regional culture was converted into Canal culture which was open and attached great importance to commodity from Lu culture which was plain and respected agriculture. The modern Ji'ning is a traditional industrial city depending on resource exploitation. The industrial culture has been the main body of regional culture. The industrial and mining enterprises are everywhere and lead the urban development.

From further analysis of the driving power of urban development and evolution in each stage, we can find that the interaction between water and city is the main driving power going through the whole process of the history of urban development. The interaction between water and city forms a multilevel regional space as a whole. Since the ancient times, Ji'ning has been a region with serried water network. In early stage of regional development, people took advantage of the natural water resources simply for agricultural production and everyday life; then artificial water system came on stage gradually and large-scale water projects were built; in modern times, coal mining has caused large-scale subsidence waters. The natural landscape changes continuously. The human settlement is also in the process of gradual development: the earliest primitive settlements developed into a political and military center of a region, and then became a prosperous commercial city. Now it's a traditional industrial city which is in the process of transformation. The urban space, with the interaction between people and water, is gradually formed and developed throughout the long history.

#### **(1) Prehistoric culture: well- developed natural water system system and emergence of original settlements**

The archaeological survey and research show that the southwest of Lu where Ji'ning locates was a region with alternated rivers and lakes and thick forests from ancient times<sup>2</sup>. The ancient people took advantage of the rich production and living resources provided by natural environment. They farmed and inhabited there, and also hunted for animals and fish. The early settlements sites distribute widely in Ji'ning, including Sigudui site, Chengziya site, Fenghuangtai site, Shihai site, Pipashan site, Yihe site and Danggudui site. These sites belonged to several different historical period and cultural types, such as Longshan and Dawenkou.

#### **(2) Lu culture (Pre-Chin—Song Dynasty): artificial water system involved and development of the city**

Though, there were always a great numbers of rivers and lakes in Ji'ning and the water resource was rich throughout the history, the water system changed greatly in different historical periods influenced by Yellow River. In Spring and Autumn Period(770-476 BC), people tried gradually to make the human power involed in natural environment and communicated the natural water system with artificial canals. For example, In 483BC, King Fuchai of Wu (reigned 495-473 BC) excavated canal to communicate Jihe River and Yihe River<sup>3</sup>; in 12th year of Yonghe in Eastern Jin Dynasty (356), Xun Xian (322-359) excavated the Guanghe River<sup>4</sup>; in 4th year of Taihe in Eastern Jin Dynasty (369), General Huan Wen(312-373) excavated the Huangong Ditch<sup>5</sup>; in 4th year of Kaihuang in Sui Dynasty (581AD), the Fengyan Ditch was excavated<sup>6</sup>. (Figure 2)

The artificial canals improved the convenience of water transport of this region and the advantage of geographical location of Ji'ning had also been enhanced. In 'Note on the Wall of Rencheng County's Hall' of Li



Bai(701-762), it is recorded that “There are 11 counties in the area of Lu. Among them Rencheng is the most strategically important section.”<sup>7</sup>The city developed gradually with the political and military function.

**(3) Canal culture ( Yuan Dynasty—Qing Dynasty): the opening of the Grand Canal and the prosperity of the whole region**

From the Yuan Dynasty, along with the excavating of the Grand Canal, a series of relevant large-scale water projects were pushed, which made the rivers and lakes as well as the terrain of the whole region changed greatly. In 20th year of Zhiyuan in Yuan Dynasty (1283AD), the Jizhou River was excavated; in 26th year of Zhiyuan (1289AD), the Huitong river was excavated. The two rivers were further dredged during the period of Yongle in Ming Dynasty(1403-1424).

