

# A brief discussion on flood and drought disaster prevention measures in the new period

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**Keywords:** new period; Flood and drought disasters; Defensive work

**Abstract:** Flood and drought disaster is one of the global natural disasters, which has caused serious impact on human society and ecological environment. With the influence of climate change and human activities, the trend of frequent flood and drought disasters has become increasingly prominent. Therefore, it is particularly important to develop effective defensive measures. This paper mainly analyzes the current situation and characteristics of flood and drought disasters, discusses the principles and methods of defense work, and introduces some effective defense measures based on actual cases, aiming to provide reference for relevant departments and individuals to jointly deal with the challenges brought by flood and drought disasters.

## 1. Introduction

Flood and drought disaster is one of the universal natural disasters in the world, which has caused serious impact on human society and ecological environment. With the continuous intensification of climate change and the continuous expansion of human activities, the trend of frequent flood and drought disasters has become increasingly prominent. Especially in the new era, the global climate anomalies are frequent, and the scale and impact of flood and drought disasters also present new characteristics and challenges. In order to effectively cope with flood and drought disasters, ensure the safety of people's lives and property, and maintain social stability and ecological balance, relevant departments and individuals must take active defensive measures.

## 2. Flood and drought disaster situation and characteristics

### 2.1 The impact of climate change is intensifying

Climate change is one of the major challenges facing the world at present, and its impact on flood and drought disasters is particularly prominent. First of all, climate change leads to uneven distribution of precipitation, which may cause drought or continuous rainfall in some areas, resulting in flood and drought disasters. The decrease of precipitation in arid areas, the drying of soil and the depletion of water sources, have a serious impact on crop growth and ecological environment. At the same time, areas with excessive rainfall can lead to flooding disasters, causing problems such as land soaking and urban waterlogging. Secondly, climate change also leads to the trend of rising temperature, which intensifies the frequent occurrence of flood and drought disasters[1]. Rising temperatures increase the rate of evaporation of surface water, making soil water loss more severe and exacerbating drought. The heat is also likely to melt glaciers and raise river levels, increasing the risk of flooding. Finally, the increase in extreme weather events is also making floods and droughts more severe and unpredictable. Frequent extreme weather events, such as heavy rainfall, persistent drought, heat wave, etc., have brought great challenges to flood and drought disaster prevention. These extreme weather events often occur suddenly, putting enormous pressure on disaster prevention and relief work, making the loss of disasters more difficult to measure and control.

## **2.2 Unreasonable land use**

With the acceleration of urbanization and industrialization, irrational land use is widespread, which directly leads to overexploitation of water resources and large consumption of soil water, thus increasing the risk of flood and drought disasters. First of all, the urbanization process has brought a large amount of land development and construction, especially in the process of urban expansion, which often occupies the original farmland and water sources, resulting in the reduction of water resources and the destruction of ecosystems. Overdevelopment of urban land not only affects water conservation and land conservation functions, but also aggravates the occurrence of urban waterlogging and geological disasters, and increases the risk of flood and drought disasters. Secondly, the process of industrialization also has a great impact on land use. The large-scale development of industrial land and the discharge of pollutants will not only directly affect the soil quality and water quality, but also have a serious impact on the surrounding environment, and aggravate the occurrence of flood and drought disasters. In particular, the wastewater and waste gas discharged by some high-pollution and energy-consuming industries will not only pollute the surface water and atmospheric quality, but also affect the ecological function of the surrounding land, aggravating the frequent flood and drought disasters. Finally, irrational land use in agricultural production is also one of the important causes of flood and drought disasters. The traditional agricultural production mode is often over-dependent on irrigation, resulting in over-exploitation of water resources and large consumption of land water. In some areas, due to improper irrigation of farmland, the groundwater level has decreased and soil salinization has intensified, thus increasing the risk of flood and drought disasters.

## **2.3 Destruction of ecological environment**

With the intensification of human activities, large-scale deforestation, wetland development and other ecosystem destruction behaviors have led to ecosystem imbalance, weakened the natural environment's buffer capacity against flood and drought disasters, and thus increased the possibility of disasters. First of all, forests are important natural barriers on Earth, which play an important role in regulating climate, protecting water sources, and preventing soil erosion. However, large-scale deforestation activities lead to the reduction of forest area and the destruction of forest ecosystem, resulting in frequent flood and drought disasters. The decrease of forests leads to the disturbance of water cycle, intensifies surface runoff and soil erosion, and increases the risk of flood and drought disasters[2]. Secondly, wetland is an important natural ecosystem, which plays an important role in regulating hydrological cycle, purifying water quality and maintaining biodiversity. However, with the continuous development and filling of wetlands, the wetland ecosystem is destroyed, resulting in frequent flood and drought disasters. The loss of wetlands increases surface runoff, increases the impact of floods, and reduces groundwater recharge, leading to a drop in the water table and worsening drought. Finally, the destruction of other ecosystems, such as grassland degradation, river ecosystem degradation, etc., has also played a role in promoting the occurrence of flood and drought disasters. The destruction of these ecosystems leads to the deterioration of the ecological environment, weakens its ability to adjust and buffer flood and drought disasters, and increases the possibility and frequency of flood and drought disasters.

