

## NATURAL DISASTER PREVENTION AND REDUCTION

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### Summary

This article describes the conditions which favor occurrence of natural disasters in China, and the landscapes and human societies most at risk from natural hazards. It then discusses the current conditions leading to meteorological disasters, geological disaster, earthquake disasters, biological disasters and land degradation, and the results of such impacts. The approach adopted by the Chinese government to controlling and reducing natural disasters is then described.

### 1. Introduction

China is one of the countries of the world which is most liable to suffer from severe natural calamities. In the last 40 years, the economic loss caused by meteorological, flood and water-logging, earthquake, geological, agricultural and forestry disasters represents 3 to 5% of annual GNP, and thousands upon thousands of people are killed in calamities each year. Especially in disaster high-risk regions, rapid growth of population and high asset density have resulted in an increase of disaster frequency, geographical

extent and degree of damage. Natural disasters are becoming limiting factors, preventing people from escaping from poverty in these regions.

The frequent occurrence and severity of calamities in China are a consequences of the unique geographical environment, as well as being related to social and economic conditions. Mainland China borders on the Pacific Ocean to the east, i.e. it faces the largest typhoon source on the earth. The Qinghai-Tibet Plateau in western China is the world’s highest plateau. Thus the complex interaction between oceanic and continental atmospheric systems often cause meteorological and marine disasters. Topographically, China is characterized by a high western part and a low eastern part, and the spatial and temporal distribution of rainfall is very uneven. These factors can lead to drought, flood and water-logging in certain areas. China lies between two large earthquake belts, one around Pacific Ocean and the other running east-west across the Eurasian Continent. The occurrence rate of earthquakes, the violence of crust movements and scale of geological disasters is the highest in the world. More than 70% of cities, 50% of the population and 75% of gross industrial and agricultural production are distributed in the coastal areas, the eastern plain and lower-hill areas where various of hazards are serious and therefore, economic damage is heavy.

Biological hazards present another kind of natural disaster in China, particularly because of global warming and environmental pollution. Moreover, large-scale exploitation of natural resources have aggravated the degree of risk from natural disasters.

## 2. Environment of Breeding Disaster and Burden of Disasters

As a system, a natural disaster can be divided into two sections—entity (M) and process (F) (see Figure 1). The Entity is the material part of the system, which involves Environment of Breeding Disaster (EBD) and Burden of Disaster (BD) as well as Factors Inducing Loss (FIL). Process implies the force and behavior of EBD, BD and FIL and their interactions

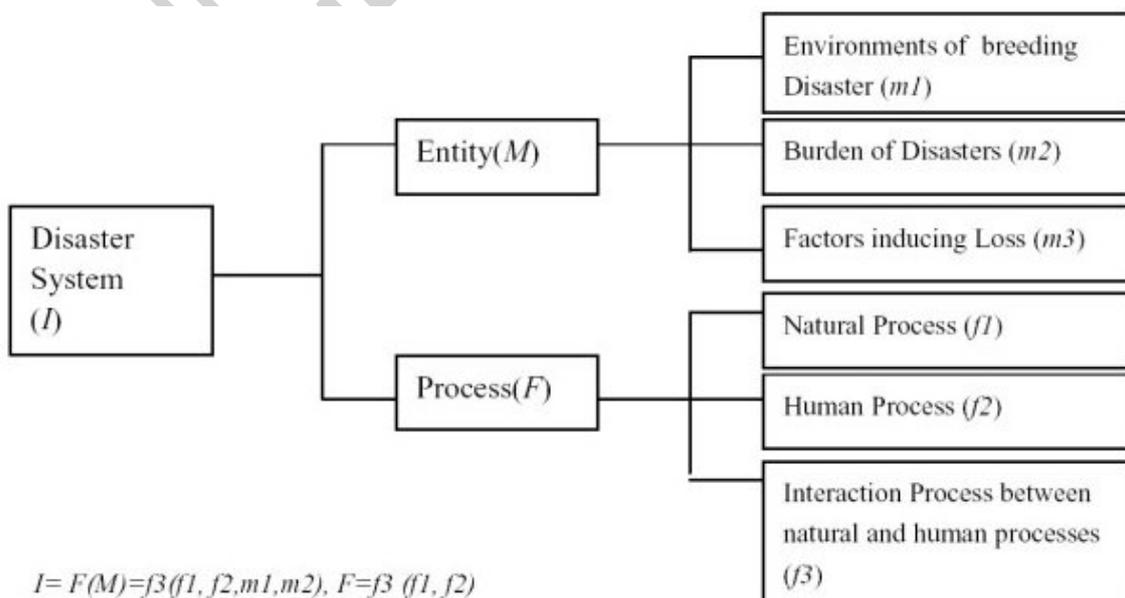


Figure 1. Structure of Disaster System.

EBD is the natural and social environment comprising atmosphere, hydrosphere, lithosphere and material-cultural sphere. Under different conditions of EBD, identical FIL and BD can cause very different losses. The BD is the object of hazard impact, often implying material wealth and human beings themselves, such as population, cities, roads, factories, farmland, grassland, reservoirs, schools, and so on. In a more extensive sense, BD also includes a variety of natural resources such as forests, steppes, minerals, etc.