The opening of the Grand Canal made Ji'ning an important node on north-south communicating artery of China. Ji'ning was located at the center point of the Grand Canal, from where “one could reach Yangtze River and Huaihe River areas in south and Zhanghe River and Wei Area in north. The land and water communications gather here, which makes it a very important region”<sup>8</sup>. In 4th year of Xuande of Ming Dynasty (1429), the court raised the tax of 33 counties to increase the income of the central government. They were mostly well-known industrial and commercial cities with prosperous economy, such as Suzhou, Yangzhou and Yingtian(Nanjing), and Ji'ning was one of them, which indicates that Ji'ning was already one of the important economic centers of the whole country<sup>9</sup>. From the Yuan Dynasty, the commercial economy of Ji'ning rised rapidly and the whole region was very prosperous. However, in the 5th year of Xianfeng in Qing Dynasty (1855), the Yellow River moved northwards and grabbed the waterway of Daqing River into sea. The Grand Canal was cut off and Ji'ning was declined gradually. (Figure 2)

**(4) Industrial civilization (modern times): surrounding land subsidence and the limitation to regional development**

Since 1950s, Ji'ning has been an important coal base in China. Long-term coal mining caused dozens of environment problems, the most severe one of which was the large-area land subsidence. Until 2010, the area of land subsidence in the City of Ji'ning is about 23,500 ha, which accounts for 2.1% of the total land area.<sup>10</sup> It is preliminary estimated that the collapsed area will be over 270,000 ha in 2050, which accounts for about 24% of the total land area and 50% of the cultivated area.<sup>11</sup> The urban construction land of Ji'ning will be surrounded by large-area water formed by land subsidence. (Figure 2)

The coal minning industry had accelerated the economic development of Ji'ning, but also caused serious problems: the water pollution spreads; the communication facilities and the infrastructure of water and transportation are damaged; a great amount of farming land and construction land is eroded. All of these problems threaten the regional ecological security and restrict the urban development greatly.

