

CHINA'S LOOMING WATER CRISES

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Executive Summary

1. Northern China is always short of water for irrigation and drinking. The north suffers from increasing months of droughts even as monsoon plagues China's south. Recent estimates put China's water shortage at about 40 billion cubic meters annually.
2. By 2010 and 2050, China will face a respective water shortage of 100 billion cubic meters and 600 to 900 billion cubic meters per year. China's total water resource in 2006 was 2533 billion cubic meters.
3. China's total water resource was about 2800 billion cubic meters in 2007, 6% of the world's total and fourth in the world. With 1.3 billion people and about 20% of the world's population, the per capita water resources in China is only about 2,200 cubic meters, one quarter of the world's average. China is one of the 13 countries with the least per capita water resources.
4. Water is used very inefficiently in China, particularly in agriculture where the traditional irrigation method is still used and where the irrigation index is at 0.45. With rapid industrialization, China's water usage for industrial output is 4 times the world's average and 5-10 times that of developed countries.
5. Water scarcity is further aggravated by pollution and wastage. Till the end of 2005, among China's 661 cities, there were still 278 cities without waste water handling capacities and 186 cities with no waste water treatment taxes. Waste water treatment capacities in most Chinese cities are less than 50%, far below the 80% stipulated in the Eleventh Five-year Program (2006-2010). China's major rivers, lakes, reservoirs and seas are all seriously polluted.
6. By 2006, 43% of people in China lived in the urban areas, lower than the world's average of 46%. According to China's Eleventh Five-year Program, urban growth will be 1.0-1.3 percentage points. By 2010, the urban population

is estimated to reach 48-50% and by 2020, to 55-60% of China's total population.

7. Further urbanization and industrialization will lead to rising demand for water, and aggravating the water shortage problem in the near future. It would also be disastrous if more waste water pollutes the tap water supply or if it is used in agricultural irrigation. A report from the Ministry of National Land Resources noted that almost 8% of the total cultivated land in China is polluted. 1.3 million people die of cancer every year after drinking polluted water.
8. A Chinese scholar suggested that China should think seriously of moving its capital from Beijing to somewhere in the middle of China where there are affluent water resources. However, the long term solution to China's water problems would be to reduce pollution through education, impose stricter legal enforcement and water conservation measures by setting the right prices for water.

CHINA'S LOOMING WATER CRISES

YANG Mu & TENG Siow Song*

Thirsty China in an Era of Water Shortage

- 1.1 The control of water pollution will be given priority on the supervision list of China's top legislature, the National People's Congress (NPC), this year. The NPC Standing Committee will hear and deliberate special work reports of the State Council, or the cabinet, on progress in efforts to prevent and control water pollution, inspect the implementation of the environmental impact assessment law this year and promote efforts to conserve energy and reduce emissions.¹
- 1.2 In November 2007, the State Council released a circular using green figures of per unit GDP energy consumption and major pollutants reduction to assess provincial officials' performances. An accountability system and a ballot veto system will be implemented and energy conservation assessment results will be provided to personnel departments. The central government will not approve newly constructed high energy consuming projects in the region that fail the assessment.
- 1.3 Northern China is always short of water for irrigation and drinking.² The north suffers from increasing months of droughts even as monsoon plagues China's south. The flood plain and riverbed of the Yangtze River, Xiangjiang River,

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¹ Water Pollution, Labourers Rights Tops NPC List, *China Daily*, 8 March 2008

² 200 million mu of cultivated land in drought, <http://www.sina.com.cn> *China Daily*, 16 May 2007. Beijing.

Lijiang River and other main rivers are exposed due to a rare prolonged period of drought.³ At the same time, Hubei, one of the country's most water-scarce provinces after a decade-long drought, is in the midst of a massive water supply construction project to supply Beijing with 80 percent of its water needs for the 2008 Olympic Games.⁴ There is water shortage almost everywhere in China.⁵

- 1.4 The water shortage problem in China is estimated to be about 40 billion cubic meters per year.⁶ By 2010 China will face a water shortage of about 100 billion cubic meters per year; by 2050, China's water shortage will be 600-700 billion cubic meters per year, about one-quarter of her total water resources of 2533 billion cubic meters in 2006. After energy resources, water resources will be the next important commodity to be competed upon by nations.⁷
- 1.5 In 2006, China's total water supply was 579.5 billion cubic meters.⁸ This constituted a 0.05% annual increase over her water usage in 2001 compared to the annual growth rate of more than 10% in GDP.
- 1.6 Due to a number of factors, China's water shortage problem could be more serious in the near future. From the supply side, the water distribution in China is very uneven and the limited resources are used very inefficiently at present; more water resources are becoming polluted and undrinkable. Simultaneously from the demand side, rapid urbanization is increasing water demand for living and industry use.

