

2006

CHINA WATER RESOURCES
BULLETIN

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Ministry of Water Resources
People's Republic of China



中国水利水电出版社

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China WaterPower Press

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江苏工业学院图书馆
藏书章



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图书在版编目(CIP)数据

中国水资源公报: 2006 = China Water Resources,
Bulletin 2006: 英文 / 中华人民共和国水利部编. —北
京: 中国水利水电出版社, 2007

ISBN 978-7-5084-5172-5

I. 中… II. 中… III. 水资源—公报—中国—2006—英
文 IV. TV211

中国版本图书馆CIP数据核字(2007)第193065号

书 作 出版	名 者 发行	CHINA WATER RESOURCES BULLETIN 2006 Ministry of Water Resources People's Republic of China 中国水利水电出版社(北京市三里河路6号 100044) 网址: www.waterpub.com.cn E-mail: sales@waterpub.com.cn 电话: (010) 63202266 (总机)、68331835 (营销中心)
经 售	售	北京科水图书销售中心(零售) 电话: (010) 88383994、63202643 全国各地新华书店和相关出版物销售网点
排 印 规 版 印 定	版 刷 格 次 数 价	中国水利水电出版社装帧出版部 北京鑫丰华彩印有限公司 889mm×1194mm 16开本 3.5印张 125千字 2007年12月第1版 2007年12月第1次印刷 0001—1000册 42.00元

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- Note: 1. The data on the whole country involved in the Bulletin do not cover Hong Kong and Macao special administrative regions and Taiwan Province.
2. Hydrological normal mentioned in the Bulletin is referred to the average over synchronous hydrological data series from 1956 to 2000 adopted for the country.

ACRONYMS

MWR	Ministry of Water Resources
PAR	Provincial Administrative Region
SFCDRH	State Flood Control and Drought Relief Headquarters
WRR	Water Resources Region

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1 General

In 2006, China had an average annual precipitation of 610.8 mm in depth, equivalent to 5,783.96 billion m³ in volume, which was 4.9% less than normal. The quantity of surface water resources was 2,435.80 billion m³, 8.8% less than normal; the quantity of groundwater resources was 764.29 billion m³, 5.3% less than normal; and the quantity of groundwater resources non-overlapping with surface water was 97.21 billion m³, and the total quantity of water resources was 2,533.01 billion m³, 8.6% less than normal.

In 2006, 18.45 billion m³ of water flowed from abroad into China; 533.20 billion m³ flowed from China into abroad and 96.58 billion m³ flowed from China into international border rivers; and the total quantity of water flowing from China into the sea was 1,462.04 billion m³, or 198.45 billion m³ less than 2005.

The year-end total water storage of 471 large-sized reservoirs and 2,865 medium-sized reservoirs in China was 11.53 billion m³ less than the year-beginning storage. The year-end shallow groundwater storage was 8.86 billion m³ less than the year-beginning one in the groundwater abstraction areas of the northern plains.

The national water supply/use was 579.50 billion m³. Of the total water supply, 81.2% came from surface water, 18.4% from groundwater, and 0.4% from other water sources. As for composition of water use, domestic use occupied 12.0% of the total, industrial use 23.2%, agricultural use 63.2%, and ecological and environmental use (only including artificial supply for urban environment and part of supplement to wetlands and lakes) 1.6%. The annual national water consumption was 304.23 billion m³ with a consumption rate (proportion of consumption to use) of 53%. The annual national wastewater discharge was 73.1 billion tons (not including discharge of thermal power once-through cooling water), of which industrial wastewater occupied two-thirds and domestic sewage one-third.

The national per capita water use in China was 442 m³; the water use per 10,000 yuan of GDP (at current price) 272 m³; the water use per mu^① of irrigated farmland 449 m³; the water use per 10,000 yuan of added industrial output value 149 m³; and the per capita domestic water use in urban areas 212 L/d (including public water use) and that in rural areas 69 L/d. Based on comparable price, the water uses per 10,000 yuan of GDP and added industrial output value decreased both by 7% as compared with the last year.

Water quality was evaluated for 138,700 km of river reaches in 2006. Of the total evaluated river reaches, 58.3% was of the first to third classes on the yearly basis, and the general status of water quality was not significantly different from that of 2005. Water quality was also evaluated for 248 monitoring sites on provincial-border water bodies, of which 38.7% was of the first to third classes, and for 43 lakes and 327 reservoirs, of which 49.7% and 79.5% had a water quality of the first to third classes, respectively, on the yearly basis. Trophic state was evaluated for 43 lakes and 275 reservoirs, and 58.1% of the lakes and 32.7% of the reservoirs were in a eutrophic state.

In 2006, large rivers in China had a basically stable flow regime without occurrence of serious flood and waterlogging disasters to large areas. But, as affected by typhoons, rainstorms occurred frequently to parts of the areas south of the lower Yangtze River and South China, floods exceeding the guaranteed water level or historical highest water level occurred to some medium and small rivers, and torrential floods, debris flows and landslides frequently occurred to the provincial administrative regions (PARs) of Fujian, Zhejiang, Hunan, Jiangxi, Guangdong and Guangxi. Severe droughts occurred to northeastern Southwest China and parts of

① 1 mu=1/15 hm².