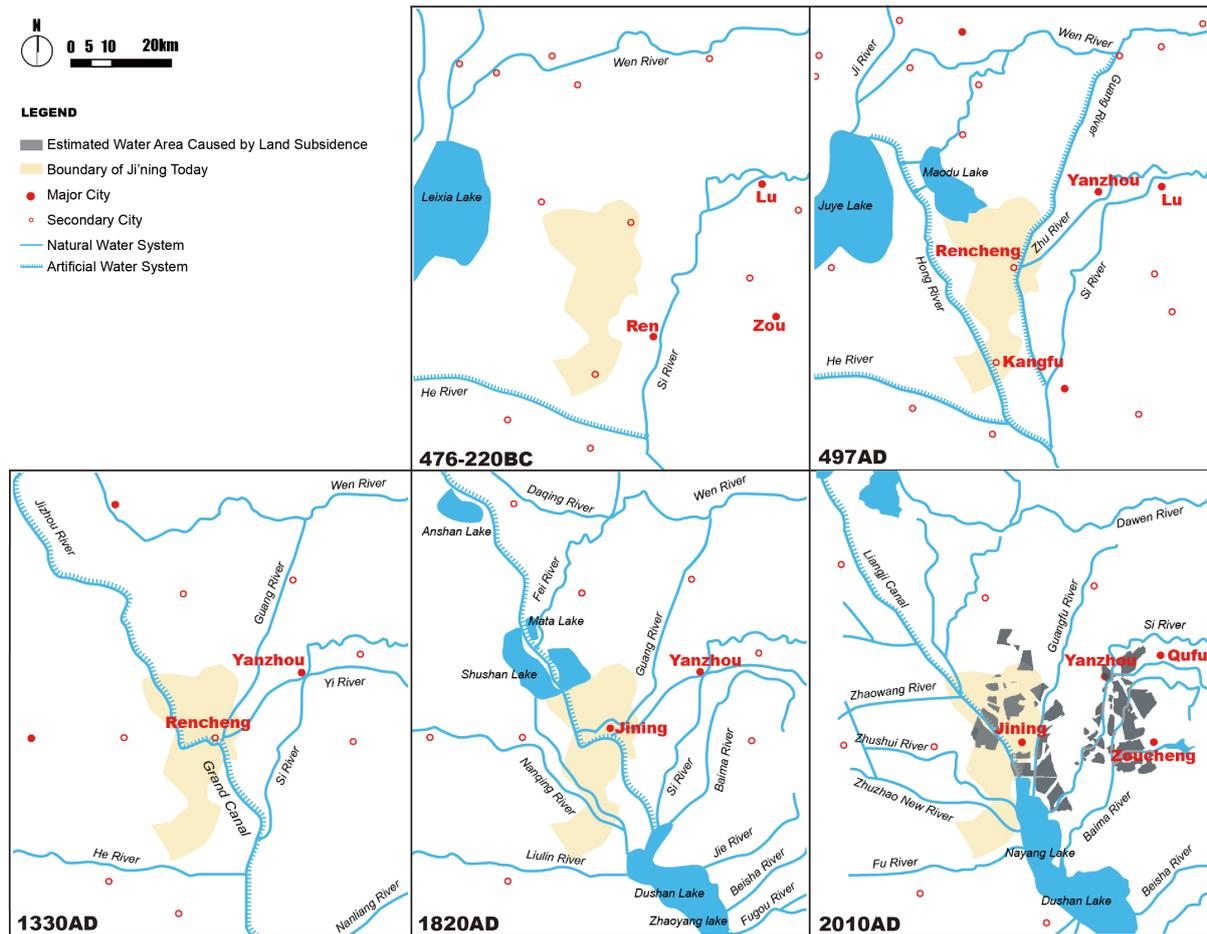


Figure 2. Evolution of the water system of Ji'ning area

**Typical characteristic of Ji'ning's historical and cultural legacy: multilevel region with the canal as the core**

Ji'ning has formed a series of colorful cultural landscapes in different historical periods. The canal culture period from Yuan to Qing Dynasty was the peak period of urban development, which shaped the main characteristics of the historical and cultural legacy of Ji'ning city. Through the analysis of this historical cross section, the mechanism of the interaction between the city and water can be deeply excavated, and the characteristics of the history and culture of Ji'ning city can be better understood. The excavation of the canal is the modification of the natural environment by man power, based on which, the urban and rural system, urban form, streets and buildings produced a full range of evolution and formed a multilevel region with the canal as the core.

**(1)Enrichment and development of urban and rural system**

The excavation of the Grand Canal had driven the formation and development of the urban and rural system in Ji'ning and surrounding areas.

On the one hand, the Grand Canal promoted comprehensive development of cities, towns and villages. Convenient water transportation promoted the prosperity of regional commercial economy. The original town scale expanded rapidly and the population increased. Nanyang, a town to the south of Ji'ning had become "a large town of over 3,000 families" from "a tiny town of 12 families"<sup>12</sup>. A large number of emerging commercial towns had sprung up on the basis of water-gates and docks, such as Liulin Water-gate, Tongji Water-gate. They had all become small settlements "with hundreds of families"<sup>13</sup>. At the same time, since the Ming Dynasty (1368-1644), in the need for grain transportation and canal management, the government stationed troops in the Ji'ning area and set up Tuntian, i.e. open up wasteland and grow food grain, which gradually evolved into towns and villages later and became new elements of the regional urban and rural system. (Figure 3)

On the other hand, the canal linked these towns and villages to an organic network. As a transport artery, the canal connected towns alongside to be a transportation and economic community; at the same time, the



governance of the canal, such as the management of springs and the dredging of the channels, also required the overall cooperation among cities, towns and villages in the region to complete<sup>14</sup>, which strengthened the communication and connection among them.



Figure 3. Ji'ning and the towns along the canal in Qing Dynasty

## (2) The expansion and evolution of urban form

The excavation of the canal also led to the evolution and change of the urban form of Ji'ning.

On the one hand, the city crossed the limitation of city wall and water system around and approached the direction of the Grand Canal. The docks and water-gates had become the gathering point of business and manufacture in surrounding areas. Guanxiang Areas [the neighborhood outside the city gate] developed rapidly. The Tianjing Water-gate and Zaicheng Water-gate to the south of Ji'ning were extremely important, which accelerated the Southern Guanxiang Area to be a newly developed area in a short time that was prosperous in business, comprehensively functional and culture flourishing. Other Guanxiang Areas developed in different degree according to the different space relationships with canal water-gates. (Figure 4, 5)

