

Water Resources and Social-Economical Development in China

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(TASAE 2006, TRUKUBA, JAPAN)

Sept. 30, 2006

ABSTRACT

The problems of water resources and water supply related nearly every country of the world. China is one of 13 countries which face the most serious condition in water resources shortages. The water resources must be saved, conserved and well managed, then the water supply will be sustainable. When constructed the hydro-engineering, the eco-systems interaction must be concerned. The cooperation, experiences and fund are the basic aspects for the water resources management.

Key Words: water resources water supply hydro-engineering management

1 Background of Water Resources Problems in China

In 2006, there are some very important events about “water” in Chinese social and economical development:

A fearful drought took place in Chongqing City, the most important city in southwest of China, from July to September this year. The disaster began in the early of July, and was more serious on the late of August. The city, with 32 million

populations, had to face the difficulties: the shortage of water supply for more than 2/3 towns and villages, more than half populations had not got enough drink water temporarily. The directly expenses as the disaster nearly reached to US\$800 million in two months .

Chongqing is only one typical sample with the drought in the media head lines this summer. In fact, there are about 400 cities, in 670 of the whole country, face the same problems, more or less, of water supply. ⁽⁴⁾ According to the statistics, the nation loses about US\$25 billion in industries with the shortage of water supply each year. It was about 1.2% of GDP of year 2004.

The 5th World Water Conference held in Beijing, in the 10th of September, 2006, organized by IWA (International Water Association) and Chinese Government. It is the first time for China, even for Asia, to organize this World Water “summit”. In the conference, the Chinese supper leaders express: It is very important to construct the society which have got the characters of natural resources savings and friendly relationship with environment. The water resources must be saved, conserved and well managed, then the water supply will be sustainable. This showed us that, for the developing country like China, the problems of water resources management and water supply had been very critical.

These problems of water resources and water supply are not only for China, but also for the whole world. According to the « World Water Resources Report» published by the UN, March 13th of this year, the consumed water quantity had increased 6 times in 20 century, but only doubled for the populations at the same time.

There are nearly 1/5 populations (1.2 billion) at the present time in the world who have not got the secure water supply for drinking. Only in 2002, there are more than 3 million people died with uncleaness water in the world. About 90% of them are the children who is younger than 5 years. The report predicted that more than 2/3 population of the world will live in the cities before 2030. Compared with that of 2007's, this rate will only be near to the HALF. It means that the water demand in the cities will magically increase. The critical problem is that the capacity of the water supply we have can not match the need for the water with some limitation like the financial support. The report said that the key link is the effective management for the water resource.

2 The Basic Conditions of Water Resources in China

Generally speaking, compared with the other countries, with the vast land and huge populations, the water resources are very few in China. The fresh water China owned are only about 7%, but they must support the whole Chinese people which are nearly 1/5 populations of the world.

In spatio-temporal, the water resources in China are inconsequence. It will be very clear if we make the comparison like following. We choose 10 countries in 190 which have got the populations over 100 millions, compared some aspects of the country's, like water resources and GDP, etc. From the table-1 we have known that, although the total water resources, $2810 \times 10^9 \text{ m}^3$, the third place, but the water resources for per-person of China, is only 2200 m^3 , just the same with 1/3 of the average level of the world's. It is the 121st place of the 190 countries of the world.

China is one of 13 countries which face the most serious condition in water resources shortages. ⁽³⁾(Table-1)

The other problem is that the water resources spread is disproportion in space.

The statistic showed us: in the north part of China, there are 62.2% of the land areas, 41.7% of the populations, 41.44% of GDP of the whole nation every year, but only 20.11% of the water resources. In the south part of the country, there are 80% of the water resources, but only 37.8% of the land area, 58.3% of the populations, and 58.56% of GDP. Especially for the Huabei plain, it is the main political, economical district of China. Beijing, the capital of the country located in the north of the plain. It only owns 8.05% of the water resources, but 39.7% of the agricultural land of the whole country. ⁽⁵⁾(Table-2)

In the years and the seasons, there are very big differences of the rainfall and snowfall, the water resources in different times all of the country. Monsoon weather is the main reason and source of the water. Dry year by the wet year, dry season by the wet season. In south part of China, about 60% rainfall took place in summer time, from April to July. But in the north, nearly 80% to 90% of the rain concentrated in hot season, from July to September. This so much rain falls in a short time, and 2/3 of the rain often forms “flow” or flooding. It is the disaster, no sense for the water resources.

