Drought and Drought Disaster Management in China

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I. General Situation of the Development of Drought Disaster Management in China

Three-level ladder landscape and monsoon climate make drought an inherent meteorological feature in our county. After the founding of People’s Republic of China, our government has carried out a wide range of water projects, which effectively takes the various losses caused by droughts under control. Since the 21st century, the number of crops damaged by droughts each year has been on decrease on the whole, and rural areas suffering from drinking problems due to droughts has been reduced; during the drought and water shortage period, the government controls and manages urban surface water, underground water and diverted water on a unified scale, carries out the planning water use regulation strictly, deploys limited water resources in a scientific way, adopts emergency water transfer measures, replenishes water supply resources, and solves urban water crisis; emergency water diverting is adopted to deal with ecological crisis of river and lake wetlands, and ecological degradation caused by droughts is effectively taken under control.

Drought disaster management in our county includes engineering measures and non-engineering measures. In terms of engineering measures, an engineering system for drought mitigation has come into a basic form at the present time, which mainly consists of water storage project, diversion project, pumping engineering and water transfer project. By the end of 2011, the national water storage project had produced a total water output of 178.28 billion m3, and the diversion project 175.15 billion m3; the total installed capacity of electromechanical irrigation and drainage pumping stations was up to 44 030MW; pumping station engineering contributed a water output of 76.24 billion m3; 5.414 million electromechanical wells had been built; besides, a series of water transfer projects had been carried out, which effectively alleviated agricultural drought, urban water supply shortage and ecological degradation. In terms of non-engineering measures, a non-engineering system has come into being, consisting of policies and regulations, planning, pre-arrangement, information management and service organization of drought-combating. By 2011, we had successively issued and carried into effect “Drought Combating Regulations of People’s Republic of China” and Eight-Province Drought Combating Regulations, and established a drought combating and management system of statistics and report, conference and consultation, release of drought disaster situations, drought combating summing up, unified dispatches of water, and pre-arranged planning system of drought combating; a pre-arranged planning and programming system of drought-combating had taken initial shape; at the same time we strengthened development in terms of drought monitoring and warning system, drought-combating service organization and material reserves. Agricultural, urban and ecological drought combating develop in a unified and coordinate way, effectively guarantee the safety of food, urban water and ecological environment in our country.
II. Characteristics and Problems of Drought Disasters in China

According to national statistics of loss caused by natural disasters, meteorological disasters loss takes up 61% of the total natural disaster loss, while drought loss accounts for 55% of the former. Drought disasters have become one of the major natural disasters in our country. Due to the fast development of economy and population, the demand of water resources on behalf of the society has been on gradual increase. Water resources being finite, the ability of the society to endure drought has sharply weakened, therefore a mild drought may lead to a great disaster. Affected by the combined influence of natural and artificial factors, phenomena such as discontinuous flow of rivers, fall of the water level, enlargement of underground funnel, shrinking of lake, oasis and wetland, sandy desertification, vegetation degradation and near extinction of rare species appeared in some areas of Northern China from 1950s to 1990s, and water ecology at that time was confronted with great crisis. Water quality was deteriorated seriously, and ecological environment in the lake districts was greatly destroyed.

The distribution characteristics of drought disasters: with the changing situation of drought disasters, the present drought disasters in our country can be generally classified into four types: agricultural, urban, ecological and rural drinking problem caused by drought.

Agricultural areas stricken by drought primarily scatter in main grain producing areas. According to the statistics of damage area and economic loss of the provinces during 2000-2010, the 13 main grain producing areas are the major part that suffers from disaster damage and economic loss.

Cities stricken by water shortage are mainly in the northern part, with 57 in the northeast, 134 in Huang-Huai-Hai area, 62 in the northwest, 42 in the middle and lower Yangtze River, 8 in the south, and 28 in the southwest. Huang-Huai-Hai area suffers most heavily from urban water shortage.

Drinking problem areas caused by drought concentrate in southwestern China. Rural areas with drought-inflicted drinking problems mainly scatter in Yunnan, Chongqing, Guizhou, Sichuan and Guangxi province (autonomous region, municipalities).