On the other hand, driven by aggregation effect of docks and water-gates, the function and form of the city also changed on the original basis. In the south of the city, "All kinds of goods gather here and travelling traders come and go". The economy was developed and industry and commerce were gathered. In southwest of the city, "There are many people who imitate the Pear Garden"<sup>15</sup> and "gamble together". The habitants were almostly businessmen and craftsmen since the Grand Canal passing through this area. In northeast, most people were soldiers because the commanding agency of Ji'ning Guard in Ming Dynasty, "many people living there like drinking". The northwest was far from the canal and got the least effect, and was a sparsely populated area.<sup>16</sup>

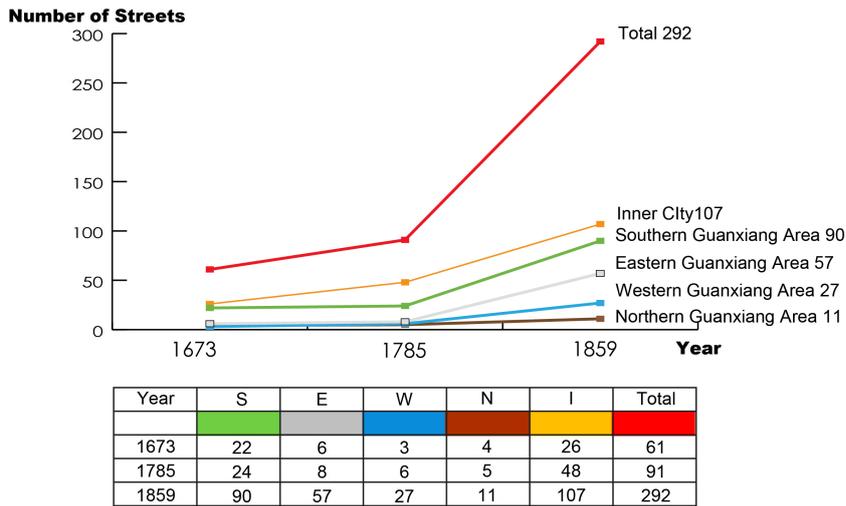


Figure 4. The number changing of streets and lanes of Ji'ning in Qing Dynasty based on the data from the Ji'ning Prefecture Annals in 1673,1785 and 1859

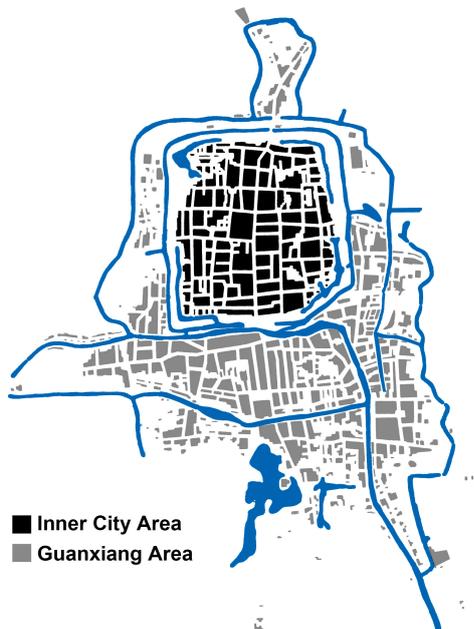


Figure 5. Space form of Ji'ning city in the republic of China (1927)

### (3)The intigration and change of streets and buildings

The opening of canal brought the economic development and cultural communication. It also drove the change of city streets and construction.

On the one hand, the forms and functions of city streets were affected by the canal. The Grand Canal crossed the city and the street space and water were tightly integrated. Until now, there are still many streets named after bridges, docks and river ports, like Yuehebei [Cross Canal North] Road, Shunhemenwai [Along the Canal and Outside of the Gate] Street, Hewan [River Bend] Street. At the same time, the commercial development relying on grain transportation formed unique along-canal streets with specific industries, like Zhugan [Bamboo Pole] Lane, Guozi [Dessert] Lane and Pifang [Cobbler Workshop] Street.