³ Thirsty China, *Beijing Review*, Jan. 10, 2008. pp. 20-21.

⁴ Water for Beijing adds to woes of drought-hit villages, *The Straits Times*, Jan. 26, 2008.

⁵ Also see Olympics Threaten Millions says official, *Financial Times* 27 Feb 2008

⁶ www.chinanews.com.cn/news/2006/2006-03-21/8/705920/shtml.

⁷ China Aims for Bigger Share of South Asia's Water Lifeline, *The Japan Times Online* Articles 26 Jun 2007

⁸ China's Statistics Year Book 2007

Water Shortage a Daily Occurrence in China

- 2.1 With such an environment, the safety of drinking water in the cities is questionable.⁹ Among 222 water resources for 113 of the largest cities, only 72% of the water is safe for drinking. Some estimate that there are about 300 million people in the countryside drinking unsafe water every day.¹⁰ The recent Taihu and Songhuajiang river pollution cases highlighted China's water resources handling abilities (see Appendix Box). Companies found responsible for serious water pollution face heavy fines or will be closed.¹¹ However, incidents like these happen continually and are constantly reported in newspapers. Recently, sulphuric acid leaked from a chemical factory in central China into a water supply, poisoning at least 26 villagers.¹²
- 2.2 There would be a big social panic and disaster if millions of people are suddenly without drinking water. How to deal with this problem has been one of the most critical challenges to the Chinese government. On 22nd August 2007, Premier Wen Jiabao held a special meeting with members of the State Council to discuss the measures needed to secure safe drinking water in Chinese cities.¹³

Water Shortage More Serious in the North

- 3.1 China's total water resources are about 2800 billion cubic meters, about 6% of the world's total and fourth in the world with the largest amount of water resources. However, with 1.3 billion people and about 20% of the world's population, the per capita water resources in China is only about 2,200 cubic

⁹ Safe Drinking Water, *China Daily* 21 Nov 2007

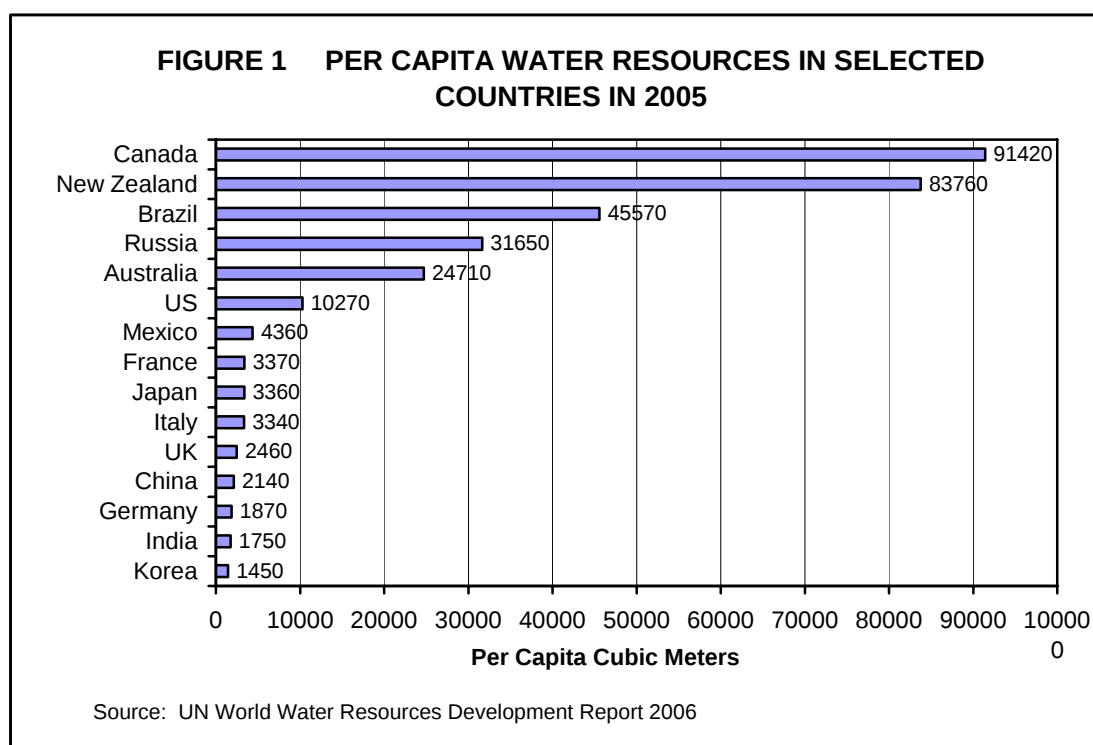
¹⁰ China's Water Pollution Crises, *Caijing* Vol.18, 2007. Page 84.

