

1998 Flood Disaster and Actions in China

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1. Flood and Loss

During the 1998 flood season, the average precipitation of the Yangtze River Basin was 37% more than the average precipitation of the same period in normal years, and with only 36mm less than that of 1954, it became the second highest record in this century. The precipitation from June to August of the Nenjiang Basin, which is located along the upper reaches of the Songhuajiang River, was 79% more than the average precipitation of the past years during the same period. Because of this high precipitation, the Yangtze River had its second overall flood in this century which was only next to that of 1954, the Songhuajiang River had its biggest flood, the XiJiang River, which is a tributary of the Zhujiang River, had its second biggest flood in this century, and the Minjiang River had the biggest flood ever.

1.1 Floods of the Yangtze River

From June 12 to 27 Boyang Lake and Dongting Lake in the Yangtze River Basin had floods during the early flood season. Floods from the two lakes poured into the Yangtze River, causing water levels along the middle and lower reaches of the river to surpass the warning levels after June 24. From July 2 to late August, eight flood peaks occurred along the upper reaches. When these floods met with that of the middle and lower reaches of the river, extraordinary floods valley floods occurred. Especially the sixth flood peak, which was the biggest one, even had a rate of flow of 63,300 cu m per second. On its way toward the middle and lower reaches, this flood peak met with the floods of the Qingjiang River, Dongting Lake and the Hanjiang River, and the water level along 360 km of the main river bank reached the highest historical point, making an extraordinary dangerous situation during the fighting

against the flood. The total volume of floods in 1998 was less than that in 1954, while the water level of the middle and lower reaches of the river was higher than that in 1954. Firstly the main reasons for the high water level is the water volume of overflows and flood division was less than that of 1954. The total water volume of the overflows and flood division on the middle and lower reaches of the river were as much as 102.3 billion m^3 ; while that of 1998 was only 10 billion m^3 . Secondly, the lake ability for flood adjustment and storage was lower than before. If the flood volume of 1998 is calculated with the natural flood adjustment and storage volume of 1954, than 1998 water level of Dongting lake, Poyang Lake and the middle reaches of the Yangtze River would have been 1 m lower than the 1998 measured level. Thirdly, the change of the water system between Yangtze River and Dongting Lake also caused this rise of water level .

1.2 Floods of the Songhuajiang River

From the end of June to early August, three big floods hit the Nenjiang Valley within the upper reaches of the Songhuajiang River one after another. The first flood mainly came from the upper reaches of the Nenjiang River and from the tributaries of the Ganhe River and the Nuominhe River. The second flood was primarily from the middle and lower reaches of the Nenjiang River and its tributaries, such as the Muominhe, Alun. Yalu, Zhuo'er and Tao'er Rivers. The third flood was a big one that affected the whole Nenjiang Valley. The water levels of the Noumin, Yalu, and Tao'er tributary rivers were all above the historical record. The flood of such magnitude occurs once every 100 to 1000 years. Affected by the water from the main stream and tributaries, the highest water levels at the Tongmeng, Qiqihar Jiangqiao and Dalai Hydrographic stations on the mainstream of the Nenjiang River were 0.25 m to 1.61 m higher than the highest historical water level recorded ever before. Harbin, a city along the Songhuajiang River bank, had its highest water level of 120.89 m which is 0.84 m higher than the historical record. The rate of flow was 166.00 m^3 per second. Such a great flood may occur once every 150 years.

29 provinces (including municipalities or cities directly under the jurisdiction of the

Central Government) in the country were hit by the flood disaster in different degrees especially Jiangxi, Hunan and Hubei, etc.

Table 1 Flood disaster and direct economic loss of China in 1998

Affected people (10 ⁸)	Death	Collapsed room	Damaged room	Affected crops (10 ⁴ ha)	Disaster crops (10 ⁴ ha)	Crop failure (10 ⁴ ha)	Direct economic loss(10 ⁸ \$)
1.8	4150	685	1329.9	2229.2	1378.5	529.5	307.34

(1\$=8.3 yuan RMB)

2. The facts of flood prevention and the anti-flood fighting

The anti-flood fighting of 1998 was carried out under the direct leadership of the Central government. With the view of safeguarding the dikes of the Yangtze River and Songhuajiang River, safeguarding key cities and securing the lives and properties of people, a mass of military and civilian people made their utmost efforts in fighting against the flood and achieved a complete victory over the attacks of the floods. The main measures taken in the anti-flood fighting were as follows:

2.1 Full preparation and comprehensive deployment

Before the flood season, the State Flood Control and Drought Relief Headquarters made an early prediction that an overall flood could occur on the Yangtze River according to the forecasts made by the meteorological department. The State Flood Control and Drought Relief Headquarters convened their first meeting a month earlier than the past years to make a general assignment of the work for flood prevention and anti-flood fighting. The State Flood Control and Drought Relief Headquarters checked the flood prevention work of the biggest rivers, especially the Yangtze River, supervised the implementation of all kinds of measures, announced the names of administrators responsible for flood prevention of big rivers, and had the major river-flood control plan modified, printed and distributed. Prevention plans of action were made, financial input was increased, and a number of dangerous sections of construction buildings, reservoirs, and sluices were consolidated. Moreover, emergency squads were organized and materials were prepared for the flood emergency, all of which had laid the base for overcoming the flood. The provinces along the Yangtze River including Hubei, Hunan, Jiangxi,

Anhui and Jiangsu, enhanced the preparation work according to the requests to resist the floods of the same magnitude as 1954.

2.2 Unified leadership and correct decision-making

Confronted with large magnitude floods and relevant emergencies, on August 7, the crucial moment of the battle against the floods, the Standing Committee of the Political Bureau convened a meeting to make a general assignment of the anti-flood work. On August 11, the State Flood Control and Drought Relief Headquarters held a special meeting, demanding localities to enhance their work of inspecting and consolidating dikes. They were asked to prepare themselves for emergencies, especially the break of dikes. Immediate actions were to be taken whenever there was any risk, and a scientific attitude was to be taken in organizing the work of rescue. During the process against the sixth flood peak, the State Flood Control and Drought Relief Headquarters called together experts to analyze the flood situation on the spot, and the Central Government decided not to use the Jingjiang Flood Diversion area. Instead, strict defense and scientific conduction were demanded. The relevant reservoirs were used to deter and hold the floods and to reduce the discharge of the flood peaks. With the joint efforts made by the military and civilians, the sixth flood peak passed Shashi City safely. This avoided the unnecessary loss that might have been caused by using the Jingjiang flood diversion.

2.3 The military and civilians were united to make full exertion to deal with the emergency

During the flooding period in 1998, many sections of dikes had to resist flood water above the water level they had been designed to defend. There were about 300 km of dike lower than the level of the flood water. It was therefore a need to build up a second defense to resist the water. On the dikes along the Yangtze River, there were more than 9,000 sites in a dangerous condition, while there were 6,000 dangerous sites on the dikes along the Songhuajiang River. At the crucial moment, the Central Government determined to deploy the People's Liberation Army on a large scale. During the flood season, it deployed 362,400 military forces and policemen,

including more than 110 generals and 5,000 leaders at the division and regimental levels to fight against the flood in the valleys of the Yangtze River and the Songhuajiang River. About 566,700 vehicles/time units; 50,000 boats and vessels/time units; and 2,241 aircraft and helicopter/time units were involved. The people together with the servicemen defeated the floods one after another and the dike was secured. Statistics shows that in late August, the people involved in the anti-flood fighting reached the highest point of about 8 million persons.

2.4 Concerted cooperation between different sectors and trades

People of all trades and sectors held to the principle that special and urgent issues related to anti-disaster fighting should be specially and immediately dealt with.

Table 2 The flood reduction actions by different departments of China in 1998

The State Council	Decided to increase the anti-flood fund by several billion RMB from the Premier's Alternative Fund.
The State Development Planning Commission, Economic and Trade Commission, Ministry of Finance, and Ministry of Civil Affairs	Had the funds allocated, and the material distributed timely.
The railway departments	Arranged for 278 round trip trains especially for anti-flood military use, and conveyed more than 120,000 people and 50,000 carriages of material.
The Civil Aviation sector	Dispatched 1000 aircraft/time units and transported 560 tons of disaster relief material and equipments.
The river traffic departments	Acted to stop navigation on the middle reaches of the Yangtze River for the safety of the dykes.
The communication departments	Made sure that communications for the anti-flood fighting was unimpeded.
The electricity department	Secured the needed supply of power
The public security department	Maintained social stability.
The press and publicity sector	Fully and timely reported the flood situation and the anti-flood fighting, inspiring the spirit of the military and civilians who were fighting against the flood.
The National Headquarters for Flood and Draught Resistance and Prevention	Immediately allotted from all over China, 100 million sand bags, 14 million square meters of geofabrics, 2.86 million square meters of adhesive-bonded fabrics, 2,415 rubber boats, 760 assault boats, 599,200 life-vests, 77,400 life-buoys, 4,650 tents, 3,082 lamps, 455 tons of galvanized wire, 67,900 cubic meters of gravel and sand material, 136 vehicles, and 46 sets of rescue equipments, the value of which totaled 494 million yuan. According to the statistics, the total value of all the allotted material in different provinces was as high as 13 billion yuan.

