

Economic Development and Water Utilization in China: A Tale of Two Cities

Jia LI[▲], Tomohiro AKIYAMA^{*}

(International Center for Chinese Studies, Aichi University)

1. Introduction

This study aims to examine the interaction between economic development and water utilization in China. Avoiding the hydrological analysis, the present study focuses on the relationship between various macroeconomic indicators and water utilization. Especially, the study intends to explore the relationship between past development strategy and current water shortage by examining the evidence from two cities, i.e., Jinchang and Zhangye.

2. Economic Development and Water Utilization in China: National Evidence¹

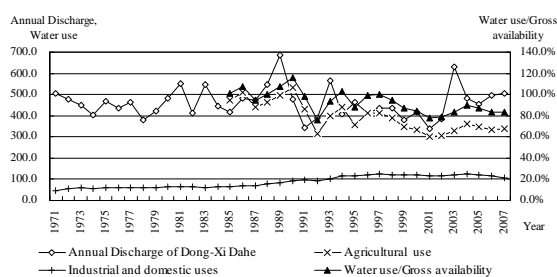
3. A Tale of Two Cities: Evidence from Jinchang and Zhangye

3.1 Water Availability and Use in Jinchang and Zhangye

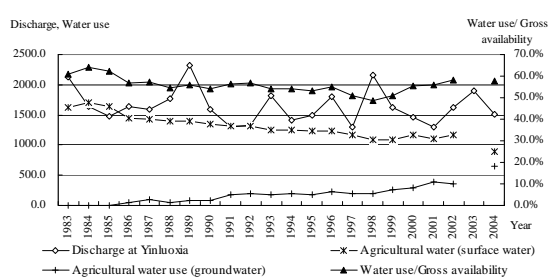
Figure 1 presents changes in water availability and water use in Jinchang and Zhangye.

Figure 1 Jinchang and Zhangye: Water Availability and Water Use (Unit: million m³, %)

A: Jinchang



B: Zhangye



Notes: Gross water availability of Jinchang is 537.4 million m³ (field interview). Gross water availability of Zhangye is 2.7 billion m³ (*Gansu Yearbook*, 2007: 207).

Sources: In the case of Jinchang, authors' field interview conducted in The Bureau of Water Resources of Jinchang (*Jinchang shuiliju*), September 17th, 2008. In the case of Zhangye, Chen (2007: 141).

In the case of Jinchang, it is clear that annual discharge of Dongdahe and Xidahe has not

^{▲*} International Center for Chinese Studies, Aichi University. Corresponding author: Jia LI. E-mail: lijia@aichi-u.ac.jp. This study is the result of a fieldwork conducted by the two authors during September 13-24, 2008. The original fieldwork was conducted in two northwestern provinces in China, i.e., Gansu and Inner Mongolia.

¹ Section 2 is omitted due to the limitation of length.

changed much since 1970s despite the annual fluctuations. From the demand-side of water, during the period 1985-2007, total water use in Jinchang had stabilized at 525.3 million m³ until 1999, and declined to 448.9 million m³ since then. Exactly, agricultural use of water had declined from 474.2 million m³ in 1985 to 339.2 million m³ in 2007, while industrial and domestic uses of water had increased from 45.0 million m³ in 1971 to 107.6 million m³ in 2007.

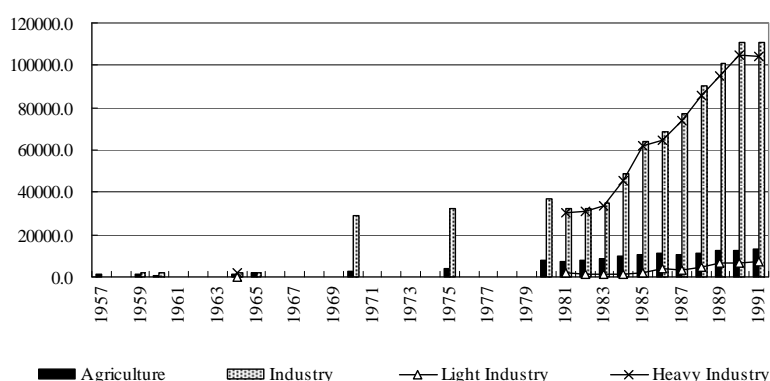
In the case of Zhangye, annual discharge at Yinluoxia Dam has been fairly stable since 1983 despite the fluctuations. From the supply-side of water, during the period 1983-2004, total agricultural water use has declined slightly. Surface water had dominated the agricultural water use, while the groundwater water had increased sharply since the early 1990s.