¹¹ Drinking Water Gets Top Priority in New Plan, *China Daily* 27 Nov 2007

¹² Acid leak lands 26 villagers in hospital, *The Straits Times*, 25 Jan. 2008

¹³ Drinking Water Polluters to Face Heavy Fines, *China Daily* 23 Nov 2007

meters, one quarter of the world's average. China is one of the 13 countries with the least per capita water resources.¹⁴



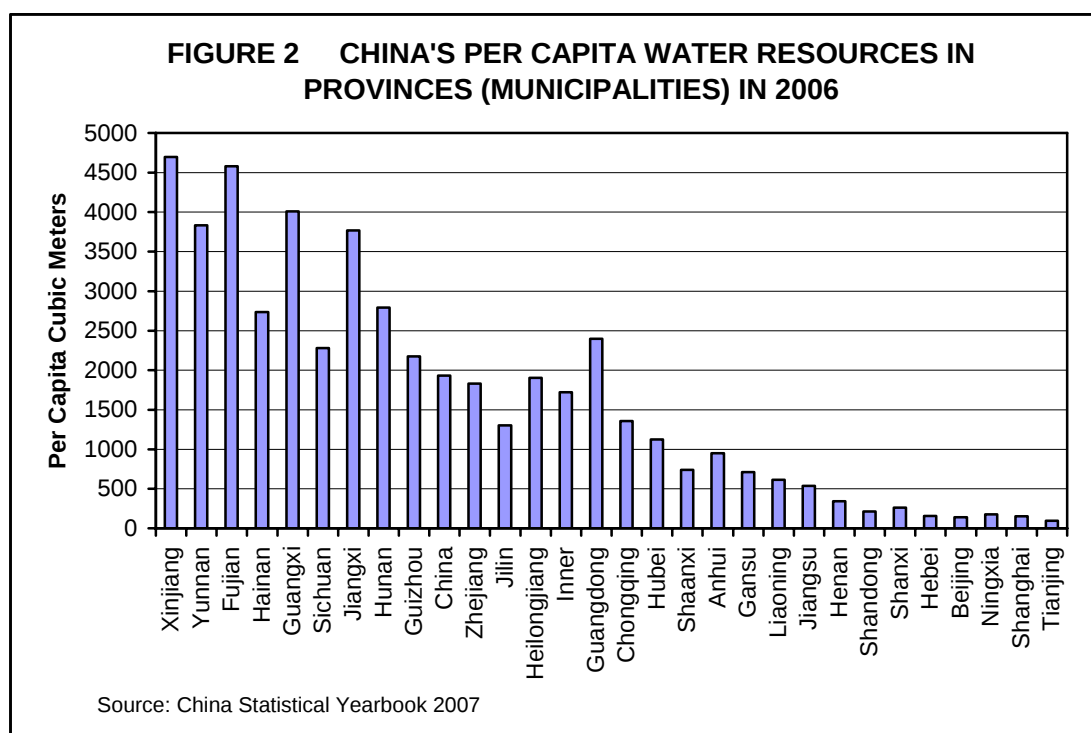
3.2 The distribution of water resources in China is very uneven. In the south of the Yangtze River, 54% of the population lives with 81% of the water resources, while in the north, 46% of population lives with only 19% of the water. The supply and demand of water are very uneven.

3.3 To meet basic human needs, about 20 to 50 liters of water free from harmful contaminants are needed per person per day.¹⁵ Considering there is also the need for water for other human activities (such as for industrial and agricultural use), in accordance to international standards, if per capita water availability is less than 2000 cubic meters, it means that there is water scarcity (the situation in China today on a per capita basis is 2200 cubic meters); if there is less than 1000 cubic meters per capita, serious water scarcity exists; if there is less than 500 cubic meters, extreme water scarcity exists. As Figure 2

¹⁴ <http://www.unesco.org/water>

¹⁵ http://www.unesco.org/water/wwap/facts_figures/basic_needs.shtml

below shows, among 30 provinces (municipals) in mainland China in 2005, there were 20 provinces with water scarcity; 13 provinces with serious water scarcity; 8 provinces, including Tianjin, Shanghai, Ningxia, Beijing, Hebei, Henan, Shanxi and Shandong, with extreme water scarcity problems.