## 2.1 Environment of Breeding Disaster

Abnormal natural phenomena causing loss of life and property occur in specific environments. For instance, great earthquakes happens on a structural belt of neo-tectonic activity; landslide and debris flow on steep slopes with loose sediment; drought, flood and water-logging occur in regions with high rainfall variability and intense storms. Apparently the spatial differentiation laws of disaster are closely linked to EBD and even the spatial distribution of disaster intensity is related to EBD. The characteristics of EBD in natural disaster system are correlated to (a) topographic features with the high west and the low east; (b) the tectonic activity of large-scale faults and (c) continental climate.

Elevation falls gradually from west to east and three ladder-shape landforms are formed in China. The transition zones between the different landforms are unstable owing to the great change of relief. These zones therefore become areas where landslides, debris flows, water loss and soil erosion are heavy.

The regional distribution patterns of crust movement are consistent with the Chinese seismic distribution and the concentration of fissure belts. The main geological hazards are distributed on the fault belts of the Yanshan Mountains, Taihang Mountain and Fengwei Fault Belts.

China covers 50 degrees latitude from south to north and 62 degrees of longitude from east to west. This vast area has many types of landscape, such as plain, low-hill, basin, plateau and mountain. Due to the impact of the southeast and southwest monsoon, the precipitation decreases gradually from east to west. The rainfall can reach 1300 to 1700 mm /a. in the southeast areas, but only 15-35 mm/a in the northwest areas. This creates a range of climatic zones including the humid, semi-humid, semi-arid, arid and extreme arid zones. These are distributed from southeast to northwest in turn. The precipitation is concentrated in the months of July, August and September.

## 2.2 Burden of Disaster (BD)

Disasters only occur when human beings and their property are affected by abnormal natural forces, and damage is caused. The seriousness of a disaster is described in terms of BD. Snow avalanches and debris flows in uninhabited mountains do not cause disasters even if they are on a grand scale. Their damage would be completely different if it was farmland and factories that were both buried.

As a large country, natural conditions and social-economic development levels vary greatly across China. Because of different BD, the same grade disaster and hazard factors will lead to completely different damage. There is a great difference between the eastern and western parts in China. The eastern provinces have developed a relatively integrated industrial system and a strong economic basis. Coastal areas are characterized by comprehensive industrial development, high levels of technological development, high index of agricultural reclamation and intensive farming, perfect commodity markets, high urbanization and a dense transport network. On the other hand, the economy in western China is under-developed, particularly in outlying districts in the northwestern area, such as Xinjiang Uighur Autonomous Region, Qinghai Province, Ningxia Hui Autonomous Region; in the southwestern area, the Tibetan Autonomous Region, Yunan Province and Kuizhou Province are also under-developed. The provinces in central China including Gansu, Shanxi and Sichuan Provinces are situated in the transitional economic zone, between the East and the West. In three economic zones, economic disparities determine the macro-distribution features of BD.

China is a developing country relying mainly on agriculture, and natural disasters have a great impact on agriculture. The regional imbalance of agricultural development results in differences in disaster-susceptibility. Production areas for grain in China are mainly distributed in the eastern area, especially in the middle and lower reaches of Yangtze River, the middle-lower areas of the Yellow River, the drainage areas of Zhujing River, Liaohe River, Songhuajing River and the coastal plain. Annual income and grain production in these areas is higher than the national average.

Agricultural productivity is lower in the west, especially in the vast mountain areas and plateau, where the land is mainly covered with grassland and animal husbandry is the mainstay. Grain production plays an important role in Chinese agriculture. The area of grain crop each year accounts for 75% of total sown area. Owing to the high population and lack of arable land, the government has been paying more attention to establishing a strong market for grain. Several strong grain production areas have been established in Songnen Plain, Sanjiang Plain of the Northeast, and the middle and lower reaches of the Yangtze River, including the plains around the Dongting Lake, Poyang Lake and Chengdu Plain, where marketable grain is provided steadily and a good supply for food is ensured. It goes without saying that the marketable grain base has great significance, and if it suffers from disasters, national food production even the national economy would be seriously affected.

As major industrial crops, cotton and oil-bearing crops are reared in Huanghuaihai Plain, the middle and lower plain of the Yangtze River and Sichuan basin respectively, taking up about 10% of the total sown area. Peanuts are produced mainly in Shandong Peninsula. Grassland in China is mainly distributed in the Inner Mongolia Autonomous Region and other provinces of the northwest. Forest is mainly distributed in the mountain areas of the northeast, the southeast and lower-mountain and hill areas of the southern Yangtze River. The distribution patterns of various BDs within agriculture, forestry and animal husbandry determine the regional disparity of disaster conditions. According to the distribution patterns of agricultural development, the key disaster-prone areas should be in the East, especially in the plain, basins and valley

areas where the damage could be greatest.

Man is the major factor of BD, so that natural disaster prevention and control aim at ensuring the safety of people's life. The number and distribution of population directly affect loss of life from disasters. By the end of 1995, the Chinese population had reached 1.21 billion and average population density was 126 person per square km, which is three times the world average. In addition, there is a much larger population in the East than in the west. The mean population density along the coast of China is over 329 people per square km, whereas mean population density is only about 10 people per square km in parts of the west, such as Xingjiang, Qinghai and Tibet.

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