Disaster Management of Tibet by the Central Government in the Qing Dynasty -- A Research Perspective Based on Big Data

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Key words: Tibet, Disaster management, Qing Dynasty, Big data，

Abstract: Since ancient times, Tibet has been an area prone to natural disasters, especially in the Qing Dynasty, which is the peak period of various natural disasters. In order to reduce the harm of disasters in Tibet, the majority of officials and civilians in Tibet have set up a relatively complete disaster control mechanism. Through the study of disaster management in Tibet in the Qing Dynasty, the historical significance of this mechanism is revealed, and the practical role of disaster management in Tibet in the current era of big data is provided for reference.

1. Introduction

In the course of the development of human society, disaster is a common natural phenomenon, which often brings great influence to human production and life.

Among the traditional Chinese historical records, "Disasters of Records" is a special historical record, which provides a reliable record for scholars to study the history of disasters and the management of disasters in the past dynasties of China. Through the study and analysis of "Disasters of Records" in history books, we can draw a conclusion that China has been a country with frequent natural disasters since ancient time. In particular, the book "Chinese Local Chorography Historical Literature Collection Disasters and Disorders", [1]based on the literature of various places, systematically sorted out the information and records about disasters, and collected the disasters and disasters-related natural disasters in a concentrated way. The content is described in detail and rich, providing first-hand original documents for relevant research. Tibet is located in the southwest frontier area, affected by the warm and wet air flow from the Indian Ocean and the unique geographical environment of the Qinghai-Tibet Plateau, and has been faced with the threat of serious natural disasters. Tibet is one of the areas with high incidence of natural disasters in China. Especially in Qing Dynasty, natural disasters in Tibet were varied, including earthquake, snow, flood, and frost, insect and so on. In addition, all kinds of natural disasters occur frequently,

and almost all kinds of natural disasters occur every year. Therefore, as a region with high frequency of natural disasters and a wide variety of natural disasters, the establishment of disaster management mechanism is an important disaster prevention and control work.

With the advent of the era of big data, data information presents explosive growth, and has profoundly changed the development model of human society, affecting all levels of society and all industries. In the process of disaster management, the practical application of big data before, during and after disasters is becoming more and more extensive. Therefore, big data provide effective technical support for disaster management.

2. The Analysis of Earthquake Disaster in Tibet during the Qing Dynasty

Earthquake is the earth's crust in the rapid release of energy produced in the process of vibration, during the seismic wave will produce a natural phenomenon. There are many reasons for earthquakes, among which the compression and collision between plates is the main reason for earthquakes." According to the plate motion theory, the Himalayan orogeny occurred when the Indian and Arabian plates collided with the Asian continent during the Tertiary period." [2]The Himalayan orogeny has had an important impact on the geographical environment of Asia, and the uplift of the Qinghai-Tibet Plateau is the most obvious result. The Qinghai-Tibet Plateau is located in the junction of the Eurasian plate and the Indian Ocean plate. The crust is very unstable, and the compression and uplift between the plates continue to be going on, which is easy to cause earthquakes and other natural disasters.

(1) Temporal Analysis of Earthquakes

Song Zhenghai mentioned in the book "The Mass Occurrence of Natural Disasters in Ancient China" that the relatively more frequent earthquakes in modern times are completely consistent with the peak of national earthquake activity in the same period, namely, the cosmic period of earthquake in the Ming and Qing Dynasties. "[3]According to incomplete statistics in the Collections of Earthquake Historical Data in Tibet, 624 earthquakes of all sizes have occurred in Tibet since the beginning of historical records.   A total of 54 earthquakes were registered from the Tang Dynasty to the Qing Dynasty, including 19 before the Tang Dynasty (618) to the Qing Dynasty (1644) and 35 during the Qing Dynasty (1644-1911). Of these, 21 occurred between 1644 and 1840. Between 1840 and 1911 there were 14 earthquakes. This completely confirms the relevant conclusion drawn by Song Zhenghai.