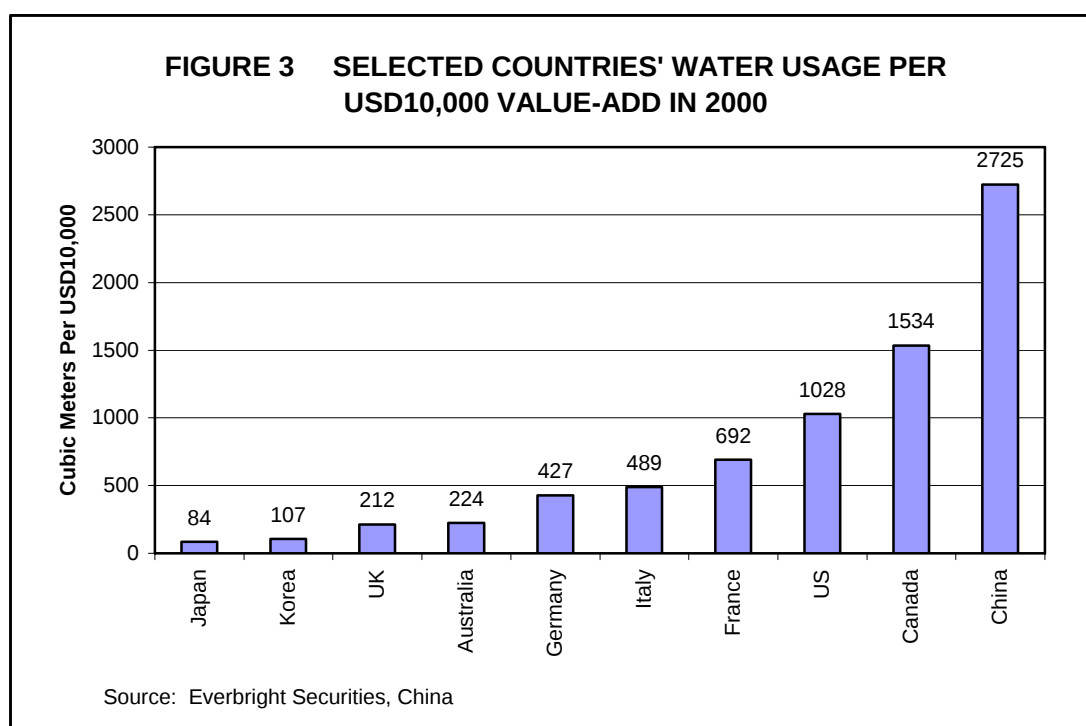
Scarce Water is used Very Inefficiently

- 4.1 In 2006, China's agricultural water usage was 366 billion cubic meters, comprising 62% of total water usage.¹⁶ China's agricultural sector today still uses the traditional method of irrigation; its irrigation index is only 0.45.¹⁷ According to the traditional policy on grain self sufficiency, cultivation and irrigation consume huge amounts of water resources in north-western China and also underground water in the North China Plain.

¹⁶ The total output of the grain (rice, wheat and corn) in China was about 500 million tonnes in 2006. A specialist from FAO estimates that 1,000 to 2,000 litres of water are needed to produce one kilogram of wheat. More water is needed to produce rice. As a big agricultural country which needs to feed 1.3 billion people, it is hard for China to reduce the demand for water in agriculture. <http://www.epochtimes.com/gb/7/3/23/n/654973.htm>

¹⁷ China Sustainable Development Strategy Report: Water: Governance and Innovation, Scientific Publishing House, Beijing, 2007, pp.20-32.

4.2 China's industrial water usage in 2006 was 134 billion cubic meters, making up 23% of total water usage.¹⁸ A yardstick used in measuring the efficiency of industrial water usage is the per USD10,000 value-added water usage index. In 2000, China's water usage per USD10,000 value-add worth of industrial output was 2725 cubic meters, 4 times the world's average and 5-10 times that of developed countries. China's industries are still generally very water inefficient because China has many resource-intensive heavy industries such as steel, aluminum and petrochemical related industries.

