

# **China (People's Republic of) (Zhonghua Renmin Gongheguo)**

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## **Location and area**

China, in East Asia, is the world's third-largest country by area (after Russia and Canada) and the largest by population. It includes more than 3,400 offshore islands. It is bordered on the north by the Mongolian Republic and Russia, on the northeast by Russia and North Korea, on the east by the Yellow Sea and the East China Sea, on the south by the South China Sea, Vietnam, Laos, Myanmar (Burma), India, Bhutan, and Nepal, on the west by Pakistan, Afghanistan, and Tajikistan, and on the north-west by Kyrgyzstan and Kazakhstan. The total area of China is about 9,571,300 km<sup>2</sup>, not including Taiwan.

China consists of 22 provinces (Anhui, Fujian, Gansu, Guangdong, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, and Zhejiang), 5 autonomous regions (Guangxi Zhuang, Nei Monggol, Ningxia Hui, Tibet or Xizang, and Xinjiang Uygur), and 4 special municipalities (Beijing, Shanghai, Tianjin, Chongqing). Hong Kong has been designated since 1997 a Special Administrative Region of China. China counts Taiwan as its 23rd province. (Microsoft Encarta Encyclopedia 2002).

## **Topography**

Mountains occupy about 43 % of China's land surface. In the west some of the world's highest mountain ranges are located, including the Tian Mountains, the Kunlun Mountains, and the Himalaya. Numerous mountain ranges enclose a series of plateaux (26 %) and predominantly hilly basins (19 %), which are mainly located in arid regions. Only 12 % of the total area are flatlands. China has a broad range of climatic types, from subarctic to tropical, and including large areas of alpine and desert habitats.

China may be divided into six major regions:

1. The North-West consists of the Dzungarian Basin (Junggar Pendi) on the north, the Tarim Basin on the south (with Asia's driest desert Takla Makan), and the Tian Mountains. The Dzungarian Basin, although containing areas of sandy and stony desert, is primarily a region of fertile steppe soils and supports irrigated agriculture.
2. The Mongolian Borderlands in north-central China mainly consists of deserts that grade eastwards into steppe lands with fertile soils. Along its eastern border is the higher, forested Greater Khingan Range (Da Hinggan Ling).
3. The North-East incorporates the Dongbei Pingyuan (Manchurian Plain) and its bordering uplands. The plain has extensive tracts of productive soils. The uplands are hilly to mountainous, with numerous broad valleys and gentle slopes.
4. Northern China, between the Mongolian Borderlands on the north and the Yangzi River Basin on the south, consists of several units.
  - The *Loess Plateau* on the northwest is extensively terraced and cultivated and readily subject to erosion.
  - The *North China Plain*, the largest flat lowland area in China with fertile loess soils, is under intense cultivation.
  - The *Shandong Highlands* on the Shandong Peninsula located to the east, consist of two distinct areas of mountains flanked by rolling hills.

- The *Central Mountains* to the southwest constitute a formidable barrier to north-south movement.
5. Southern China embraces the Yangzi Valley and the diverse regions to the south. The Yangzi Valley consists of a series of lowland basins with fertile alluvial soils, with many waterways and lakes. The Sichuan Basin, located to the west, is a relatively isolated area of hilly terrain, enclosed by the Central Highlands. The area is known for its intensive terraced farming. The highlands of South China extend from the Tibetan Plateau east to the sea. In the west the deeply eroded Yunnan-Guizhou Plateau is bordered by a series of mountain ranges separated by deep, steep-walled gorges. To the east are the largely deforested and severely eroded Nan Ling hills, and along the coast are the rocky South-Eastern Highlands. The Xi Basin lying south of the Nan Ling hills is predominantly a hilly area with infertile soils; fertile, flat-floored alluvial valleys, however, border the numerous streams of this region. The broad delta plain of the Zhu Jiang (Pearl River) is commonly called the Canton delta.
  6. The Tibetan Plateau in the southwestern extremity of China is the world's highest plateau region with an average elevation of about 4,500 m. Bordering ranges include the Himalaya on the south, the Pamirs and Karakorum Range on the west, and the Kunlun Shan and Qilian Mountains on the north. The plateau is dotted with salt lakes and marshes, crossed by several mountain ranges, and also contains the headwaters of many major southern and eastern Asian rivers, including the Indus, Ganges, Brahmaputra, Mekong, Yangzi (Chang Jiang), and Huang He (Hwang Ho or Yellow River). (Microsoft Encarta Encyclopedia 2002).