3 The Problems in Water Resources Management

In the past 30 years, the average speed of the increase of GDP is about >8% in China. It is clear that the industrialization and urbanization will strong impact the social and economical development of the country. And also, the demand for the water

increases very fast. The water consumption like this: 103 billion m³ in 1949, 443.7 billion m³ in 1980, and 554.8 billion m³ in 2004. It is necessary to cultivate the underground water to irrigate the farms. The agricultural production still decrease 35 million tons each year since the water shortages. Further more, there are more than 300 million people have not got enough fresh and clean water in the countryside.⁽⁴⁾

With the over pumped water, the underground water level were far deeper than before in a big areas. According to the reports, the underground water is lower 30m than that of 40 years before in Beijing. This may lead the new disasters.(Figure-1)

The water quality is a serious problem also. One of the reasons for the water pollution is the chemistry in the agricultural production. The chemistry, like N, often used as fertilizer, nearly half part of them flow down and leak into the soil with rainfall. The underground water may be polluted. According to the survey, the test well, in Huabei plain, the content of NO₃⁻ in the underground water increased greatly and reached to 233.33% in the past 25 year, from 42mg/l in 1982 to 140mg/l in 2005. Although the agricultural land had been less than before after 2000, but the water pollution trend is still continuous with some dimness reasons. (Figure-2, Chen Yinghui, 2006)

4 Water Resource Management and Development Strategy

Water resource management is the core for the Chinese people living and development. The drought and flooding had impacted China deeply and for a long time. And also, Chinese people have gained an abundant experiences in dealing with the “water”.

According to the historic book, we have known that Chinese had been fighting with the big flooding and after that established the first dynasty “Xia” in Chinese history about 5000 years ago.

On the Qin dynasty, about 200B.C., “Du Jiangyan” Hydro-Engineering was constructed. It is well known as the Great Magic Hydro-Engineering in the world history. It was evaluated as: with the longest time and only one irrigation engineering without any dam in the world history. (24th World Heritage Conference, UNESCO, Nov.,30, 2000) It can not be imagined that this system are still irrigating more than 1 million hectares agricultural land every year in China now.

“The Great Canal” is the longest manmade river in the world history. The 1782km long canal from Hangzhou to Beijing, in the east part of China, is about 22 times compared with “Panama Canal”. It began at 486B.C., and finished in 1293A.C. at last, nearly lasted for about 1800year. It used to played a very important role in Chinese history as the food transfer channel from south to north. And even at the present time, “The Great Canal” is still to be used not only as the water way, but also as the tour-sites.

With the practices in the long history, Chinese have achieved a lot and formed a mature concept and strategy for the water resources management. The main contents are: dragged the rivers withstand the flooding; to dial with the water resources spread disproportion in spatio-temporal through hydro-engineering, like Dams, reservoir; and further more, in modern times, formed a very important idea “water supply sustainable”, through resolving the water pollution and saving the water in the

social and economical development.

Since 1950s, China had constructed 85 thousands reservoirs. The total capacities for the water supply are about 500 billion m³. And more than 1 million hydro-engineering sites are constructed. China now have got the capacities of water supply 580 billion m³ each year.

In the next 15 years, the country will finish some big hydro-engineering. After that, the government may will have got enough water resources to serve the social and economical development.

5 Discussions

1) In the developing countries like China, hydro engineering is payed more attention to since the fast and clear benefits. But the hydro-engineering, dams, reservoirs, water transfer buildings, etc., have their life time since the sand deposition and the other reasons. So many hydro-engineering were constructed in a short time, we must think about the problem of them, for example, the eco-systems interaction.