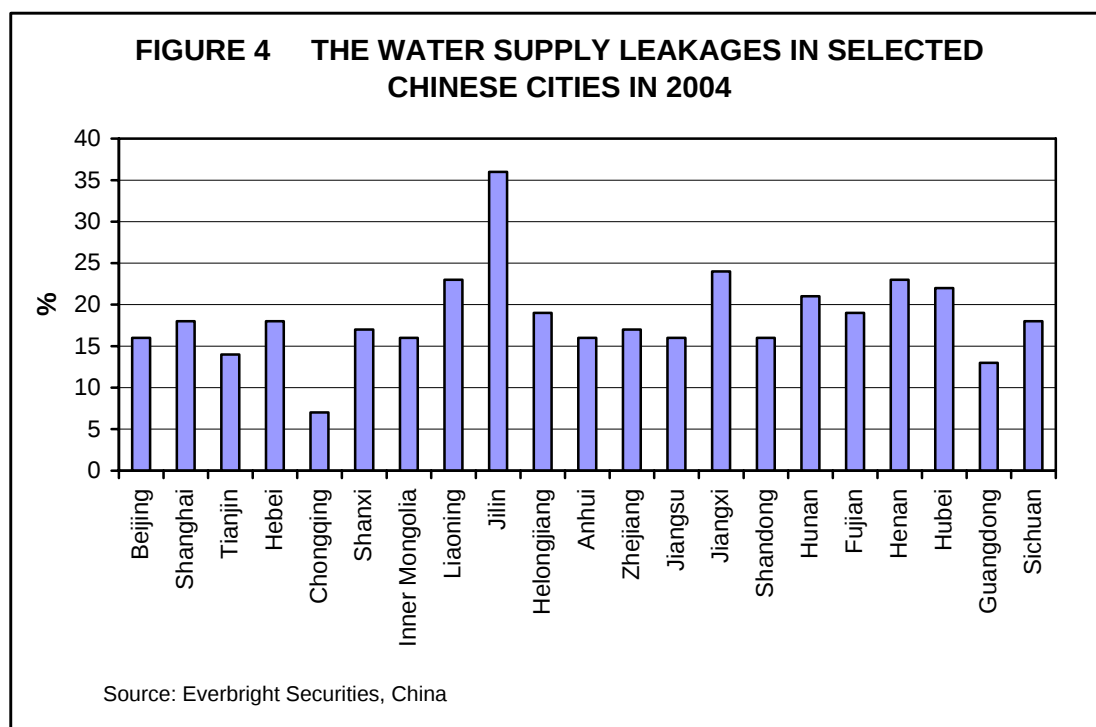


4.3 The amount of water consumed by Chinese households for domestic uses in 2006 was 69.4 billion cubic meters, 12% of the total water used.¹⁹ The low water prices in China as compared to other countries encourage people to consume more water. Wrong water pricing policies have been adopted in China, resulting in inefficient water usage and wastage.

¹⁸ As in footnote 7.

¹⁹ China Statistical Yearbook 2007.

4.4 A more serious problem is the extremely high leakages in the water supply systems of Chinese cities. According to statistics from the Department of Construction on 408 Chinese cities, the leakage from the potable water supply system is 21.5%, far higher than developed countries' leakages of less than 10%. In 2005, China's national water leakage stood at 10 billion cubic meters, about 1.7% of her water usage in 2005.²⁰



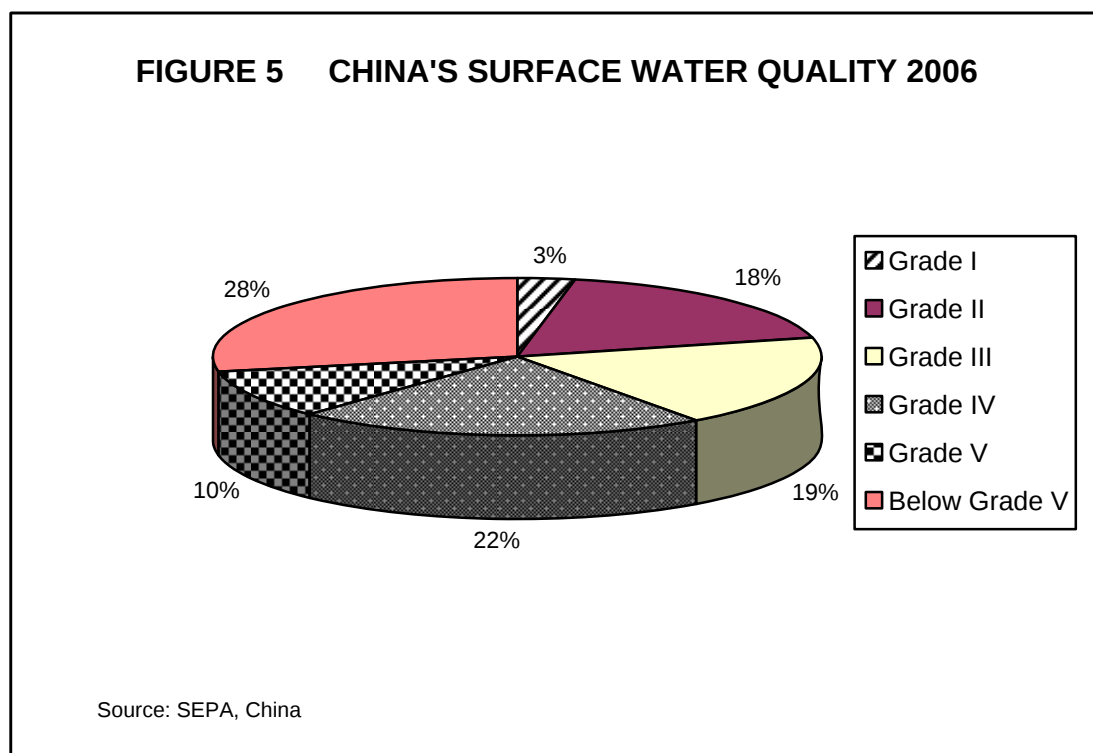
Scarce Water also Seriously Polluted²¹

5.1 By the end of 2005, among China's 661 cities, there were still 278 cities without waste water handling capacities and 186 cities with no waste water treatment taxes. Waste water treatment capacities in most Chinese cities are less than 50%, far below the 80% stipulated in the Eleventh Five-year Program.