## **Water**

About 50 % of the total land area drains to the Pacific, 10 % to the Indian and Arctic oceans, whereas the remaining 40 % has no outlet to the sea and drains to the arid basins of the west and north, where the streams evaporate or percolate to form deep underground water reserves (e.g. the Tarim).

The most northerly major Chinese river is the Amur (Heilong Jiang) on the border with Russia. The Songhua (Sungari) and Liao rivers and their tributaries drain most of the Dongbei Pingyuan and its surrounding highlands.

The major river of North China is the Huang He. The Yangzi River of central China is the longest river in Asia with a vast drainage basin.

Most of the important lakes of China lie along the middle and lower Yangzi Valley. The two largest in the middle portion are the Dongting and Poyang. In summer these lakes increase their areas by two to three times and serve as reservoirs for excess water. Lake Tai is the largest lake in the Yangzi delta, and Hongze Lake and Gaoyou Lake lie just to the north of the delta.

Saline lakes, many of considerable size, abound in the Tibetan Plateau. The largest is the marshy Qinghai Lake (also known as Koko Nur) in the less elevated northeast, but several others nearly as large occur on the high plateau. In the arid northwest and in the Mongolian Borderlands are a number of large lakes, most of which are saline; principal among these are Lop and Bosten lakes east of the Tarim Basin. Ulansuhai Lake, which is fed by the Huang He, is in Nei Monggol Autonomous Region; Hulun Nur lies west of the Greater Khingan Range in Dongbei. More than 2,000 reservoirs have been constructed throughout the nation, primarily for irrigation and flood control. (Microsoft Encarta Encyclopedia 2002).

## **Climate**

Temperate climates prevail, with desert and semi-arid regions in the western interior and a small area of tropical climate in the extreme southeast. Summer temperatures are remarkably uniform throughout most of the country, but extreme temperature differences between north and south characterize the winters. The Asian monsoon winds exert the primary control on China's climate. In winter, cold dry winds blow out of the high-pressure system of central Siberia, bringing low temperatures to all regions north of the Yangzi River and drought to most of the country. In summer, warm moist air flows inland from the Pacific Ocean, producing rainfall in the form of cyclonic storms. Precipitation decreases rapidly with distance from the sea and on leeward sides of mountains. The remote basins of the northwest receive little precipitation.

Desert and steppe climates prevail in the Northwest and in the Mongolian Borderlands. January temperatures average below  $-10^{\circ}\text{C}$  everywhere except in the Tarim Basin. July temperatures generally exceed  $20^{\circ}\text{C}$ . Annual rainfall totals less than 250 mm, and most of the area receives less than 100 mm.

January temperatures average  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) over much of the Dongbei Pingyuan, and July temperatures generally exceed  $22^{\circ}\text{C}$ . Rainfall, concentrated in summer, averages between about 500 and 750 mm in the east but declines to about 300 mm west of the Greater Khingan Range.

Also North China, which has no mountain ranges to form a protective barrier against the flow of air from Siberia, experiences a cold, dry winter. January temperatures range from about  $-10^{\circ}\text{C}$  north of Beijing and in the higher elevations to the west to  $4^{\circ}\text{C}$  in the extreme south. July temperatures generally exceed  $26^{\circ}\text{C}$  and, in the North China Plain, approach  $30^{\circ}\text{C}$ . Almost all the annual rainfall occurs in summer. Annual precipitation totals are less than 760 mm and decrease to the northwest, which has a drier, steppe climate. Year-to-year variability of precipitation in these areas is great; this factor, combined with the possibility of dust storms or hailstorms, makes agriculture precarious. Fog occurs on more than 40 days a year in the east and on more than 80 days along the coast.