## **2.4 The urbanization process is accelerating**

With the acceleration of urbanization, a large number of people pour into cities, the urban area expands, and the construction land continues to expand, which leads to a higher risk of flooding in cities, and the impact of flood and drought disasters on urban infrastructure and residents' life is increasingly apparent. First of all, a large amount of land development and construction land expansion required for urban construction have caused great changes in urban land cover and increased the formation and flow speed of surface runoff and flood. Especially in the process of rapid urban expansion, inadequate soil and water conservation measures in many areas, unreasonable design of urban drainage systems and other problems lead to higher flood risk in cities. Secondly, dense urban population and infrastructure construction also make cities more vulnerable

to flood and drought disasters. Drainage systems and flood control facilities within cities may not be able to remove precipitation in time, leading to problems such as waterlogging; The city's infrastructure, such as roads, Bridges, transportation facilities, etc., may also be damaged by floods, affecting the normal operation of the city. Finally, urbanization also leads to the intensification of urban heat island effect, which makes cities more prone to extreme meteorological events such as drought and heat wave in hot weather, and intensifies the risk of flood and drought disasters faced by cities.

## **2.5 The influence of Bridges, roads and other cross-river structures on river flood discharge capacity**

Bridges, roads and other structures that cross rivers can create physical barriers above the river, preventing the free flow of water. When the water level of the river rises, these structures may reduce the effective width of the channel and obstruct the flow of water, increasing the resistance of the flow of water in the channel, resulting in easy accumulation and impact of flood water. The presence of structures across the river may affect the natural water level regulation ability of the river. When there is more rain or faster snowmelt in the upper reaches of the river, the water volume increases, and cross-river structures can hinder the smooth flow of flood water, causing the water level to rise, increasing the risk of channel breaches and increasing the likelihood of bank slippage. The presence of cross-river structures will change the hydraulic conditions of the river, which will affect the transmission of flood water in the river. When the flow of water is blocked, the spread of flood water may be slowed down, or even water gushing may occur, making the area around the channel more vulnerable to flooding. The construction of Bridges, roads and other cross-river structures often requires excavation and reinforcement of river banks, which may lead to increased erosion of river banks. Especially at high water levels, the force of the flood hitting the river bank is greater, easily accelerating the erosion of the river bank, increasing the risk of soil loss and rock collapse. The construction of cross-river buildings may destroy the ecological environment around the river. For example, the construction of Bridges may destroy wetlands, habitats and habitats of aquatic organisms on both sides of river channels, and affect the balance of water ecosystem[3].

## **3. Principles and methods of flood and drought disaster prevention**

### **3.1 Comprehensive treatment**

Comprehensive management pays attention to soil and water conservation, through rational land use planning and implementation of soil and water conservation measures, to prevent the occurrence of land desertification, soil erosion and other problems, reduce the damage to the land by floods and droughts. Measures such as afforestation and grassland restoration should be taken to increase vegetation cover and improve surface soil and water conservation capacity, so as to reduce the occurrence of flood and drought disasters. Comprehensive management focuses on the regulation and control of water resources, through the construction of reservoirs, storage tanks, irrigation facilities and other water conservancy projects, reasonable allocation and use of water resources, improve the utilization efficiency of water resources and water supply capacity, reduce the shortage of water resources in arid areas, reduce the risk of flood and drought disasters. Comprehensive governance also focuses on ecological restoration. By restoring wetlands, restoring river ecosystems, and strengthening environmental protection in water areas, we will enhance the stability and resilience of ecosystems and reduce the damage caused by floods and droughts to the ecological environment. Comprehensive treatment also includes strengthening the construction of scientific monitoring and early warning and forecasting systems, keeping abreast of the dynamic changes of flood and drought disasters, and making preparations for prevention and response in advance. At the same time, we will strengthen the construction of social relief and emergency management systems, and improve the capacity and efficiency of responding to sudden floods and droughts.