²⁰ <http://finance.sina.com.cn/stock/hyyj/20070216/10193348180.shtml>

²¹ For further information on China's water pollution, see "Cost of Pollution in China" A Report by The World Bank & State Environmental Protection Administration, China Feb 2007.

5.2 China is suffering from the consequences of many years of environmental pollution and neglect to her ecosystem. Almost all the major rivers, lakes and water catchments areas in China are polluted and unfit for direct human consumption.²² Figure 5 below summarises the level of pollution in China's surface water quality in 2006. Water quality was monitored in more than 2,000 river sections across the main rivers in China. About 25,000 kilometers of Chinese rivers failed to meet water quality standards for aquatic life and 90% of river sections around urban areas were badly polluted.²³ The polluted water in these rivers is often used for irrigation purposes, resulting in severe economic losses.²⁴



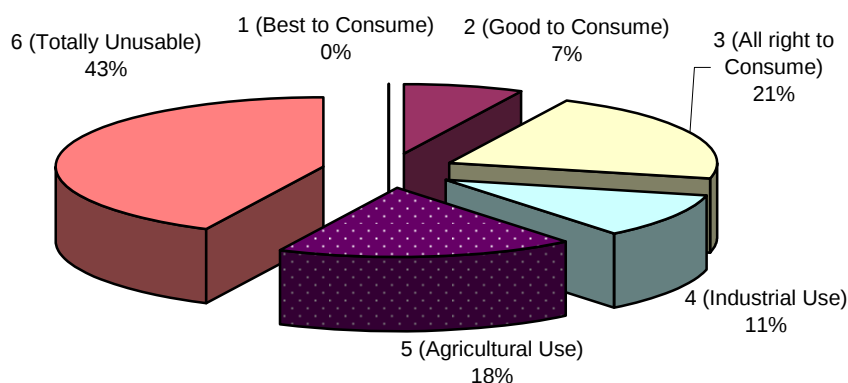
5.3 Figure 6 indicates pollution levels in China's top 28 lakes and reservoirs in 2005. Most lakes and reservoirs were badly polluted in China. Only 28% of the water in the main lakes and reservoirs is still drinkable.

²² Yangtze Water Worsening, *China Daily* 15 Apr 2007

²³ For a list of potential health problems associated with drinking polluted water, see appendix

²⁴ For more on economic losses caused by waste water irrigation, see appendix

FIGURE 6 POLLUTION IN CHINA'S TOP 28 LAKES / RESERVOIRS IN 2005



Source: China's Environment Communiqué 2005

- 5.4 Water quality in China's Three Gorges reservoir has not improved despite an ambitious, multibillion-dollar effort to clean up the reservoir badly polluted by the construction of the world's largest dam, according to China's top environmental regulatory agency. The report reveals the continuing difficulties China's leaders face in managing the Three Gorges Dam, a flagship national project that has generated an array of unforeseen consequences, from water pollution to landslides along the shores of its massive reservoir.
- 5.5 According to the study by the State Environmental Protection Administration, \$2.5 billion Yuan has already been spent on clean-up projects such as new wastewater-treatment and garbage plants since 2000, but only one-third of the projects have been completed; some of the newly built facilities are not running at full capacity, the report added. Construction of the dam officially cost 180 billion Yuan, or \$25 billion Yuan at current conversion rates.²⁵
- 5.6 According to Chinese official reports in 2005, about 1.5 billion cubic meters out of a total of 24.3 billion cubic meters or roughly 6% of China's waste

²⁵

Three Gorges Water Cleanup Makes no Gains, *The Wall Street Journal Asia* 21 Feb 2008

water was directly discharged into the sea without treatment.²⁶ Another 41% was discharged directly into the Yangtze River, eventually entering the sea.²⁷ The director of the Institute of Ocean Development, the National Ocean Bureau, Gao Zhiguo said that Bohai is the most polluted sea area in China. Among the 53 rivers entering Bohai, 43 are seriously polluted.²⁸ Table 1 shows the pollution problem in the seas of China.