2.5 Deal with emergencies and disasters with a scientific attitude

In resisting the 1998 catastrophic flood, 763 large and medium sized reservoirs in the 5 provinces and cities of Hunan, Hubei, Jiangxi, Sichuan, and Chongqing were used to store as much as 34 billion cubic meters of flood water which played an

important role in decreasing flood peaks. For example, when the sixth flood peak arrived, Geheyan Reservoir and Gezhou Dam were used to hold back the flood water, resulting in lowering the water level by 0.40 meter. In Danjiangkou Reservoir of Hanjiang River, the maximum inflow was 18,300 m³ per sec and the maximum outflow was 1.280 m³ per sec. This storage reduced 93% of the flood peak and thus avoided the need for flood diversion in Dujiatui near Wuhan City and reduced the pressure on the City of Wuhan. According to the statistics in 1998, 1,335 large and medium sized reservoirs were used to store as much as 53.2 billion m³ of flood water and decrease the flood peaks. Therefore, 2.28 million ha of farmland with a total population of 27.37 million people were protected from the flood.

In the work against the 1998 flood, professionals and technical personnel in the field of water conservancy and meteorology played very important roles. They made scientific analysis and judgement of precipitation, water situation in rivers, danger and ability of resistance of dykes, and provided expert advice and suggestions. The State Flood Control and Drought Relief Headquarters sent out about 30 experts working groups to the flood-fighting front to direct work. With the instruction of these professionals, correct and effective measures were adopted for rescue and reduced many dangerous situations.

2.6 Take strict flood prevention measures accordance with the law

In the emergency situation of the 1998 flood, the flood stricken the provinces of Jiangxi, Hunan, Hubei, Jiangshu and Anhui declared, one after another, that they had entered into the emergency flood prevention stage according to the Law of the People's Republic of China on Flood Prevention. In Heilongjiang Province, cities such as Harbin, Qiqihare and Daqing along the rivers also entered the emergency flood prevention stage. The flood prevention command offices at various levels made requisitions for materials, goods and vehicles for the emergency. Barriers in rivers were cleared and those who neglected their duty of flood prevention were punished according to the law.

A decisive victory was achieved in the flood fighting through an arduous struggle.

Thus, losses caused by the disaster were reduced to a minimum. The Yangtze River flood in 1998 was a major flood like in 1931 and 1954, however, the flooded area and the number of dead and injured were much less.

Table 3 Comparison of the three serious floods of the Yangtze River in Chinese history

Year	Dike breaks	Flood area	Death(person)
1931	300	the middle and lower river reaches were all flooded	145000
1954	60	an area of 3.17 million ha were flooded	33000
1998	1	an area of 321,000 ha were flooded	1562

3. Emergency Response to the Flood

3.1 Immediate transfer of the flood affected population

After the early warning was given the county governments informed people who would be endangered by flood of the transfer announcement through different means such as broadcast and television. The transfer means, routes and displacement places were detailed in the announcement. People from the grass-roots organizations at townships and villages as well as local civil affairs departments went to the transferred places to explain explicitly the local people about the necessity and organized the local people to evacuate in an organized and orderly way. Rescue team were established, boat medical team, victim settlement team, patrol police team and water obstacle clearance team so as to save people who would be trapped on hillsides and housing roofs, and in trees and water.

Statistics reveal that in 1998, 18.393 million people affected by floods were immediately transferred and displaced, which brings the casualties to the minimum. Floods caused the death of 4,150 persons, slightly more than a normal year and less than 1931 when 145,000 people lost their lives, and in 1954 and 1991 30,000 and 7,300 people lost their lives respectively.

3.2 Disaster assessment teams organized by governments at various levels hurried to disaster-hit areas to make a thorough evaluation of the disaster situation and demands there.

3.3 Appropriate arrangements for displacement of transferred people through different ways.

Flooded people were encouraged to go and seek refuge with their relatives and friends; With the organization and co-ordination of the local governments, people affected by floods were settled in non-flooded areas nearby. Houses were provided by the local governments; shelters and tents were built on the dams.