### **3.2 Technical support**

Remote sensing technology can obtain real-time information such as surface water situation, soil moisture and vegetation cover through satellite remote sensing and aerial remote sensing, and monitor and analyze the occurrence and evolution of flood and drought disasters. Through remote sensing technology, the signs of flood and drought disasters can be found in time, disaster preparedness can be made in advance, and disaster losses can be reduced. Geographic information System (GIS) technology can realize the spatial analysis and evaluation of flood and drought disaster risk, and help decision makers to formulate scientific and effective disaster prevention countermeasures and emergency plans. GIS technology can be used to draw the spatial distribution map of flood and drought disasters and the map of prone areas, etc., to provide spatial information support for disaster management and response. In addition, the use of artificial intelligence, big data and other technical means can realize the intelligent monitoring and early warning of flood and drought disasters, and improve the accuracy and timeliness of early warning. Through the establishment of flood and drought disaster monitoring and early warning system, disaster hazards can be found in time, timely measures can be taken to reduce disaster losses to the greatest extent.

### **3.3 Social participation**

First of all, the promotion of flood and drought disaster knowledge is the key to enhancing social participation. By conducting publicity and education activities on disaster prevention and control and holding training on flood and drought disaster response skills, the public should have a better understanding of flood and drought disasters and enhance their awareness of self-protection and ability to cope with them. This includes introducing to the public the causes of floods and droughts, early warning signals, response measures and other knowledge, and cultivating the public's emergency response capacity in the event of disasters. Secondly, establish a sound community disaster prevention organization and mass prevention and management mechanism. Through the establishment of community disaster prevention committees and villagers' self-governing organizations, community residents are organized and mobilized to actively participate in flood and drought disaster prevention and control, so as to improve the community's disaster prevention ability and the overall efficiency of coping with flood and drought disasters[4]. At the same time, disaster drills and emergency plans for community residents should be strengthened to improve their response ability and awareness of self-rescue and self-protection. Finally, strengthening the participation of social organizations and volunteers is an important force to promote flood and drought disaster prevention and control. Through the establishment and development of disaster relief teams, volunteer service teams and other organizations, strengthen the monitoring and early warning of flood and drought disasters, provide disaster relief and assistance services, and provide emergency relief and assistance to the disaster-affected people.

## **4. Effective flood and drought disaster prevention measures**

### **4.1 Establish flood and drought disaster monitoring and early warning system**

First of all, the flood and drought disaster monitoring and early warning system should cover a variety of monitoring means and technologies. Including ground monitoring stations, satellite remote sensing, weather radar, hydrological stations and other monitoring equipment and technical means, to achieve real-time monitoring of rainfall, water level, soil moisture, vegetation cover and other key indicators and data collection. Through comprehensive analysis of these monitoring data, the risk and evolution trend of flood and drought disasters can be accurately assessed, and scientific basis for disaster prevention decisions can be provided. Secondly, the flood and drought disaster monitoring and early warning system should have the function of timely warning and information release. Based on monitoring data analysis and model prediction, timely release flood and drought disaster early warning information, early warning information and response suggestions to relevant government departments, social organizations and the public, and guide all parties to take timely and effective disaster prevention and mitigation measures. Early warning information should

include the expected time, place and possible impact scope of flood and drought disasters, so as to provide sufficient time and space for relevant units and individuals to prepare for prevention and response. Finally, the flood and drought disaster monitoring and early warning system should also have the characteristics of network and information. Through the establishment of flood and drought disaster monitoring and early warning information network, the information sharing and interconnection between monitoring stations at all levels and relevant departments will be realized, the collection and transmission efficiency of monitoring data will be improved, and the comprehensive monitoring and timely early warning capacity for flood and drought disasters will be strengthened. At the same time, the use of modern information technology means, such as the Internet, mobile communication, to disseminate early warning information to a wider audience, improve the public's awareness of flood and drought disasters and response ability.

#### **4.2 Strengthen water resources management**

First of all, strengthening the rational development and utilization of water resources is the key. Through scientific planning and layout, the rational development and utilization of groundwater, surface water and other water resources, the construction of reservoirs, diversion canals and other water conservancy projects, increase the storage and utilization rate of water resources, improve the supply capacity of water resources. At the same time, strengthen the economical use of water resources, promote water-saving irrigation, water resources recycling and other technical means, reduce the waste of water resources, improve the utilization efficiency of water resources. Secondly, the construction of water resources regulation project is an important measure to ensure flood and drought disaster prevention. Through the construction of water resources control projects such as reservoirs, storage tanks and hydrology stations, the regulation and control of water resources are realized, and the supply capacity of water resources and the disaster resistance capacity are improved. In the dry season, increase water storage to ensure water supply demand; During the flood season, the risk and impact of flood disasters can be reduced by means of flood discharge and water diversion. Finally, strengthening water resources management also requires strengthening water resources monitoring and information management. Establish a sound water resources monitoring network, realize real-time monitoring and data collection of water resources, and improve the scientific and timely management of water resources. The water resources management information system is established by using information technology to realize the overall management and scheduling of water resources and improve the utilization efficiency and management level of water resources.