Northeast, North and Northwest China, in which a 100-year exceptional summer drought occurred to Chongqing and the most severe summer drought since 1951 occurred to eastern Sichuan. According to statistics, in the whole country, flood and waterlogging disasters affected 158 million mu of farmland and caused 2,276 deaths and 133.26 billion yuan of direct economic loss; and droughts affected 311 million mu of farmland, of which 201 million mu was ruined, and brought about temporary drinking water difficulties for 35.78 million people and 29.36 million head of large livestock. Facing such frequent, concurrent and severe disasters, under the high attention and correct leadership of the central government, the State Flood Control and Drought Relief Headquarters (SFCDRH) and the Ministry of Water Resources (MWR) made careful deployment, the relevant agencies provided close cooperation, the governmental leaders in the disaster-affected areas provided command in front, and the armies and the people united together to fight the disasters, thus reducing the loss caused by the disasters to the maximum extent.

In 2006, according to the policies for water resources work in the new era, the water resources administrations at all levels followed the scientific concept of development and actively practiced the thinking on sustainable water resources management, and water resources work continued to develop soundly, thus making a good beginning of the Eleventh Five-Year Plan period. Construction of the Three Gorges Dam was fully completed ahead of schedule and water was stored up to the water level of 156 m in elevation; smooth progress was achieved in construction of the South-to-North Water Transfer and Huaihe River Harnessing projects; and obvious achievements were made in consolidation of defective and dangerous reservoirs. With construction of a socialist new countryside at the core, further progress was made in the work of rural drinking water safety, water-saving renovation of irrigation districts, farmland water capital construction, soil and water conservation and rural hydropower development. Unified operation and allocation of water resources were implemented continuously, and a series of water diversion was implemented to guarantee the security of urban and rural water supply and contribute to ecological restoration, including emergency diversion of fresh water to stop saline water intrusion in the Pearl River, diversion from the Yangtze River to the Taihu Lake, diversion from the Yellow River to the Baiyangdian Lake and concentrated diversion from the Yongding and Chaobai river systems to Beijing. A number of water related regulations were issued for implementation, including the Regulation for Water Drawing Permit and Collection and Management of Water Resources Fee, Regulation for the Operation of the Yellow River Water, Regulation on Land Acquisition Compensation and Resettlement for Construction of Large and Medium-sized Water Resources and Hydropower Projects, and great achievements were made in water administration and management by law. Steady progress was achieved in planning with the Eleventh Five-Year Plan for the Development of Water Resources Undertakings issued for implementation, key results on water resources allocation preliminarily acquired in the comprehensive water resources planning, and the Plan for the Control of Flash Flood Disasters and the Eleventh Five-Year Plan for Rural Drinking Water Safety approved by the State Council. Construction of water-saving society was carried out extensively, 30 national-level pilot projects were added; the Zhangye pilot project passed acceptance; achievements were made in the Mianyang pilot project; and the plans for the construction of water-saving society in the national-level pilot project cities such as Tianjin passed the examination by MWR. New progress was achieved in water resources protection, and water function zoning plan had been approved by 27 PAR governments; survey and registration of effluent outlets to rivers were completed in all the seven major river basins; three pilot projects were added for the protection and restoration of water ecological system at Wuxi and Laizhou cities and the main Oujiang River; and 42 national-level water scenic spots were added. The development and innovation of water resources undertakings provided strong support to the national economic and social development and contribute to the construction of a socialist harmonious society.