3.4 Provisions of food and clothing

In food provisions, different arrangements were made in accordance with specific conditions. Those who temporarily stayed on the dams were mainly provided with instant food such as bread, steamed bread, instant noodles, biscuits, drinking water, water purification supplies and medicines. Flooded people were also organized to dig wells for temporary purposes. Those who separately settled could receive 2-3 Yuan on a daily basis and were provided with food and accommodations by the families they stayed with together. Those who sought refuge with their relatives and friends could receive a lump-sum grant for travel and food. In clothing provisions, social donations were mainly mobilized. The Ministry of Civil Affairs(MoCA) organized 13 provinces/municipalities including Beijing and Tianjin to collect clothes and quilts to give counterpart support to the flooded provinces. Within 20 days, more than one hundred million pieces of clothes were raised and fully distributed to the victims before the winter approached.

3.5 Medical Care Provisions

Groups of medical teams were sent to the flooded areas to carry out the mobile medical treatment in the flooded areas. The designated medical stations were setup in areas where disaster victims were concentratedly displaced. Medicines were distributed for preventing and cure diseases. The victims were organized to keep a sanitary living environment so as to control the occurrence of diseases. Publicity was given to disease prevention and cure through mass media, such as broadcast, television, and newspaper and publicity materials to raise people's awareness in preventing and curing diseases in the flooded areas. Counterpart assistance was organized among provinces. A system of reporting the monitoring of epidemic diseases were established.

3.6 Organize and mobilize disaster relief donations

With further severity of flood, the disaster victims' difficulty in livelihood increased, which aroused the great concern of people of all nationalities in China, personalities of various circles in Hong Kong Administrative Region, compatriots in Macao and Taiwan as well as overseas Chinese and foreigners of Chinese origin. They were at an all time high to give donations in cash and in kind to support the flooded areas. Therefore, the Central Government decided to mobilize a disaster relief campaign across the nation. On August 23, the Ministry of Civil Affairs was authorized by the State Council to make a unified organization of the nationwide donations. For this purpose, a leading group was immediately established by MoCA to launch a powerfull and dynamic donation campaign throughout the country.

MoCA, China Charity Federation and Red Cross Society of China made public their account numbers on disaster relief donations; MoCA and Civil Affairs Departments at various levels set up special groups to accept, manage and distribute donations in cash and in kind within 24 hours. In close cooperation with relevant departments in charge of railways, transportation, civil aviation and customs, MoCA facilitated the formality completion of custom declaration and transportation of relief donation within 24 hours. Sponsored Disaster Relief Charity Show started a new upsurge of donations. MoCA and Ministry of The Culture together organized a large-scale charity show 'Build the Great Wall Har'd's in Hands'. China Charity Federation, Red Cross Society of China and China Central Television (CCTV) also sponsored such a show 'All People With One Heart'. The UN system was informed of China's flood situation by the Deputy Secretary-general of the United Nations, who launched an appeal for international assistance.

People of all nationalities volunteered to donate money and materials to the disaster stricken areas. The total donation of funds received by the Ministry of Civil Affairs and its local branches, the China Charity Federation, and the China Red Cross Association reached 3.5 billion yuan. The donated materials were valued at about 3.7 billion yuan. People of all economic circles in Hong Kong, Compatriots in

Macao and Taiwan, and many overseas Chinese showed great concern for the people in the flood areas and made financial contributions to them. Many friendly countries, international organizations, foreign enterprises and individuals also gave a financial support to the flood fighting in China.

4. Post-flood Relief

After the floods, a full-scale reconstruction is required. In accordance with the principles of overall planning with due consideration of all concerned, treating the problems by looking into both root cause and symptoms and seeking comprehensive harnessing of resources, the Central Government worked out the post-flood reconstruction policy of 'improving reforestation by prohibiting hunting and grazing on mountains and returning farmland to forests, removing some embankments to discharge floodwater and return some farmland reclaimed from lakes back to the original state; working for relief and building new towns for the displaced people and strengthening dikes and dredge silted rivers and lakes'. While making a long-term planning of the post-flood reconstruction, the Central Government also made appropriate arrangements for the flood-affected people.