Regarding the ratios of water use, Jinchang had continuously fallen into the environmentally overexploited range during whole sample period with an average of 92.8 percent. Zhangye had fallen into the comfortable range after 1985, but continuously at the verge of environmentally overexploited range with an average of 55.8 percent over the period.

3.2 Jinchang: Mining of Natural Resources and the Construction of Industrial City

Jinchang is a typical mining city established and developed accompanied by the exploitation of nickel mine. As shown in Figure 2, industry, especially heavy industry has attained remarkable growth since the late 1950s. Using constant 1980 price, in 1957, the gross output value of industry was RMB 956,000 yuan, less than one tenth of the gross output value of agriculture. Since 1959, the industrial output has outperformed the agricultural output. In addition, during the period 1981-1991, heavy industry had accounted for 95.0 percent of total industrial output on average.

Figure 2 Jinchang: Changes in Industrial Structure, 1957-1991 (Unit: 10,000 yuan, 1980 constant price)



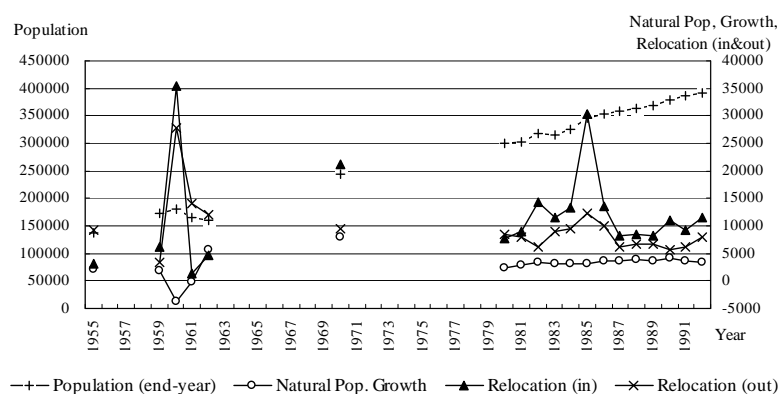
Source: *The Jinchang Chronicles (Jinchang shizhi)*.

One peculiar feature of Jinchang in the process of building an industrial city is the mass relocation of population. Figure 3 depicts the population increase and the relocation of population in Jinchang since 1955. In the years for which statistics are available, the cumulative number of net relocation to Jinchang was 125,516 persons. It accounted for 2.2 times of the natural population growth in the city. Especially, large amount of population had been relocated to Jinchang to support

the development of mining industry.

In 1958, in order to exploit nickel mine, large amount of workers, technicians and managers were relocated from Heilongjiang, Liaoning and Baiyin, Gansu to Jinchang. By the end of 1961, population in the mining district reached 14,317 persons. These people and their families consisted of the main population which formed the urban district in Jinchang. After the establishment of Jinchang city, the government allowed the families of mine workers to change their rural Hukou to urban Hukou (*Nongzhuanfei*). The policy resulted in the considerable increase in the urban population in Jinchang. In the five years from 1982 to 1986, there were 83,212 persons who migrated to the urban area of Jinchang. Meanwhile, in 1958, after the iron mine was discovered in Dongdashan, many workers, technicians, managers and their families were gradually relocated to Hexibao. By 1964, there were 10,348 persons in Hexibao. The number amounted to 36,717 persons in 1982².

Figure 3 Jinchang: Population Increase and Relocation of Population, 1955-1992 (Unit: person)



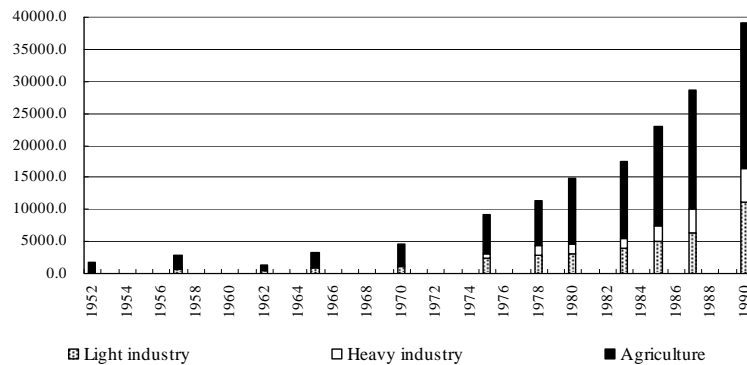
Source: *The Jinchang Chronicles (Jinchang shizhi)*.