Geographical Areas of East China, Central China and West China

East China: Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan

Central China: Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei and Hunan

West China: Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang



2 Quantity of Water Resources

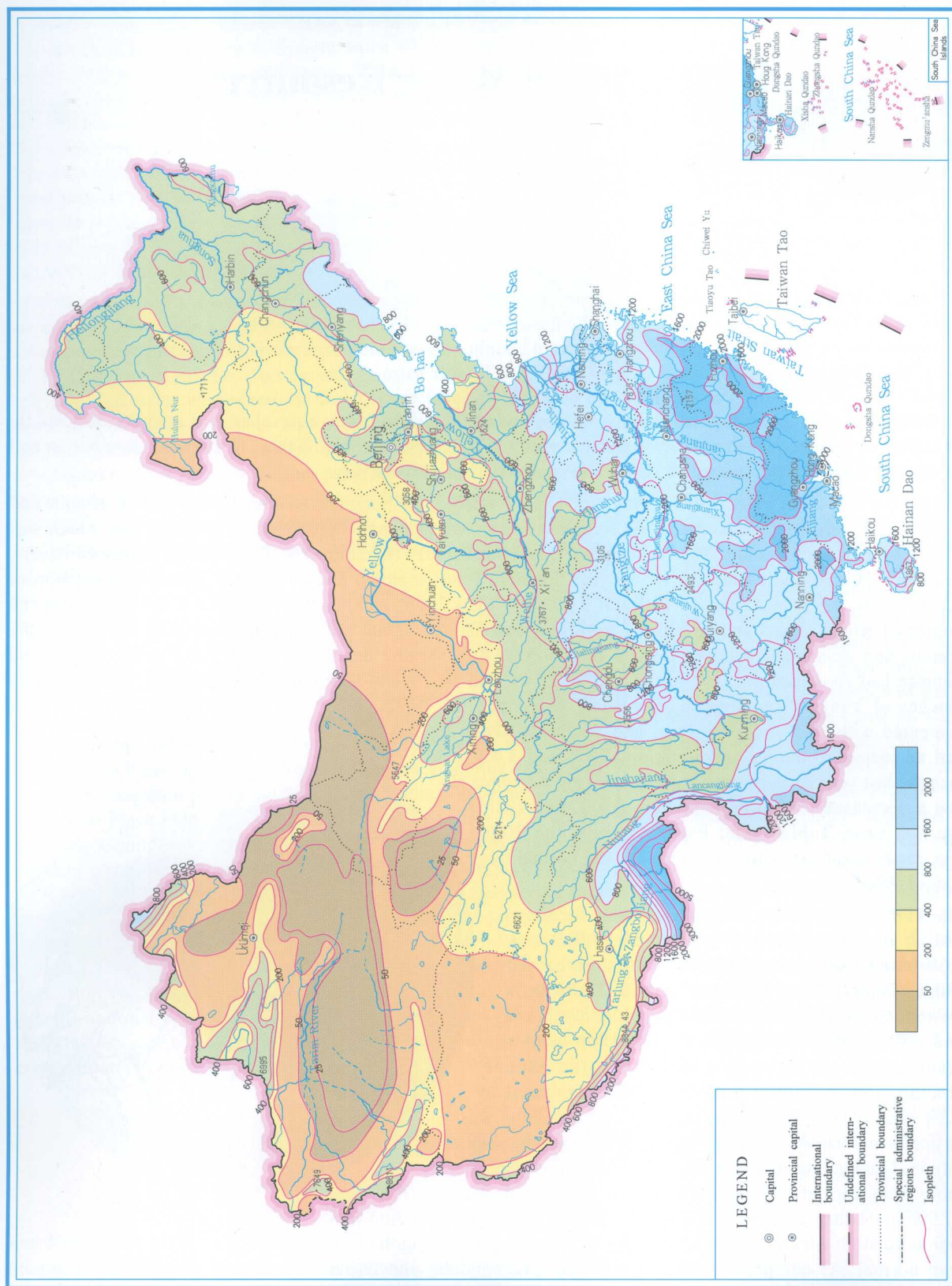
2.1 Precipitation

In 2006, China had an average annual precipitation of 610.8 mm in depth, equivalent to a quantity of 5,783.96 billion m³ in volume, which was 4.9% less than normal and 5.3% less than 2005. The regional distribution and anomaly of annual precipitation are shown in Figures 1 and 2, respectively.

Among the first-class water resources regions (Class I WRRs), the Songhua, Liaohe, Haihe, Yellow, Huaihe and Northwest Rivers (i.e., the Northern Six Regions) had an average annual precipitation of 380.8 mm, which was 5.9% less than normal and 9.5% less than 2005; and the Yangtze (including the Taihu Lake), Southeast Rivers, Pearl (Zhu Jiang) and Southwest Rivers (the Southern Four Regions) had an average annual precipitation of 1,146.7 mm, 4.5% less than normal and 3.1% less than 2005. Among the ten Class I WRRs, except the Southeast Rivers, Pearl and Northwest Rivers, which had an annual precipitation more than normal, all the regions had an annual precipitation less than normal to a varying degree, in which the Huaihe, Liaohe and Yangtze had an annual precipitation of 18.1%, 13.4% and 10.4% less than normal, respectively, with the upper reaches of Yangtze experiencing the driest year since the 1950s. As compared with 2005, only the Pearl and Southeast Rivers regions had an increased annual precipitation, 8.8% and 3.4% more than the last year, respectively; and the other eight regions all had a decreased annual precipitation, 4%-22% less than the last year. Table 1 and Figure 3 show the 2006 precipitation and comparison with 2005 and normal by Class I WRR.

The 11 PARs in eastern China (East China for short) had an average annual precipitation of 1,155.9 mm, 4.6% more than normal; and the 8 PARs in central China (Central China for short) and the 12 PARs in western China (West China for short) had 873.8 mm and 459.4 mm, 4.6% and 8.4% less than normal, respectively. As compared with 2005, the annual precipitation in Central and West China decreased by 4.3% and 7.5%, respectively, and that of East China was basically unchanged. Among the 31 PARs, seven, such as Fujian, Guangdong and Xinjiang, had an annual precipitation more than normal, in which Fujian had an annual precipitation 27.9% more than normal; and 24 PARs had an annual precipitation less than normal, in which Beijing, Chongqing, Hubei and Inner Mongolia had an annual precipitation over 20% less than normal. As compared with 2005, Ningxia, Guangdong and Fujian experienced an increase of annual precipitation of 10%-25% and Shandong, Henan and Sichuan experienced a decrease of 20%-30%. See Table 2 and Figure 4 for the 2006 precipitation and comparisons with 2005 and normal by PAR.