4.1 Help flood-affected people rebuild houses for wintertime

A unified plan was made. Following the principles of suiting measures to local conditions, building affordable and practical houses as well as designing rational layout, Departments of Civil Affairs, Construction and Land Resources made a unified planning to the reconstruct new villages. In this way, the old looks of the villages were changed, but the arable land saved. The houses standards for preventing and fighting against natural disasters was raised. Efforts were made to avoid building new houses in the area of floodwater storage and discharge and area prone to mountainous disasters. When conditions permitted, houses made of steel and cement, bricks and wood, instead of earth were built. Housing funding was raised through various channels. Such funds were raised by means of governmental relief benefit, mutual help, neighbor's contribution in labor and building materials, work for relief, loans and formulation of preferential policies. Governmental relief

benefit was mainly provided to the needy families seriously affected by floods; Formulated preferential policies were: The less severely flooded areas and relevant department were organized to give support to the worst flooded areas. Victims received assistance in building new houses in terms of funding, techniques and goods. Procedures were simplified and taxes charge and fees were reduced. Stable commodity prices was maintained. Relevant departments were coordinated to ensure a timely production and transportation of rehabilitation supplies.

4.2 Various steps to provide food grain for flood-affected people

Those who could provide for and help themselves but temporarily had no money to buy food grain could borrow some food grain. Those who had source of income but no money to buy food grain could buy credit. Those without money and food grain were provided with donated grain from non-flooded parts of the province. Those who were most needy families without food grain and money had to receive relief from the government.

According to the statistics, the Central Government provided 8.33 billion yuan of relief funds and a great quantity of relief goods to the flooded areas. 4.11 billion yuan were utilized to provide for livelihood. Governments at various levels input 2.79 billion yuan for the flooded people. Relief donations amounted to 7.259 billion yuan. A total of 14.15 billion yuan of funds and materials were used to make arrangements for people's food, clothing, housing and medical care in the flooded areas, which lay a solid material foundation to help victims tide over difficulties.

With the concerted efforts of all sides, appropriate arrangements were made for the displacement of people threatened by floods, and the basic needs of these people, such as food, clothing, housing and medical care, had been met. Great achievements had been scored in the recovery and rehabilitation of the flooded areas.

Table 4 The relief fund of the Central Government

Relief fund (10 ⁸ \$)	Subvention (10 ⁸ \$)	Recovery fee (10 ⁸ \$)	Flood prevention fee (10 ⁸ \$)	Projects repairing fee (10 ⁴ \$)	Epidemic prevention fee(10 ⁸ \$)	Administration of culture and education fee (10 ⁸ \$)	Relief fertilizer (10 ⁴ Ton)	Relief diesel oil (10 ⁴ Ton)
10.0	3.5	1.5	3.5	602.4	0.3	0.9	20	50

(1\$=8.3 yuan RMB)

Table 5 The donations from different ways

Department	Money(10^8 \$)	Goods to money(10^8 \$)	Total(10^8 \$)
The Ministry of Civil Affairs	1.26	1.00	2.27
China Charity Society	0.40	0.28	0.68
China Red Cross Society	0.16	0.17	0.33
Different department of civil affairs	2.42	3.05	5.47
Inland	3.50	4.22	7.73
Hong kong and Macao	0.42	0.03	0.45
Foreign governments, International organizations and the overseas	0.30	0.26	0.57
Total	4.23	4.51	8.75

(1\$=8.3 yuan RMB)

5. Main experience

To sum up the flood fighting and relief operations in 1998, the experiences were concluded as follows:

5.1 A sound coordination mechanism undertaken by the Central Government

Early-warning and forecasting system was established to make scientific forecast. It was necessary to acquire information concerning rainstorms and floods. Information was shared among various departments. Plans were formulated for flood fighting and relief operations as well as emergency response. Armed forces were mobilized. Different departments coordinated with each other to arrange for relief funds and materials. It needed coordination to engage in flood relief operations. Technical support was provided for the flooded areas by coordination among various technical departments.

5.2 Intensify the responsibility of local governments to carry out relief operations

It is clear that local governments bear major responsibilities in disaster relief and the Central Government gives necessary support. A responsibility of leading officials should be set up. People affected by floods were organized to transfer immediately. Displacement of flood affected people made a success; Relevant departments should be coordinated to arrange for assistance. Scientifically local manpower, material and financial resources should be dispatched. Victims should be organized to provide for

themselves by engaging in production. Post-flood rehabilitation plans was a very important work.

5.3 Organize the entire people to participate in the disaster relief operations

Disaster victims should be mobilized to participate in relief operations. Armed forces should be mobilized to carry out relief operations. All government functions give support to the fight against floods. The active participation of NGOs and volunteers in the relief efforts was very important. A successful organization of relief donations was helpful.