On the other hand, due to the cultural and technical communication brought by the Grand Canal, the buildings of Ji'ning were fitted with southern characteristic on the foundation of traditional northern architectural style. Temples stand facing the canal and houses were constructed along the water, which are the typical forms of the buildings in the Yangtze River delta. At the same time, these buildings were stable and thick which was the nature of the northern architecture. Though the shops mostly have Yingshan [flush gable] roof which was



common in the North, the wind-window loft style buildings, which were the typical southern style, were also not unusual on streets. (Figure 6)



Figure 6. The traditional commercial street: Bamboo Lane

### **Conclusions: The inspiration to modern transformation development from historical legacy**

On the basis of the study of urban development driving force and functional mechanism, we can get the inspiration to modern transformation and development from historical legacy.

First of all, historical legacy is the cultural base for the survival and development of the city, the reasonably and effectively protection of which is the first step for transformation development. On the one hand, as a cultural city with long history, the historical legacy of Ji'ning is not only indicated in Canal culture, Prehistoric culture and Lu culture had also left rich heritage. All of them formed the complete process of city development. We should extend the range of legacy protection and take consideration of the cultural legacy various historical periods as a whole. Meanwhile, Canal culture is the peak of Ji'ning historical culture and it has very important value, which was reflected in the multilevel whole region with canal as the core. Therefore, the protection of the canal legacy should not be limited to the canal only, but expanded to the integrated system of city and natural environment. The legacy protection, water system governance as well as the city environment improvement and optimization could be combined as comprehensive strategy.

At the same time, the mechanism and characteristic of Ji'ning urban development in history are rooted in the region. They are the fruits of wisdom accumulation for hundreds of years and still have enlightening significance to transformation development nowadays. On the one hand, the development of Ji'ning in history was driven by the interaction between water and city. We still have to pay attention to the relationship between water and city. Starting with solving the contradiction between people and water, different methods such as ecological management and landscape shaping could be applied comprehensively to improve the destroyed natural environment and restore the positive interaction between people and water. On this basis, industry upgrading and culture development could be promoted and the urban development would be pushed into a reasonable developing circuit again. On the other hand, the interaction between water and city not only had an effect on the two sides along the canal or within the city wall, but also influenced both the urban and rural area and created a multilevel region as a whole. In the modern times, since the city construction scale is becoming larger and larger, it is even more important to view the regional space as a whole. The approaches of transformation development of Ji'ning should not be limited in the planning and construction of city, but be extended to the comprehensive creations in the region, the multi-scale and multilevel planning and constructions of the region, city, city districts, streets and buildings should be considered as a whole to improve the quality of inhabitant environment completely.

### **Acknowledgements**

Supported by the National Natural Science Foundation of China (Grant No.5160829)

### **Disclosure Statement**



No potential conflict of interest was reported by the author.

### Notes on contributor(s)

Dr Lu Guo has a PhD in Urban and Rural Planning from Tsinghua University (China). She is an assistant professor of Urban Planning and Design at School of Architecture, Tsinghua University and Jing Brand Fellow (2015-2016) at Needham Research Institute of Cambridge (UK). Her research and publications focus on the history of urban and regional planning of China