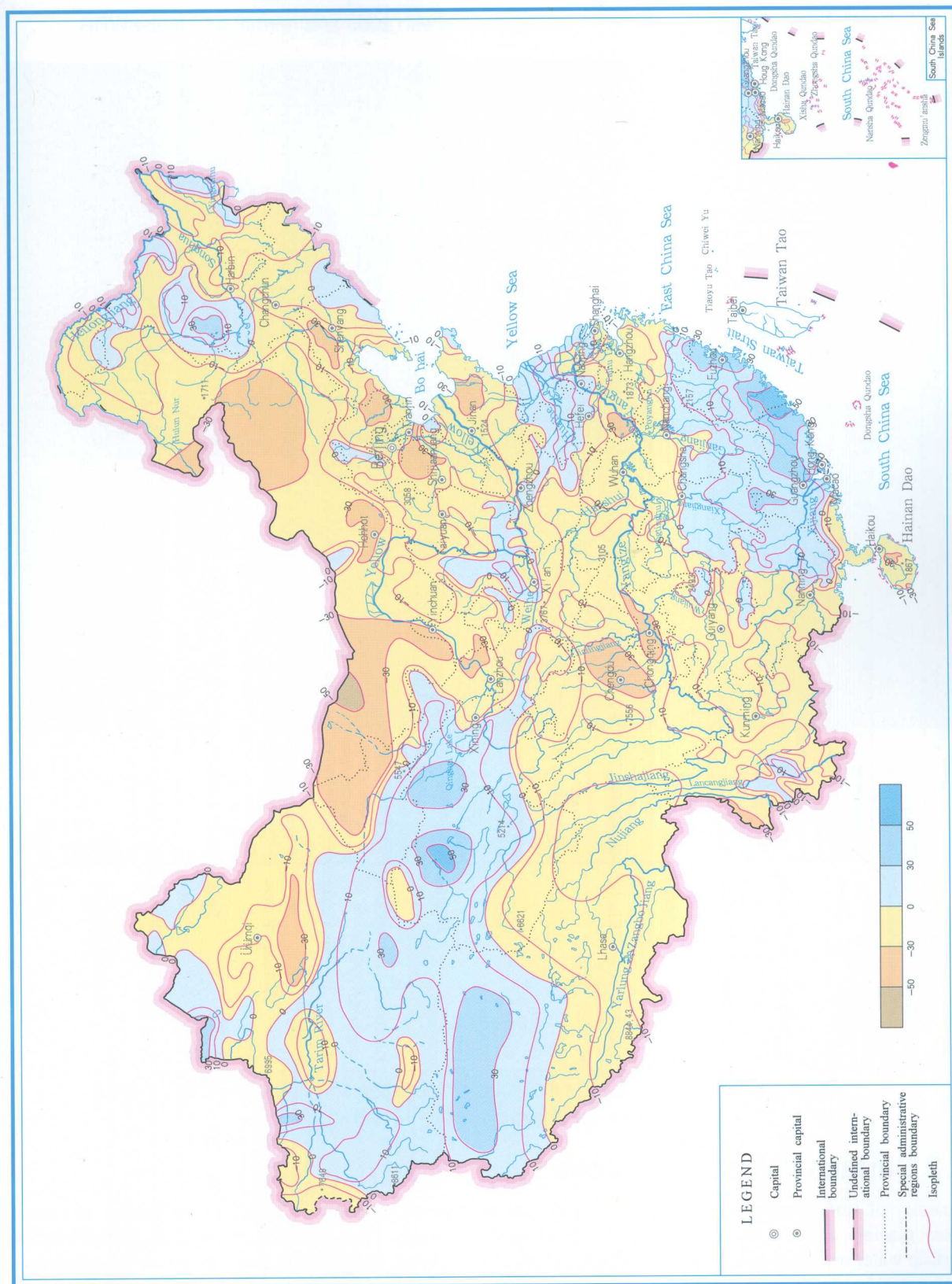




审图号: GS (2007) 1561号

2007年10月10日国家测绘局

Figure 1 Isohyetal map of annual precipitation in China, 2006 (Unit: mm)



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Figure 2 Anomaly map of annual precipitation in China, 2006 (Unit: %)



Table 1 The 2006 precipitation and comparisons with 2005 and normal by Class I WRR

Class I WRR	Precipitation in 2006 (mm)	Comparison with 2005 (%)	Comparison with normal (%)	Class I WRR	Precipitation in 2006 (mm)	Comparison with 2005 (%)	Comparison with normal (%)
China	610.8	-5.3	-4.9	Huaihe	806.8	-21.6	-3.8
Southern Four Regions	1,146.7	-3.1	-4.5	Yangtze	974.1	-9.2	-10.4
Northern Six Regions	308.8	-9.5	-5.9	in which Taihu Lake	1,085.0	4.6	-8.0
Songhua	463.7	-3.8	-8.1	Southeast Rivers	1,886.6	3.4	13.4
Liaohe	472.0	-17.9	-13.4	Pearl	1,621.4	8.8	4.7
Haihe	438.2	-10.0	-18.1	Southwest Rivers	1,003.9	-4.4	-7.7
Yellow	407.2	-5.6	-8.7	Northwest Rivers	166.1	-6.4	3.0