#### **4.3 Promote ecological restoration**

First of all, strengthening wetland protection is one of the important ecological restoration measures. As an important ecosystem, wetland has important functions such as regulating water quantity, purifying water quality, maintaining biodiversity, etc., and plays an obvious role in regulating and buffering flood and drought disasters. Strengthening wetland protection and maintaining the ecological integrity and stability of wetlands will help improve the buffer and adjustment ability of wetlands to flood, drought and other disasters. Secondly, strengthening the construction of water conservation forest is an important measure for water protection and ecological restoration. As an important ecological project for water conservation and soil and water conservation, water conservation forest can not only protect the ecological environment and water resources of water source, but also improve soil water retention capacity, reduce soil erosion, and alleviate the occurrence and impact of flood and drought disasters. Strengthening the construction of water conservation forest and repairing the damaged ecosystem is helpful to improve the adjustment and buffering ability of ecological environment to flood and drought disasters. Finally, strengthening ecological restoration also needs to pay attention to the integrity and comprehensiveness of the ecosystem. Through comprehensive treatment, ecological compensation, ecological restoration and other means, the damaged ecosystem will be restored to improve the stability of the ecological environment and the ability to resist disasters. At the same time, we should pay attention to the sustainable development of the ecosystem, promote the self-regulation

and recovery capacity of the ecosystem, and provide lasting ecological protection for preventing and mitigating flood and drought disasters.

#### **4.4 Build flood control projects**

Building dikes can effectively stop the invasion of floods and protect cities and farmland from flooding. Strengthening the construction and maintenance of levees and improving their flood control capacity and stability will help mitigate the impact of floods and protect people's lives and property. The drainage capacity and stability of the river can be improved and the risk of flood can be reduced by dredging, dredging and strengthening of the river. At the same time, rational planning and layout of urban river channels, strengthen the ecological restoration and greening of river shorelines, improve the ecological environment quality of urban river channels, and provide better conditions for flood control. In addition, strengthening the construction of urban drainage system is also an important part of flood control projects. Through the construction of rainwater drainage network, rainwater garden and other facilities, the drainage capacity and treatment efficiency of urban rainwater can be improved, the phenomenon of waterlogging during the rainy season can be reduced, and the risk of flood disaster can be reduced. At the same time, technical personnel should strengthen the daily management and maintenance of urban flood control facilities, ensure their long-term stable operation, and improve the flood resistance capacity of the city.

#### **4.5 Implement soil and water conservation measures**

By strengthening the construction of soil and water conservation projects, such as afforestation, grass and livestock balance and terrace construction, the occurrence of soil erosion can be effectively reduced, and the ability of soil to retain water and fertilizer can be improved, so as to reduce the risk of flood and drought disasters. In addition, strengthening the monitoring and assessment of soil and water loss, and taking timely measures to control it, such as building slope protection, terraces and soil and water conservation forest belts, can effectively reduce the losses caused by flood and drought disasters on agricultural production and ecological environment, and ensure the sustainable and healthy development of rural economy.

#### **4.6 Develop water-saving agriculture**

Through the promotion of efficient water-saving irrigation technology, such as drip irrigation, sprinkler irrigation, etc., can minimize the waste of farmland water, optimize agricultural water structure, and improve water utilization rate. At the same time, we should strengthen crop variety selection and soil improvement, cultivate new varieties that can withstand drought and flood, improve crop adaptability and disaster resistance, and effectively reduce the impact of flood and drought disasters on agricultural production. By developing water-saving agriculture, it can not only improve the stability and sustainability of agricultural production, but also reduce the excessive use of water resources and promote the sustainable development of rural economy.

### **5. Conclusion**

To sum up, flood and drought disaster prevention is a long-term and arduous task, which requires the joint efforts of the government, all walks of life and individuals. Faced with the grim situation of floods and droughts in the new era, we should strengthen cooperation, take scientific and effective defense measures, improve the capacity and level of social response to disasters, and contribute to the building of a safe, stable and prosperous social environment.

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