Table1：The statistics and proportion of earthquakes in Tibet in historical period（618-1911）

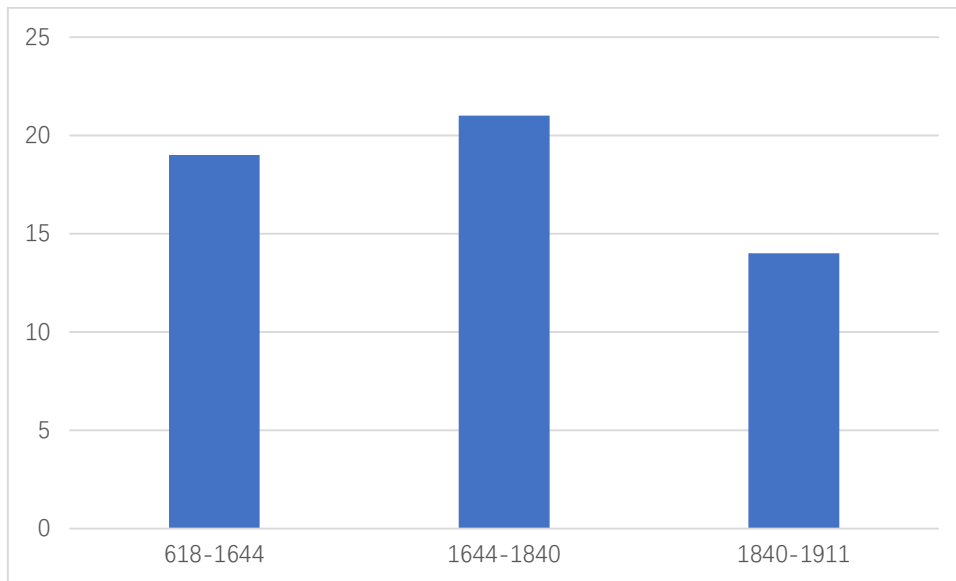| Time	The Number	The Proportion
Before the Qing dynasty(618-1644)	19	35%
Qing dynasty(1644-1911)	35	65%
A combined	54	100%

Figure 1：The statistics of earthquakes in Tibet in historical period

(2)Spatial Analysis of Earthquakes

By analyzing the spatial distribution of earthquakes in Tibet in historical periods, we can see from the text of Collector of Historical Seismic Data in Tibet:From the Tang Dynasty to the Qing Dynasty, there were 127 earthquakes in Tibet, 47 before the Tang Dynasty (618) to the Qing Dynasty (1644), and 80 before the Qing Dynasty. The earthquakes affected 47 counties, accounting for 63.5 percent of the 74 districts and counties in Tibet today. Especially the 1840s and the end of the 19th century and the beginning of the 20th century were the two periods of the most frequent earthquakes in Tibet during the Qing Dynasty. It should be noted that all the earthquakes with large destructive force and wide affecting area are recorded in the book "Tibet Earthquake Historical Data Collection", while some earthquakes with small destructive force and narrow affecting area are not recorded, but are found in other historical books.
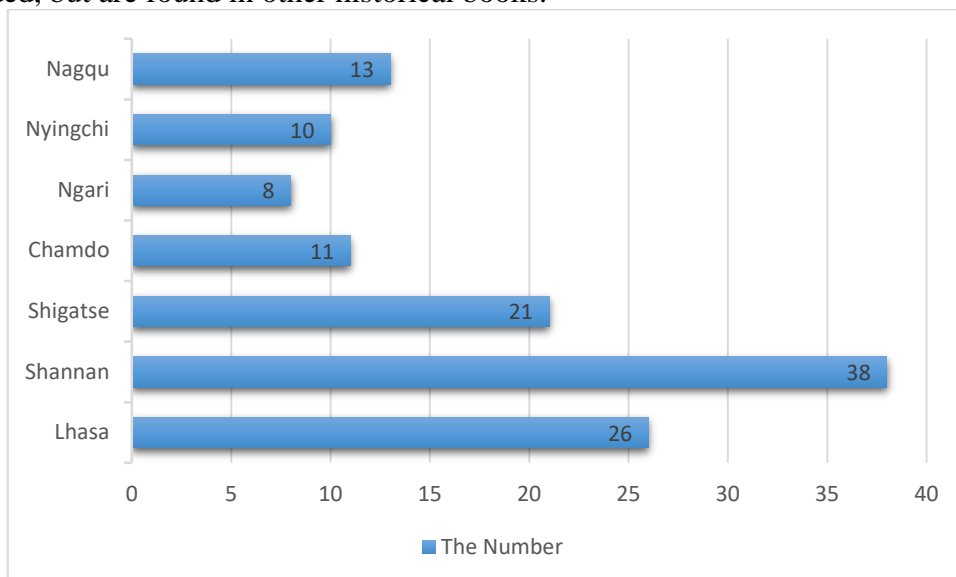