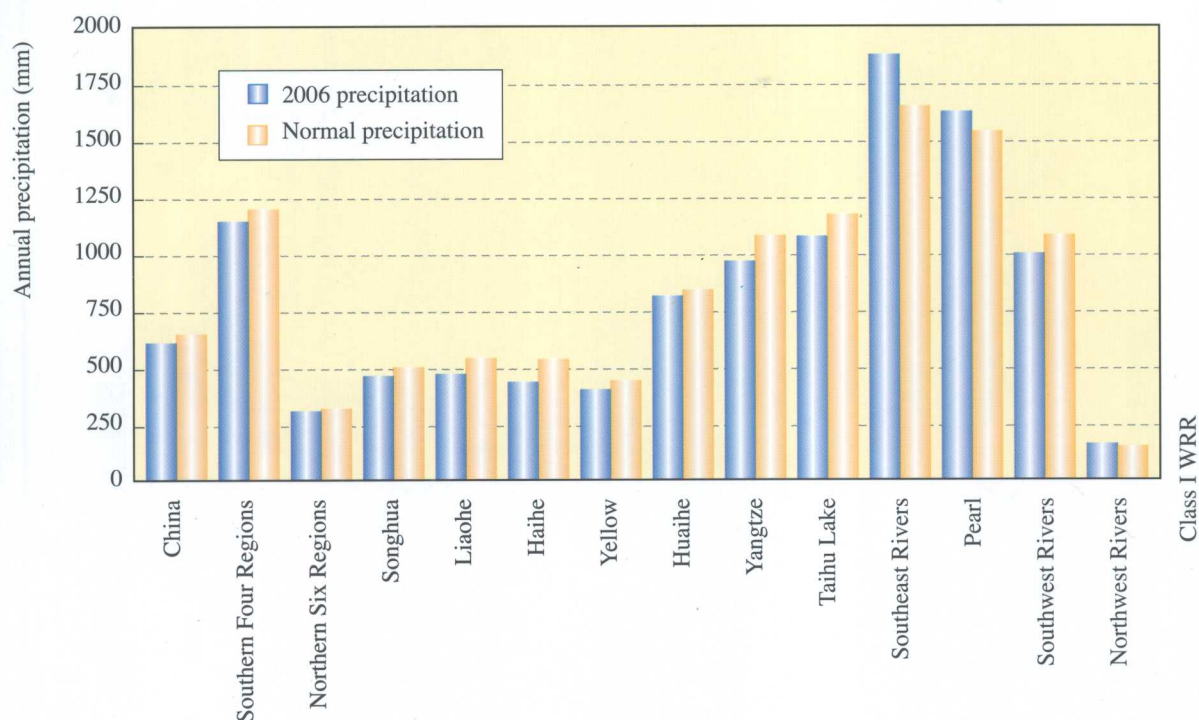


Figure 3 Comparison between the 2006 precipitation and normal by Class I WRR

Note: The Yangtze includes the Taihu Lake.

2.2 Surface Water Resources

Quantity of surface water resources refers to the annual renewed quantity of surface water bodies in rivers, lakes, glaciers, etc., i.e., annual quantity of natural runoff formed by local precipitation. In 2006, the quantity of surface water resources in China was 2,435.80 billion m³, equivalent to 257.2 mm in depth, which was 8.8% less than normal and 9.8% less than 2005.

The quantity of surface water resources in the Northern Six Regions in 2006 was 10.8% less than normal and



Table 2 The 2006 precipitation and comparisons with 2005 and normal by PAR

PAR	Precipitation in 2006 (mm)	Comparison with 2005 (%)	Comparison with normal (%)	PAR	Precipitation in 2006 (mm)	Comparison with 2005 (%)	Comparison with normal (%)
China	610.8	-5.3	-4.9	Henan	714.8	-21.1	-7.3
Beijing	448.0	-4.3	-23.4	Hubei	930.3	-14.6	-21.2
Tianjin	468.1	-9.5	-18.6	Hunan	1,494.7	8.3	3.1
Hebei	425.9	-9.9	-19.9	Guangdong	2,110.2	19.5	19.2
Shanxi	477.8	3.2	-6.1	Guangxi	1,529.9	4.5	-0.5
Inner Mongolia	222.6	4.0	-21.1	Hainan	1,511.2	-14.0	-13.6
Liaoning	597.9	-19.0	-11.8	Chongqing	929.4	-17.8	-21.5
Jilin	570.8	-19.0	-6.3	Sichuan	829.8	-20.6	-15.2
Heilongjiang	523.0	4.3	-2.0	Guizhou	1,015.1	2.5	-13.9
Shanghai	1,098.3	2.5	0.8	Yunnan	1,099.8	-4.5	-14.0
Jiangsu	1,021.2	-5.8	2.7	Tibet	554.7	-4.3	-3.0
Zhejiang	1,542.3	-7.1	-4.0	Shaanxi	595.8	-8.4	-9.2
Anhui	1,069.0	-11.5	-8.9	Gansu	272.1	-11.3	-9.7
Fujian	2,145.0	12.2	27.9	Qinghai	287.3	-18.4	-1.1
Jiangxi	1,684.4	1.7	2.8	Ningxia	248.5	25.0	-13.9
Shandong	570.2	-29.7	-16.1	Xinjiang	170.3	-12.9	10.1