TABLE 1 SEA WATER POLLUTION IN CHINA IN 2006²⁹

Sea	Clean Area	Lightly Polluted Area	Moderately Polluted Area	Heavily Polluted Area
National Total	34%	35%	12%	19%
Bohai Sea	41%	37%	9%	14%
Yellow Sea	40%	28%	11%	21%
East Sea	31%	34%	13%	22%
South Sea	25%	52%	13%	9%

Source: *China Statistics Year Book 2007*

Further Urbanization Raises Water Demand and Pollution

- 6.1 Apart from industrialization, rapid growth of cities also led to increased water demand. At the end of 2006, the national production capacity of tap water supply was 269.6 million cubic meters per day. Total annual volume of water supply was 54,047 million cubic meters, of which 22,204 million cubic meters (41%) were for residential use and 25,263 million cubic meters (47%) were for industrial/ productive use.³⁰

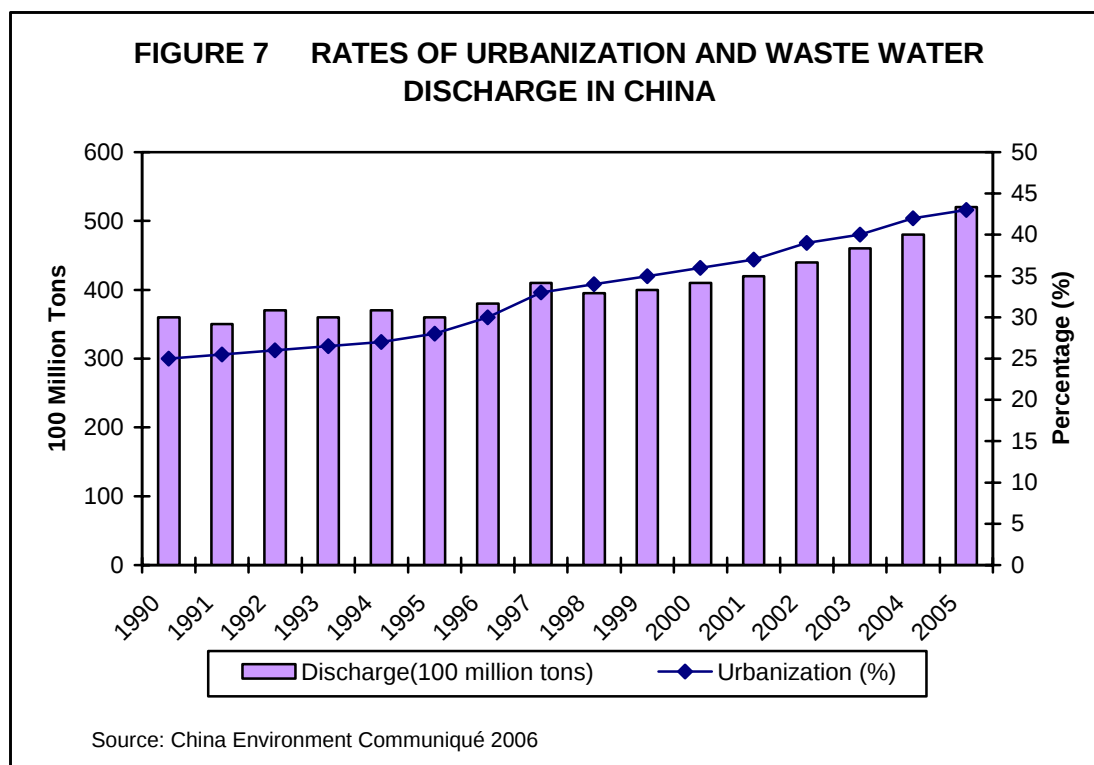
²⁶ China Statistical Yearbook 2006 page 414

²⁷ *International Herald Tribune*, 28 Sep. 2007.