Ecologically-degraded areas caused by drought mainly scatter in the northern part. Ecological degradation of river and lake districts primarily take place in the the North during 1960s and 21st century, such as Baiyangdian Lake, Xianghai wetland, Zhalong wetland, Nansi Lakes, Tarim River and Heihe.

III. Transformation on drought management ideas

In China, "Drought Prevention" is temporarily emergency mitigation actions, but many current drought mitigation activities are beyond "temporary" and "emergency". We have developed relevant policies and regulations, plans, monitoring systems, drought management teams and
material reserves.

Chinese drought disaster management agencies were mostly established under Agricultural Department or irrigation sectors from 1949-1988. With two decades of accelerated urbanization, urban arid and arid ecosystems increasingly highlighted, agricultural drought management could not meet the needs, so China established a unified national institutions.

Drought management ideas have changed, due to China's population and rapid economic and social development. From the affected agricultural and rural water use, gradually extended to the cities' industrial and residential water use and eco-environmental water use, China has made "two transformations "strategic guides, “from flood control to flood management”, “from simple prevention to comprehensive drought prevention---expanding the field of drought prevention to agriculture, urban, ecological economic and social development services”, “focus shift from agricultural efficiency to social, economic and ecological benefits”, “change from passive to active drought prevention. It is to minimize the overall economic, social, ecological damages.

In 2011 the State Council executive meeting examined, adopted and formally approved China's first "National Drought Plan". Currently "National drought plan and implement program" has been completed. "National Drought Plan" follows the principle of "prevention is the main task, with combination of defense". It comprehensively surveys and systematic analyses regional distribution of drought. We should base on "China's Drought Ordinance" requirements, at based on national and provincial drought planning experience, and gradually promote China's city and county level drought-related plans, and gradually establish long term drought mitigation mechanisms.

IV. Future development of our drought disaster management

1. Promote and implement drought risk management

Drought risk management (DRM) is the process of monitoring, analyzing and forecasting drought hazards and their patterns, assessing potential losses and impacts of drought hazards, optimizing and combining a variety of measures for drought resistance to cope with drought in an orderly and effective manner and conducting post-disaster evaluations. The United Nations has coordinated with many countries to launch DRM research in recent years. The Drought Risk Reduction Framework launched by the UN in 2009 was in line with our DRM concept; therefore, it is possible to continue to improve and implement our method in order to manage drought hazards.

2. Improve structural and non-structural measures

The large number of water conservancy and irrigation projects launched in the past 60 years has mitigated the impact of normalized droughts, with an agricultural water supply rate of 50% to 70% and an urban water supply rate of 70% to 100%. However, regular water projects are insufficient to quickly relieve drought hazards during a drought emergency if the drought is
relatively severe. New structural projects are needed as supplements, such as emergency water supply for drought resistance. Although ten different forms of regulations were issued, including the Drought Control Regulation of the People’s Republic of China, the operability, scientific soundness, and completeness of these measures can still be improved upon. Research should be intensified in the areas of pre-disaster prediction, forecasting, early warning indicators, disaster management practice effectiveness, and the disaster aid system’s ability to recover quickly post-disaster.

3. Making drought disaster management more scientific

Due to the complexity of drought and drought hazards, our knowledge is very limited and the scientific soundness of our drought disaster management remains at a low level. Analyzing the mechanics and patterns of these disasters requires a significant amount of data. The key to making drought disaster management more scientific is to collect, investigate and share drought and drought disaster-related data.

4. Prioritize water conservation while aggressively seeking alternative sources

We must realize that the ultimate solution to drought is water conservation. Reasonable and scientific use of water is a sustainable strategy for drought resistance. Conservation, protection and allocation of water resources should be prioritized. Building a society focused on water conservation and pollution prevention should be the long-term goal of drought resistance and disaster reduction efforts. We should cultivate a rational and scientific pattern of water consumption, enhance people’s awareness of water conservation and pollution prevention, and promote the development of a circular economy. A price system should be established that reflects water shortages and facilitates water conservation. We should establish an index system that controls the total quantity of water use; complete and improve water use quotas for industries; efficiently set indices controlling water use; establish a system to limit sewage runoff in water resource areas; and develop agricultural practices, industries, and a service sector that makes more efficient use of water.