3.3 Zhangye: Construction of Agricultural Production Base and Agricultural Development

Different from Jinchang, Zhangye is a typical agricultural city with a long history of agricultural development. As Figure 4 shows that, the economic structure of Zhangye had been agriculture-concentrated during the period 1952-1990. Although the expansion of industry, especially light industry had been remarkable since 1950s, the gross agricultural output had continuously outperformed the gross industrial output. Using constant 1980 price, the gross industrial output had increased from RMB1.7 million yuan in 1952 to RMB 162.9 million yuan in 1990. The gross agricultural output had increased from RMB 15.6 million yuan in 1952 to RMB 228.6 million yuan in 1990.

² *The Jinchang Chronicles*. 1995: 93-95.

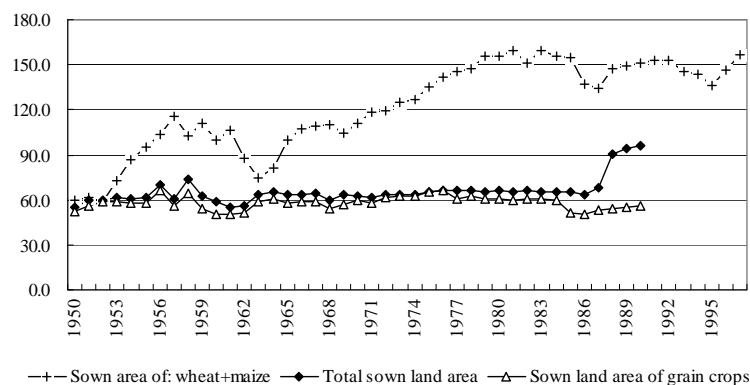
Figure 4 Zhangye: Changes in Industrial Structure, 1952-1990 (Unit: 10,000 yuan, 1980 constant price)



Source: *The Zhangye Chronicles (Zhangye shizhi)*.

The presence of Zhangye as an important agricultural production base has been repeatedly addressed by Gansu provincial government and central government. As a result, huge area of waste land had been reclaimed after 1949. The total cultivated area in Zhangye has increased from 0.9 million mu in 1949 to 3.9 million mu in 2008³. As shown in Figure 5, the sown area of two primary crops in Zhangye, i.e., wheat and maize, had experienced a sharp increase in 1950s, and then a sudden decrease in the three years of natural disaster. After that, the sown area had increased again and finally stabilized at around 1.5 million mu in 1990s. In absolute values, the total sown area of wheat and maize had increased from 0.6 million mu in 1950 to 1.6 million mu in 1996. In addition, using the data of former Zhangye county, it is clear that the total sown land area increased again after 1987 while the sown land area of grain crops had slightly decreased. This suggests that the sown area of cash crops experienced increase after the recognition of Zhangye as a national-level vegetable production base in 1987.

Figure 5 Zhangye: Changes in Sown Land Area, 1950-2003 (Unit: 10,000 mu)



³ Field interview conducted in the Bureau of Water Resources of Zhangye (Zhangye shuiwuju), September 18th, 2008.

Notes: 1. 1 mu=1/15 hectare.

2. The data from *the Zhangye Chronicles* only covers former Zhangye county (currently, Ganzhou district).

Source: In the cases of sown area of wheat and maize, *the Zhangye Crop Chronicles (Zhangye diqu liangshizhi)*, p.38. In the cases of total sown area and the sown area of grain crops, *the Zhangye Chronicles (Zhangye shizhi)*.

4. Concluding Remarks

Using the evidence from two cities, Jinchang and Zhangye, this study revealed the relationship between past economic development strategies and current water stress situation in China. We found that the development strategies lacking long-term visions are attributed to the water shortage in both cities. In Jinchang, the establishment of a city for developing extraction industries since late 1950s had been accompanied by the mass relocation of population to the area wherein water resources can not accommodate so large amount of population. In Zhangye, although the city had a long history of agricultural development, the construction of agricultural production base had been accompanied by the excessive reclamation of waster land. The increase in water consumption induced by the substantial increase of cultivated land consequently resulted in the water shortage in Zhangye and also the conflict between Zhangye and lower reach region of Heihe river basin.

References

- Chen, Jing. 2007. (in Japanese). Water Use in the Middle Reach of Heihe River Basin. In *Chugoku henkyo chiiki no gojunen* (edited by Nakao, Hohbaatar and Konagaya). Toho Shoten. Tokyo.
- Gansu Yearbook (former Gansu Statiscal Yearbook)*. Various years. China Statistics Press. Beijing.
- The Jinchang Chronicles (Jinchang shizhi)*. 1995. China City Press. Beijing.
- The Zhangye Chronicles (Zhangye shizhi)*. 1995. Gansu People Press. Lanzhou: Gansu.
- The Zhangye Crop Chronicles (Zhangye diqu liangshizhi)*. 1999. Gansu People Press. Lanzhou: Gansu.