Southeastern China, from the Yangzi Valley southward, has a subtropical climate with a distinctly tropical climate in the extreme south. Summer temperatures in this region average  $26^{\circ}\text{C}$ . Average winter temperatures increase from about  $4^{\circ}\text{C}$  along the Yangzi River to  $18^{\circ}\text{C}$  in the tropical south. An average of eight typhoons a year, mainly between July and November, bring high winds and heavy rains to the coastal areas. The mountainous plateaux and basins to the southwest also have subtropical climates, with considerable local variation. As a result of higher elevations, summers are cooler, and as a consequence of protection from northerly winds, winters are mild. The Sichuan Basin, which has an 11-month growing season, is noted for high humidity and cloudiness. Rainfall, especially abundant in summer, exceeds 1000 mm annually in nearly all parts of southern China.

Because of its high elevation, the Tibetan Plateau has an arctic climate; July temperatures remain below  $15^{\circ}\text{C}$ . The air is clear and dry throughout the year with annual precipitation totals of less than 100 mm everywhere except in the extreme southeast. (Microsoft Encarta Encyclopedia 2002).

## **Land use**

Most of the original vegetation has been removed during centuries of settlement and intensive cultivation. Natural forests are generally preserved only in the more remote mountain areas. Dense tropical rainforests are found in the region south of the Xi valley. An extensive region of subtropical vegetation extends north to the Yangzi Valley and west to the Tibetan Plateau. To the north of the Yangzi Valley a broadleaf deciduous forest originally prevailed. (Microsoft Encarta Encyclopedia 2002).

The distribution of forests in China is very uneven. The northeast and southwest have half the forest area. In the mountains of northern Dongbei, extensive tracts of a larch-dominated coniferous forest remain. The Dongbei Pingyuan, now under cultivation, was once dominated by a forest steppe. China's forest resources are limited due to centuries of overfelling for fuel and building materials. The area of forested land was 13 per cent in the early 1990s. (Microsoft Encarta Encyclopedia 2002).

Steppes are found in the eastern portion of the Mongolian Borderlands. The vegetation of this region has been depleted by overgrazing and soil erosion. The more arid regions of the northwest are characterized by clumps of herbaceous plants and grasses separated by extensive barren areas; salt-tolerant species dominate here. Somewhat lush tundra vegetation is found on most of the high plateau of Tibet. (Microsoft Encarta Encyclopedia 2002).

Only about 10 per cent of China's total area is arable (mostly located in eastern China), and nearly all this land is under cultivation. Almost half the cultivated land is irrigated. The most important crop is rice, which occupies about one third of the total cultivated area, for the most part south of the Huai River (notably in the middle and lower valley of the Yangzi River, in the Pearl River delta in the Guangzhou region, and in the Red Basin of Sichuan). The second most important food crop is wheat, which is grown mainly north of the Huai River. The chief wheat-growing areas are the North China Plain and the valleys of the Wei and Fen rivers in the loess region. Kaoliang (a sorghum) and millet are important food crops in North China and Dongbei. Maize occupies about 20 per cent of the cultivated area. Oats are important chiefly in Nei Monggol and in the west, notably in Tibet. (Microsoft Encarta Encyclopedia 2002).

### **Wetlands**

Liu & Zhao (1987) estimate the total area of "mire-wetlands" in China to be 110,000 km<sup>2</sup>. For the Sanjiang plain they mention an area of "mire-wetlands" of 11,200 km<sup>2</sup>; a part of this area of "mires" has been reclaimed for agriculture. The total "mire" area in the Rouergai plateau is 3,000 km<sup>2</sup>.

According to Yan & Zhang (1994) the Chinese wetlands consist of 110,000 km<sup>2</sup> of freshwater swamp and marsh, 21,000 km<sup>2</sup> of shoreline, coastland, floodplain marsh, and mangrove, and 120,000 km<sup>2</sup> of lakes and reservoirs. The total area of all wetlands in China is more than 250,000 km<sup>2</sup>, with about 80 % of them freshwater. There are also an estimated 340,000 km<sup>2</sup> of rice paddies in China. Kuyi & Daming (1994) mention a total "natural wetland" area of 250,000 km<sup>2</sup> (2.6% of the land area) and a total „man made“ wetland area of 400,000 km<sup>2</sup> (mainly rice fields). According to Huaining (1994) the „mire“ area in China is nearly 1,000,000 km<sup>2</sup>.