While making every effort to conserve water resources, we also need to find new water sources; improve and complete the water resource allocation system and project structure; make full use of the drought resistance capacity of our existing water projects; strengthen the joint management of water conservancy project systems during emergencies, and promote the establishment of emergency water supply systems in order to comprehensively improve the capacity of river basins and other regions to cope with severe and persistent droughts.

4. Save water first, and actively develop resources

We must recognize that the key to fighting droughts is to save water, and the permanent solution should be rational and scientific water usage. We should give priority to water saving, protection and allocations, establish a water-saving society in the long term, build up a scientific and rational pattern of water consumption, enhance social awareness, and therefore promote a
circular economy. We need to establish a water-pricing system that corresponds to water shortage and saves water, set up a control index system for total use of water, improve industry-water quota system, clarify the control index of water efficiency, establish a pollutant-limit system in water function zones, develop water-saving agriculture, industry and service industry, and improve water efficiency. And while we do everything possible to save water resources, it is also necessary to actively develop new water resources, improve the system of water allocation and engineering, raise the drought-resilience of current water projects, enhance emergency joint-management of water projects to resist droughts, promote the establishment of emergency back-up water projects, all of which above help to fully improve the ability of water basin and regions to resist severe and prolonged droughts.

5. Implement socialized drought resistance management

Currently China’s drought management is basically a government action. The infrastructure, manpower, physical and financial resources in emergency, as well as disaster relief, are all provided by the government. Practical experiences show that sharing risk of disasters is an effective way to reduce risk of droughts and disaster losses. We can minimize the impacts of droughts if the government takes the lead in fighting disasters while enterprises and individuals share responsibilities, and insurance and reinsurance companies provide back-ups.

6. Enhance public education for dealing with drought disasters

In the context of global climate change, extreme droughts may occur in the future. If we do not change the passive situation of drought resisting in emergency, human survival and social stability would probably be threatened. At present, basically China’s public society is not receiving adequate knowledge of disaster prevention and mitigation. The public awareness of droughts and disaster risks mainly comes from the media. Therefore, to take preventive measures to avoid disastrous consequences of extreme droughts, to eliminate adverse effects of natural factors and correct bad behaviors of human society, the education of drought disaster risk should be systematized and popularized among all citizens, starting from children, and brought into the public education system including universities, junior schools and elementary schools.

7. Prepare for severe disasters, mentally and physically

Droughts have been a major concern for China ever since ancient times, which have brought immeasurable sufferings to the country, and even led to social unrest and change of dynasties. During the late Ming Dynasty and the early Qing Dynasty, there was a severe drought lasting for 6 to 10 years. If it happened now, the consequences of the disaster would be unimaginable. Because there has not been such a severe disaster since the founding of new China, many people lack the necessary consciousness. In history, grain storage in case of disasters has played a significant role for the country. Therefore, we should adhere to implementing the strictest protection system for arable land, and maintain the level of 1.8 billion mu (120 million hm²) of arable land. It is also important to enhance river harnessing, water projects, reconstruction of
irrigation areas and water-saving reforms, middle/low-yield field reforms, etc., in order to solve water-related problems of food security in China. Groundwater is particularly important in resisting droughts, which could maintain the basic need of water for life and production during the period of droughts. In the northern areas, we should first stop the over-exploitation of groundwater, make use of rain and floodwater, protect groundwater resources, gradually restore groundwater levels, and set up the primary level (red line) of groundwater protection. It is like a ‘groundwater bank’, which should maintain groundwater level above the red line at ordinary times, and rapidly recover groundwater level after drought periods. As for the southern areas, in addition to develop projects of utilizing surface water, we should also investigate on groundwater resources and build water intakes according to the demographic and environmental conditions of communities. Those water intakes should be sealed in usual, in order to prevent passive situation such as searching for water and digging wells during drought periods.