Figure 2：Earthquake statistics of Tibet in Qing Dynasty

3. The Formation and Influence of Frequent Earthquakes

(1) Two peaks of earthquakes

The 1840s was the first time peak of frequent earthquakes in Tibet during the Qing Dynasty.

In 1833, that is, the 14th year of Raojiongyin Water Snake in the Tibetan calendar, an earthquake occurred in Xigaze. Nyalam, Rongxia, Xiegar, Jilong and other places were severely affected by the earthquake. Among them, "21 earthquakes occurred in Rongxia, and 22 houses collapsed, causing many casualties among the people, especially the death of horses and livestock."[4]Belong local earthquake, Zongfu and many houses collapsed, personnel, property suffered extremely heavy."On the one hand, there were continuous aftershocks; on the other hand, the earthquake was severely affected, which greatly affected the normal social production and life of the people, thus forming the initial continuous earthquake peak in Tibet.

Half a century later, in 1987, the fifteenth year of the Tibetan calendar, the succeeding earthquake peak occurred in Tibet.In that year, Lhasa, Xigaze and other places were hit by numerous earthquakes. "(Tawang) was an unheard of earthquake, which caused the temple of the landlord and the sutra hall of the affiliated temple to be destroyed, and the farmhouses and temples were severely damaged"; "countless people were killed and injured in the villages"; "All the villages, communities and temples were completely destroyed. Roads in various canyons are blocked by rock collapses, and the disaster is unprecedented. "Because of the earthquake, "The Times was up. The livelihood is down. "[5]This earthquake peak lasted for a long time until 1901, and affected a wide range of places, including Chauna, Yadong, Pali, Gamba, Loza, Langkazi, Lunzi, Chokel, Lhasa, Nimu, Rimpu, and even northern India.

(2)The Effects of the Earthquake

Earthquake as a serious harm to human production and life of natural disasters, especially strong earthquake intensity, often brought a series of damage, and often accompanied by other secondary disasters.Tibet, in particular, which is at the junction of two tectonic plates, has been hit even harder.

The immediate impact of the earthquake is casualties and economic losses.In 1806, an earthquake occurred in Cuonazong, causing "the Cuonazong House to collapse, the houses of the rich and poor people were nearly destroyed, and more than 100 people died, goats, donkeys, cattle suffered a lot of losses", "some people in the pastures area due to the collapse of their houses after the earthquake, all their property was buried underground, and they lost their livelihood, and most of them became beggars".[6]After the earthquake, it is not difficult to cause floods, pestilence and other disasters.

(3)Disaster Relief and Management after the Earthquake

Earthquakes as a kind of unpredictable natural disaster, have a very strong sudden, especially in the backward science and technology of the feudal society, the production and life of the people caused more serious damage.The frequent earthquakes in Tibet and the vast area make it more difficult to report the disaster situation and carry out the relief work after the disaster. Especially in Tibet of Qing Dynasty, the people affected by the disaster could not get the basic guarantee of life and could only rely on the relief of the Kashag government.