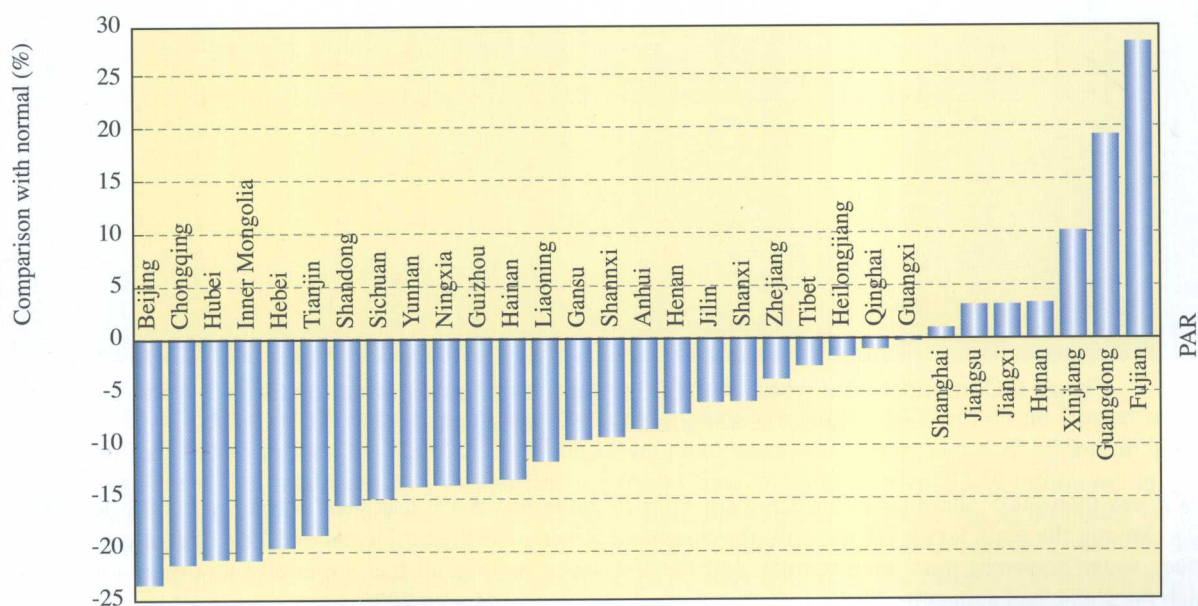


Figure 4 Comparison between the 2006 precipitation and normal by PAR



Table 3 The 2006 natural runoff and comparison with 2005 and normal by Class I WRR

Class I WRR	Runoff in 2006 (mm)	Comparison with 2005 (%)	Comparison with normal (%)	Class I WRR	Runoff in 2006 (mm)	Comparison with 2005 (%)	Comparison with normal (%)
China	257.2	-9.8	-8.8	Huaihe	192.2	-42.9	-6.3
Southern Four Regions	599.1	-7.0	-8.4	Yangtze	446.4	-18.7	-19.2
Northern Six Regions	64.6	-21.9	-10.8	in which Taihu Lake	353.7	10.4	-18.1
Songhua	116.1	-16.8	-16.2	Southeast Rivers	1,119.6	3.3	17.3
Liaohe	102.2	-29.9	-21.3	Pearl	862.7	13.8	5.9
Haihe	30.1	-21.0	-55.4	Southwest Rivers	612.7	-7.0	-10.4
Yellow	57.4	-30.6	-26.2	Northwest Rivers	39.3	-2.5	12.6