2) Compared with the engineering, for the water resources management, the new concepts and experiences are more important. “sustainable water supply” is the key link in the water management through resolving the water pollution and water savings. Exchange ideas, sharing the experiences are not only benefited for the developing countries, but also for the developed countries. “Thinking first, then actions ”

3) The problems of water resources and water supply not only related every country of the world, and also to make all of the countries related from each other because some rivers flow on the different countries and “we only have one globe”. The

cooperation, experiences and fund are the basic aspects for the water resources management.

4) Policies may be the one of the most important factors for the water resources management. The governments and non-governments have the same responsibilities in this field because the driven power will push the water resources management forward, and the POLICIES will organize the people, both of the officials and the common people earnest to resolve the problems in the water resources management.

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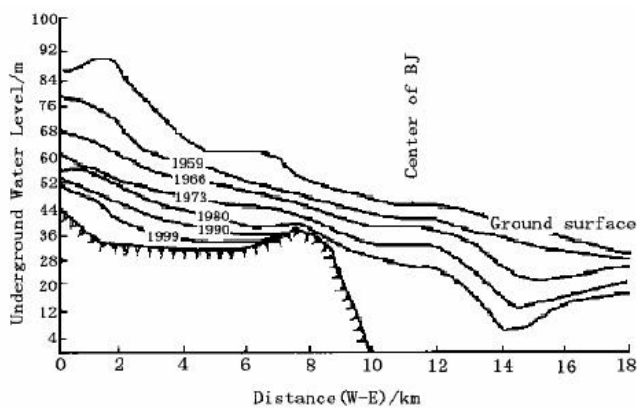


Figure-1 Underground Water Level Changes (1959~1999)⁽⁶⁾

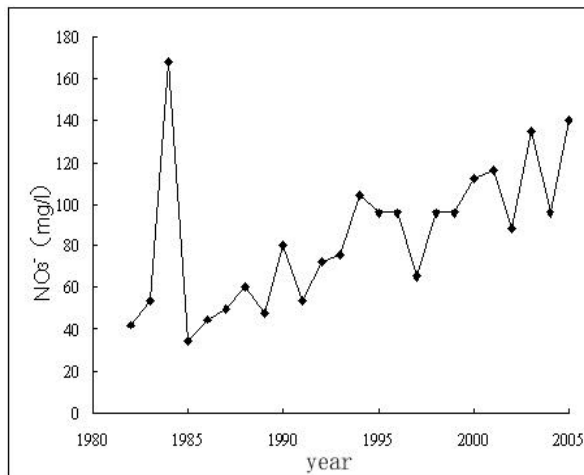


Figure-2 NO₃⁻ Changes in the Underground water

Table-1 Comparison of WR in 10 Countries⁽³⁾

Country	Population (10 ⁸)	W-R (10 ⁹ m ³ /year)	W-R (m ³ /pers)
China	12.76	2800	2194
Pakistan	1.41	429.4	3045
Bengal	1.29	1357	10519
Japan	1.27	547	4307
India	1.28	2085	2044
Indonesia	1.29	2530	12048
Nigeria	1.2	280	2333
Russia	1.44	4498	31236
Brasil	1.7	6950	40882
US	2.83	2478	8756
??	36.2	23954.4	6617

(Note: populations data based on the survey of 2004)

Table-2 Distribution of water resources, arable lands and GDP in the different regions of China⁽¹²⁾

District	WR (10 ¹² m ³)	Population (10 ⁸)	WR-pp (m ³ .pers ⁻¹)	Agri-land (10 ⁷ hm ³)	GDP-US\$ (10 ¹¹)
whole country	2.81	12.85	2189.4	13.00	10.48
N-part	NE	0.15	1.07	1427.0	2.15
	N-1	0.17	3.35	502.5	3.19
	NW	0.22	0.93	2410.3	1.61
S-part	SE	1.28	2.50	5092.8	2.09
	SW	0.93	4.90	1891.3	3.08