4. The Application of Big Data in Disaster Management

Since human beings entered the modern society, various natural and man-made disasters have occurred frequently in the world, posing serious threats to human life security and economy. Disaster management has become a global issue, attracting strong attention of governments and all

walks of life in the world. In contemporary society, big data have become the mainstream, which is bound to cause profound changes in the concept, thinking mode and coping model of disaster management. Through big data, people have a deeper understanding of disasters, and promote people to establish a strong sense of disaster prevention; it provides scientific decision support for disaster management and is beneficial to the reconstruction after the disaster.

(1)Predigested Prevention and Preparedness: Building Early Warning Mechanisms with Big Data Technology

Natural disasters, such as earthquakes and floods, are characterized by strong suddenness, uncertainty and urgency, making it more difficult for human beings to face the reconstruction work after the disaster, which makes it more necessary for people to do a good job in pre-disaster prevention and preparation. Through pre-disaster prevention and preparation, we should control and manage natural disasters from the source, and strive to minimize the losses caused by natural disasters. Massive data generated in the era of big data provides a new information source for pre-disaster prevention and preparation. From the perspective of geographic information technology, the data summary analysis of natural disasters in history can "provide data support and scientific basis for pre-disaster warning." [7]The combination of big data and geographic science can help people identify the source of natural disasters early in the morning and establish a complete and effective warning mechanism. Before the disaster occurs, the government can inform the public of the information about the impending natural disaster through big data technology, implement effective two-way interaction, improve the prevention and preparation before the disaster, and strive to achieve the optimal effect.

(2)Responding to Disasters: Big Data Technology Communicates Accurate Information

After the occurrence of natural disasters, they often have a strong persistence and will not end in a short time. In this process, effective response to natural disasters often depends on the accuracy of disaster information. After the occurrence of natural disasters, it has had a direct impact on human beings. By conveying accurate information, big data technology can quickly solve the sudden problems encountered in a limited time and minimize any possible losses. Through big data technology, a huge amount of information can be filtered into a small amount of useful information, which can provide correct information sources for decision makers, and also timely convey this accurate information to the people in the disaster-stricken areas, thus providing powerful help for disaster response. To be specific, the precise location of the affected people in the disaster may be constantly changing. Through big data technology and geographic information technology, the specific location and other useful information of the affected people can be determined.

(3) Rebuilding after Disasters: Big Data Helps Rebuild

Big data technology can play a huge role before and during disasters, but the role of big data technology in post-disaster reconstruction is rarely mentioned. Big data can provide scientific and technical guidance for the post-disaster reconstruction of the disaster areas, and has a positive impact on the post-disaster reconstruction work. Post-disaster reconstruction needs not only the government's leading and participation, also need to broad participation of the people, by big data technology, to spread effective post-disaster reconstruction ideas, realize the meaning of the post-disaster reconstruction work, arouse the enthusiasm of people to participate in the post-disaster reconstruction, for social and economic recovery and a certain contributions to the stability of production and living.

5. Conclusion

Through studying the general situation and time and space analysis of earthquakes in Tibet in the Qing Dynasty, and discussing the impact of earthquakes on the production and life of human society, as well as how to deal with the impact of earthquakes, the mode of disaster management in Tibet in the Qing Dynasty is summarized, which provides useful experience for the current disaster management in Tibet.

The current society is in an era of rapid change. Big data technology is becoming ever more mature, which provides a brand new technical support for disaster management in Tibet today. Big data technology can play a unique role in disaster management. Big data technology can help humans to establish early warning mechanisms before a disaster, transmit accurate information during a disaster, and facilitate reconstruction after a disaster.

In a word, from the perspective of specific technology, big data provides a novel means for disaster management in Tibet and has great potential. However, we should also recognize the limitations of this technology.

Disaster management is a complicated process which requires not only effective technology, but also correct cognition and active participation of human beings.

Acknowledgement

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