### Endnotes

- 
- <sup>1</sup> MENGLEI CHEN (1650-1751) ed, *GUJI TUSHU JICHENG* [THE COMPLETE CLASSICS COLLECTION OF ANCIENT CHINA] (BEIJING: ZHONGHUA BOOK COMPANY, 1940), ZHIFANG ALLUSION VOLUME 230, YANZHOU, 16.
- <sup>2</sup> YANGJUN HOU, "Archaeological Landform and Environment of the South-western Shandong Area Four Thousand Years Ago", *JOURNAL OF HEZE COLLEGE*, 12(2007) : 132-137.
- <sup>3</sup> ZHAO WEI (204-273), *COMMENTARY ON GUO YU*(SHANGHAI: SHANGHAI GUJI PRESS, 2008), VOL. 19, WU YU
- <sup>4</sup> XUANLING FANG (579-648) ed, *JIN SHU* [BOOK OF JIN], (BEIJING: ZHONGHUA BOOK COMPANY, 2000), VOL. 75, BIOGRAPHY OF XUN XIAN
- <sup>5</sup> IBID. VOL. 78, BIOGRAPHY OF HUAN WEN
- <sup>6</sup> ZHENG WEI (580-643) ed, *SUI SHU* [BOOK OF SUI], (BEIJING: ZHONGHUA BOOK COMPANY, 1973). VOL. 56, BIOGRAPHY OF XUE ZHOU
- <sup>7</sup> YOUHENG LIAO ed, *Ji'NING ZHOU ZHI* [JI'NING PREFECTURE ANNALS](1673), VOL. 8, YIWEN [LITERATURE]
- <sup>8</sup> ZONGGAN XU ed, *Ji'NING ZHILI ZHOU ZHI* [JI'NING PREFECTURE ANNALS] (1859), VOL. 2, FANGYU [HISTORICAL GEOGRAPHY]
- <sup>9</sup> *MING SHILU* [VERITABLE RECORDS OF THE MING], VOL. 56, GRAIN TRANSPORTATION.
- <sup>10</sup> JI'NING BUREAU OF LAND RESOURCES, *Ji'NING LAND RECLAMATION PLAN (2011-2015)*.
- <sup>11</sup> JI'NING URBAN AND RURAL PLANNING BUREAU, *Ji'NING MASTER PLAN (2008-2030)*.
- <sup>12</sup> QIAN TAN(1593-1658), *BEI YOU LU* [NORTH TOUR RECORD] (1653-1656) (BEIJING: ZHONGHUA BOOK COMPANY, 1960), 141.
- <sup>13</sup> IBID.
- <sup>14</sup> BOXING ZHANG(1651-1725), *JUJI YIDE* [THE FEELING OF LIVING IN JINING], (BEIJING: ZHONGHUA BOOK COMPANY, 1985), VOL. 4, DREDGE RIVERS.
- <sup>15</sup> The Pear Garden was the first known royal acting and musical academy in China founded during the Tang dynasty by Emperor Xuanzong (712 – 755). It is an example of a historically early institutional academy of music.
- <sup>16</sup> DELIN HU ed, *Ji'NING ZHILI ZHOU ZHI* [JI'NING PREFECTURE ANNALS](1785), VOL. 2, STREETS AND ROADS.

### Bibliography

- Menglei, Chen (1650-1751) ed, *Gujin Tushu Jicheng* [The Complete Classics Collection Of Ancient China]. Beijing: Zhonghua Book Company, 1940.
- Xuanling, Fang (579-648) ed, *Jin Shu* [Book Of Jin], Beijing: Zhonghua Book Company, 2000.
- Yangjun Hou, "Archaeological Landform and Environment of the South-western Shandong Area Four Thousand Years Ago", *Journal Of Heze College*, 12(2007): 132-137.
- Delin, Hu ed, *Ji'ning Zhili Zhou Zhi* [Ji'ning Prefecture Annals] (1785).
- Youheng, Liao ed, *Ji'ning Zhou Zhi* [Ji'ning Prefecture Annals](1673)
- Qian, Tan (1593-1658), *Bei You Lu* [North Tour Record], Beijing: Zhonghua Book Company, 1960.
- Zhao, Wei (204-273), *Commentary On Guo Yu*, Shanghai: Shanghai Guji Press, 2008.
- Zheng, Wei (580-643) ed, *Sui Shu* [Book Of Sui], Beijing: Zhonghua Book Company, 1973.
- Zonggan, Xu ed, *Ji'ning Zhili Zhou Zhi* [Ji'ning Prefecture Annals](1859)
- Boxing, Zhang (1651-1725), *Juji Yide* [The Note of Living in Jining], Beijing: Zhonghua Book Company, 1985.

### Image sources



## The 18th International Planning History Society Conference - Yokohama, July 2018

---

Figure 3: Drawn by the author based on *Bei You Lu [North Tour Record]* of Qian Tan(1593-1658), the base map is part of the Map of Yanzhou in *Shandong Annals*(1735).

Figure 6: MEIRONG SUN ed. *Ji'ning Wenwu Guji [Historical Sites and Cultural Relics in Jining]*(BEIJING: CULTURAL RELICS PUBLISHING HOUSE, 2009), 176.