### **Peatlands**

Kivinen & Pakarinen (1980), referring to the 1979 peatland statistics of the International Peat Society (cf. Kivinen 1980), mention a peatland area (> 30 cm peat) for China of 34,800 km<sup>2</sup>. This value is also mentioned by Chai (1980) for the area of "surface peatland" (34,770 km<sup>2</sup>), by Kivinen & Pakarinen (1981) and Markov et al. (1988) for the peatland area (> 30 cm peat), and by Aselmann & Crutzen (1989) (31,000–34,800 km<sup>2</sup>) for the area of "virgin peatlands".

Next to an area of 34,770 km<sup>2</sup> of “surface peat”, Chai (1980) mentions an area of 6,820 km<sup>2</sup> of “buried peatland”, together amounting to 41,590 km<sup>2</sup>, with total peat reserves of 27,000 Mt (80 % in surface peatland, 20 % is buried peatland).

“Surface peatlands” are found in the northeastern mountains, the Sanjiang Plain, the Ruoergai Plateau and the Altai mountains in Xinjiang. Some 9,400 km<sup>2</sup> are situated on the Qingzang high plateau in Central China. Buried peat is mainly found along the east coast in the middle/lower Yangtse Basin and the Yunnan-Kweichow Plateau (Chai 1980, Kunshu 1985, see however also Beug 1982, 1987).

Peatlands in Inner Mongolia (Kezuohou County) cover 2.54 km<sup>2</sup> with 54 million m<sup>3</sup> of peat, now largely buried under superficial deposits (Nishizaki et al. 2000).

Björk (1993) estimates the recent “peatlands” on the Hongyuan-Ruoergai plateau to be 4,000 km<sup>2</sup> and to contain 1,900 Mt of air-dried peat. This Sichuan Province contains – according to He & Deng 1996 - 26% of the total “peatland” area of China and 45% of the total peat reserves. The Heilongjiang Province (NE China) is reported to have 2,008 km<sup>2</sup> of “peatland” with a “peat reserve” of 1,318 Mt (Tienan et al. 1994).

Sedge and reed peats occupy the coastal swamps, river floodplains and inland lake depressions; transitional peat is found only in colder regions at higher altitude (Zu et al. 1984).

The figures of Chai (1980) are quoted by Bord na Mona (1985). Shrier (1985) mentions a “mire” area of 41,600 km<sup>2</sup>, but refers to the 34,700 km<sup>2</sup> of surface peats and the 6,820 km<sup>2</sup> of buried peats separately. Andriess (1988), however, uses the total areal value of 41,600 km<sup>2</sup> to describe the extent of “organic soils” (42,000 km<sup>2</sup>), whereas Schneider & Schneider (1990) and Pfadenhauer et al. (1993) use that value for peatlands. Markov et al. (1988) use the value of 41,600 km<sup>2</sup> more correctly to estimate the area of „peat resources“ (peat thickness not mentioned).

Xuehui et al. (1993) and Rongfen (1994) estimate the „mire“ area of China to be 113,000 km<sup>2</sup> and the peat “reserves” to be 5,000 Mt of which 80% is on the surface and 20% is buried peat. According to Xuehui & Yan (1996) the recent (1985) “wetland” area in China (excl. Taiwan) is 250,000 km<sup>2</sup>, the recent “peatland” area 10,440 km<sup>2</sup>. This “peatland” area consists for 3,028 km<sup>2</sup> (29%) of buried peat, whereas 7,412 km<sup>2</sup> (71%) is surface peat. The peat resources are estimated to be 4,690 Mt (dry matter). He & Deng (1996) report for the 1980s a recent “peatland” area of 10,044 km<sup>2</sup> (cf. the 10,440 km<sup>2</sup> of Xuehui & Yan 1996) and peat resources of 4,690 Mt. The “verified” peat reserves would amount to 329 Mt. The same data are presented by Xuehui & Jinming (2000).

Rieley et al. (1996a) estimate the extent of peat swamps in China at 10,000–30,000 km<sup>2</sup>. Yang (2000a) mentions the total area of “mire“ of China to be 120,000 km<sup>2</sup>.

According to the interpreted World Soil Map (Van Engelen & Huting 2002) 84,711 km<sup>2</sup> of histosols exist in China and 790,213 km<sup>2</sup> of gley soils.