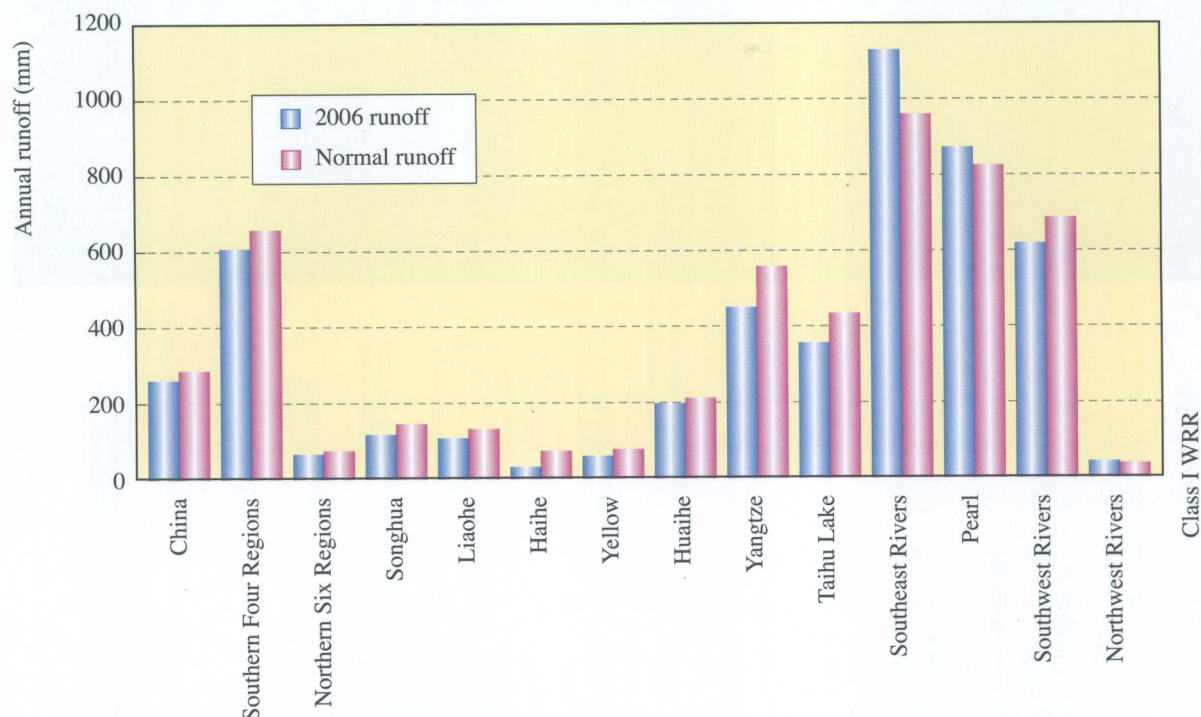


Figure 5 Comparison between the 2006 natural runoff and normal by Class I WRR

Note: The Yangtze includes the Taihu Lake.

21.9% less than 2005; and that in the Southern Four Regions was 8.4% less than normal and 7.0% less than 2005. Among the ten Class I WRRs, only the Southeast Rivers, Northwest Rivers and Pearl had a quantity of surface water resources more than normal, and the rest seven regions all had a quantity less than normal, in which the Haihe had a quantity 55.4% less than normal. As compared with 2005, except the Pearl and Southeast Rivers which experienced increases of 13.8% and 3.3% in quantity of surface water resources, respectively, all the regions experienced decrease to a varying degree, in which the Huaihe, Yellow and Liaohe experienced a



decrease of 30%-40%. See Table 3 and Figure 5 for the 2006 annual natural runoff depth and comparison with 2005 and normal by Class I WRR.

In 2006, East China had a quantity of surface water resources of 568.45 billion m³, equivalent to 533.2 mm in depth, 9.6% more than normal; and Central and West China had 568.43 billion m³ and 1,298.92 billion m³, or 340.7 mm and 192.9 mm in depth, 9.9% and 14.7% less than normal, respectively. As compared with 2005, East China experienced an increase of 2.5% in quantity of surface water resources; Central China experienced a decrease of 10.1%; and West China experienced a decrease of 14.1%. Among the 31 PARs, only 7, such as Fujian, Guangdong and Jiangsu, had a more than normal quantity of surface water resources, and 24, such as Hebei, Beijing and Shandong, had a less than normal quantity of surface water resources, in which Hebei and Beijing had a quantity over 60% less than normal. As compared with 2005, only 8 PARs experienced increase of surface water resources to a varying degree; and among the 23 PARs having a decreased quantity of surface water resources, Shandong and Henan experienced a decrease of over 50%. See Table 4 and Figure 6 for the 2006 natural runoff depth and comparison with 2005 and normal by PAR.

Table 4 The 2006 natural runoff and comparison with 2005 and normal by PAR

PAR	Runoff in 2006 (mm)	Comparison with 2005 (%)	Comparison with normal (%)	PAR	Runoff in 2006 (mm)	Comparison with 2005 (%)	Comparison with normal (%)
China	257.2	-9.8	-8.8	Henan	129.6	-50.8	-29.4
Beijing	39.7	-12.0	-62.4	Hubei	327.6	-32.6	-39.5
Tianjin	55.5	-7.2	-37.8	Hunan	832.5	5.9	4.8
Hebei	22.4	-27.4	-65.0	Guangdong	1,242.5	26.9	21.2
Shanxi	34.3	6.5	-38.2	Guangxi	794.8	9.3	-0.6
Inner Mongolia	25.4	-13.1	-27.6	Hainan	659.1	-26.1	-26.0
Liaoning	160.8	-30.4	-22.7	Chongqing	461.5	-25.4	-33.0
Jilin	159.3	-39.3	-13.3	Sichuan	385.0	-36.2	-28.7
Heilongjiang	132.4	-1.6	-12.2	Guizhou	462.4	-2.4	-23.3
Shanghai	435.9	13.0	13.6	Yunnan	446.7	-7.3	-22.6
Jiangsu	308.7	-14.1	18.8	Tibet	345.7	-6.6	-5.4
Zhejiang	858.5	-11.5	-5.8	Shaanxi	119.8	-47.4	-38.8
Anhui	382.0	-20.7	-18.3	Gansu	44.4	-32.2	-32.2
Fujian	1,309.9	15.9	37.6	Qinghai	77.1	-35.7	-9.8
Jiangxi	964.6	8.1	4.2	Ningxia	15.9	19.7	-13.3
Shandong	69.9	-63.0	-44.7	Xinjiang	55.0	-0.7	14.6

In 2006, 18.45 billion m³ of water flowed into China from abroad, in which 160 million m³ flowed into the Songhua, 7.40 billion m³ into the Pearl, 2.12 billion m³ into the Southwest Rivers, and 8.77 billion m³ into the Northwest Rivers. The total quantity of water flowing from China into abroad was 533.20 billion m³, in which 1.30 billion m³ was from the Songhua, 507.87 billion m³ from the Southwest Rivers, and 24.03 billion m³ from the Northwest Rivers. The total quantity of water flowing from China into international border rivers was 96.58 billion m³, in which 81.37 billion m³ from the Songhua, 14.02 billion m³ from the Liaohe, 930 million m³ from the Pearl, and 260 million m³ from the Northwest Rivers.