²⁸ <http://www.txdyt.com/bbs/dispbbs.asp?boardid=128&id=29778&star=1>

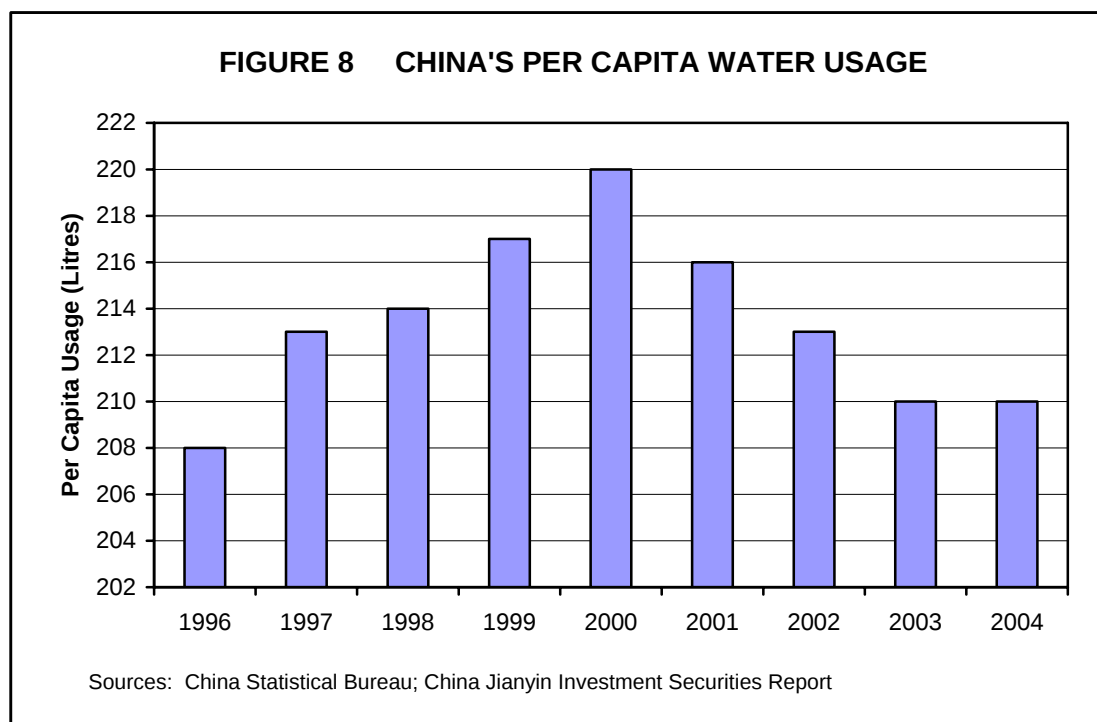
²⁹ Typically, the coastal area of a country is defined as within 12 nautical miles away from its coast.

³⁰ China Statistical Yearbook 2007.



6.2 By 2006, 43% of people in China lived in the urban areas, lower than the world's average of 46%. According to China's Eleventh Five-year Program, the rate of urban growth will be 1.0- 1.3 percentage points per year. By 2010 and 2020, the urban population is estimated to reach 48-50% and 55-60% of China's total population respectively. China's annual population growth is estimated to be between 13 and 15 million people. With such large urban and population growth, Chinese cities are estimated to use about 45 million cubic meters of water per day, requiring huge investments.³¹

³¹



6.3 The increased demand for water will make the shortage more serious in the near future. It would be worse if more waste water pollutes tap water or is used in agricultural irrigation. A report from the Ministry of National Land Resources noted that the amount of polluted cultivated land is 150 million mu, almost 8% of total cultivated land in China. A total of 1.3 million people, typically poor people in the rural areas, die of cancer every year after drinking polluted water.

6.4 Cancer has been the number one killer in China. There are at least 12 cancer-stricken villages in China's eastern coastal areas such as in Xititou Town (Tianjin), Feicheng (Shandong), Shuzhou (Anhui), Yancheng (Jiangsu) and Hangzhou (Zhejiang).³² In big cities like Shanghai, Beijing and Guangzhou, most people will only drink bottled water from big water companies, such as Nongfu Shanquan (农夫山泉) and Waterman, rather than tap water. China has thus become the world's third largest bottled water market.³³

³² The Cancer Villages in China's East Coast Line, *The Apple Daily* 6 Nov. 2007, Hong Kong.

³³ It is estimated to have grown over 30 per cent annually in recent years, reaching 30 billion Yuan in sales in 2007, according to a China News Agency report. *South China Morning Post*, 28 Jan. 2008.

6.5 A scholar from the Academy of International Trade and Economic Cooperation, China Ministry of Commerce, suggested that China should think seriously of moving its capital from Beijing to somewhere in the middle of China where there are affluent water resources.³⁴ However, the long term solution to China's water problems can be summarized by the following phrase: reduce pollution through education and enforcement, conserve water by raising prices.

³⁴ China should seriously think to change the location of its capital, the Financial Times Chinese Website, 9 Nov 2007

Appendix

BOX 1 SERIOUS WATER POLLUTION INCIDENTS IN CHINA IN THE PAST 3 YEARS

- 1) Feb 2008: Han river in Hubei and Yunnan provinces polluted; two hundred thousand people went without drinking water.
- 2) May 2007: One million residents in Wuxi city went without drinkable water due to the Taihu lake pollution.
- 3) Sept 2006: Yueyang city in Hunan province water pollution.
- 4) Aug 2006: Jialing river in Chongqing seriously polluted.
- 5) Aug 2006: Songhua river in Jilin province polluted by industrial chemicals.
- 6) Jan 2006: Xiangzhangxiang river in Hunan was polluted by cadmium.
- 7) Dec 2005: Beijiang in northern Guangdong province polluted by heavy cadmium.
- 8) Nov 2005: Jilin Shuangbenhua factory explosion affecting Songhua river; Harbin city had to cut water supply for 4 days, affecting Russia too.
- 9) Mar 2004: A million people stopped using tap water after the level of ammonia in Sichuan's Tuo river rose past 50 times the safety limit.