### **Mire and peatland losses**

Mangroves originally (“nature”) covered 136.5 km<sup>2</sup> in China (Han et al. 2000). Coastal wetlands are found along the Yellow Sea and Bohai Sea. They are facing over-utilization and water pollution following the rapid economic development (Wang et al 2000). In the Liaohe Delta (13,000 km<sup>2</sup> consisting of open water, beach, reed marsh, paddy fields), the wetland area has decreased by agricultural use, e.g. by the development of >70 km<sup>2</sup> of prawn crab

ponds in the period 1986-94 (Wang 2000). The Bohai Sea saline meadow (flooded grassland & savannas) of 11,600 km<sup>2</sup> is critical/endangered (www.worldwildlife.org/wildworld/profiles/terrestrial/pa/pa0902\_full.html) as is the Nenjiang River grassland with 23,200 km<sup>2</sup> of flooded grassland & savannas (www.worldwildlife.org/wildworld/profiles/terrestrial/pa/pa0903\_full.html).

Almost all “peatlands” in China have been disturbed in some degree by human activities (Yang 2000b). As early as two hundred years ago China began to drain peatlands in order to improve the farmland, pastureland and the land fit for afforestation.

At the end of the 1970s, 92 % of the peatlands were considered to be still in a virgin (undrained) condition (Kivinen & Pakarinen 1980). According to preliminary estimation, about 1,162 km<sup>2</sup> of peatland have been converted into farmland, and about 700 km<sup>2</sup> ha are drained for forestry (Schneider & Schneider 1990). In the past few years the utilization of peat resources has increased dramatically.

According to Xuehui & Yan (1996) more than 15 % of the “peatlands” are drained for agriculture, 8 % is used for forestry, and 10 % as grassland. Data on drainage for fuel extraction are not presented.

Peat in Sichuan is used by nomad Tibetans for constructing walls and fences and by Chinese for fuel. The increasing mining activities (1987-1992) are reported to have been “inefficient and environmentally destructive” (Björk 1993, see also Ekstam xxx).

In the alluvial Sanjiang Plain (NE China) with a total area of 108,900 km<sup>2</sup> and an original (“nature”) 24,200 km<sup>2</sup> of wetland (Kuivi & He 2000), desertification by human activities has affected 20% of the total land area and only 380 km<sup>2</sup> of “peatlands” are left (Yang 2000b) (original figures are presented in hm<sup>2</sup>; we have considered 1 km<sup>2</sup> to be 100 hm<sup>2</sup>). Liu et al. (2000) report that the “marsh” area in this plain decreased from 49.09% of the total area to 9.59% in 1994. The Sanjiang Plain is today the largest wheat and soybean commodity base of China (Rongfen 1994).

The wetland area in Northeast China (Sanjiang Plain, Songnen Plain, north part of the Daxinganling Mountains) was 33,350,000 km<sup>2</sup> ( 2.7% of the land area). In 1950 only 9,100 km<sup>2</sup> of arable land existed in this area. By the mid-1980s the arable land had increased to 34,850,000 km<sup>2</sup>, „most of them converted from peatlands“ (Yinliang et al. 1994).

Shulan & Jian (1994) report that in the Northeast Region of China more than 400 km<sup>2</sup> of „paddy soil peat-mire type“ exist.

On the Zoige (Ruoergai) Plateau with 4,900 km<sup>2</sup> of peatlands > 2,000 km<sup>2</sup> (42.5%) is drained and 60% affected by excessive pasturing. Desertification by human activities affects 4,090 km<sup>2</sup> (Yang 2000b?, Chew 2003). Peatlands have completely disappeared in the Changbai Mountains and in the Xiaoxinganling Mountains. In Tanghonglin 31.7 km<sup>2</sup> is drained (Yang 2000b). In the Daxinganling Mountains forest fires have burnt 920 km<sup>2</sup> of peatland (Yang 1995).

Fotos: <http://www.ipcc.ie/wpchina.html>

Still to be checked:

**Kunshu**, Zh. 1985. Vorläufige Studie über die Bildung der Moore im Holozän im nördlichen China. Telma 15: 57-66.:

**Zu Wenchen**, Ma Xuehui, Wang Rongfen. 1984. The basic properties and utilization of peat in China. Proceedings of the 7th International Peat Congress, Dublin 2:88-100.