The national quantity of water flowing into the sea in 2006 was 1,462.04 billion m³, or 12.0% less than 2005, in

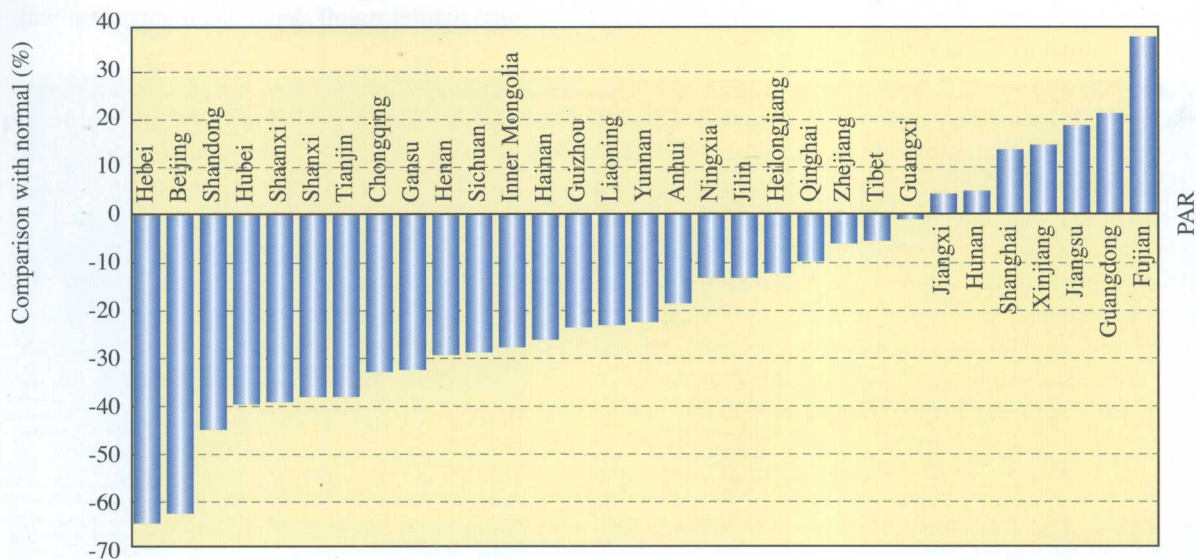


Figure 6 Comparison between the 2006 natural runoff and normal by PAR

which 9.51 billion m^3 was from the Liaohe, 1.39 billion m^3 from the Haihe, 18.67 billion m^3 from the Yellow, 47.34 billion m^3 from the Huaihe, 702.00 billion m^3 from the Yangtze, 219.35 billion m^3 from the Southeast Rivers, and 463.78 billion m^3 from the Pearl. Water flowing into the sea accounted for 15%-40% of the regional quantity of surface water resources in the Liaohe, Haihe and Yellow and 75%-95% in the rest four Class I WRRs.

2.3 Groundwater Resources

Quantity of groundwater resources refers to the annual renewed water quantity of aquifer, i.e., recharge by precipitation and surface water. Quantity of groundwater resources in mountainous and hilly areas is calculated in terms of groundwater discharges, including river base flow, piedmont lateral seepage discharge, evaporation from water table and net consumption via groundwater abstraction. Quantity of groundwater resources in plain areas is calculated in terms of groundwater recharges, including recharge by direct precipitation infiltration, recharge by surface water infiltration, recharge by piedmont lateral seepage, and recharge by well irrigation, and total recharge minus recharge by well irrigation is taken as quantity of groundwater resources in plain areas. The calculated quantity of groundwater resources in a water resources region or administrative region is the sum of quantities of groundwater resources in mountainous and hilly areas and in plain areas minus the overlap between them.

In 2006, the national calculation area of groundwater resources with a mineralization degree of ≤ 2 g/L was 8.54 million km^2 and the calculated quantity of groundwater resources was 764.29 billion m^3 , or 5.3% less than the average of the 1980-2000 series. In the total quantity of groundwater resources, plain areas occupied 166.81 billion m^3 , mountainous and hilly areas occupied 628.40 billion m^3 , and the overlap between calculated quantities of groundwater resources in mountainous and hilly areas and in plain areas was 30.92 billion m^3 . See Table 5 for the 2006 quantities of groundwater resources in the Class I WRRs and Table 6 for the 2006 quantities of groundwater resources in the PARs.

In 2006, the total groundwater recharge in plain areas of China was 173.39 billion m^3 , and the total groundwater recharge in plain areas of the Northern Six Regions occupied 140.55 billion m^3 or 81.1% of the national total, being an important source of water supply for northern China. The total groundwater recharges in plain areas of the Northern Six Regions were: 24.97 billion m^3 in the Songhua; 10.44 billion m^3 in the Liaohe, 13.14 billion m^3 in the Haihe, 16.01 billion m^3 in the Yellow, 30.00 billion m^3 in the Huaihe, and 46.00 billion m^3 in the Northwest Rivers. Of the total groundwater recharge in plain areas of the Northern Six Regions, recharge by direct precipitation infiltration accounted for 51.9%, recharge by surface water infiltration 38.8%, recharge by