

# Enlightenment of Fire Accident in Wengding Village of China to Fire Risk Management in Traditional Villages

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Wengding Village, a historical village located in Yunnan Province, China, retains the folk customs and residential buildings of the Wa ethnic minority in China. It is a relatively complete original ecological Wa village so far. On the night of February 14, 2021, it was severely damaged by fire, and hundreds of traditional grass-wood dwellings were burned to ashes. Taking this case as an example, based on literature review, this paper analyzes and summarizes the damage mechanism, and discusses problems of existing fire emergency management and protection suggestions of this village, which aims to provide reference for fire emergency and prevention in similar ethnic villages.

**Keywords:** fire, traditional village, risk management

## 1. Research Background

### (1) Introduction of Wengding Village

Lincang is a city in Southwest Yunnan Province, China, which is located in the south extension part of the Nushan Mountains, belonging to the longitudinal valley area of western Yunnan. There are many ethnic minorities and strong ethnic customs, and Cangyuan Wa Autonomous County is one of the only two Wa Autonomous County in China. Wengding, means a place where is Mist-shrouded in Wa language. Wengding Village is located in Mengjiao Township, about 40 kilometers northwest of Cangyuan Wa Autonomous County, Lincang City. The terrain of it is high east and low west which covers an area of 6.3 square kilometers. It is a typical 'directly-entering-socialism ethnic group', and it's currently the most preserved original ecological Wa village, which is also recorded in the list of Chinese traditional villages.

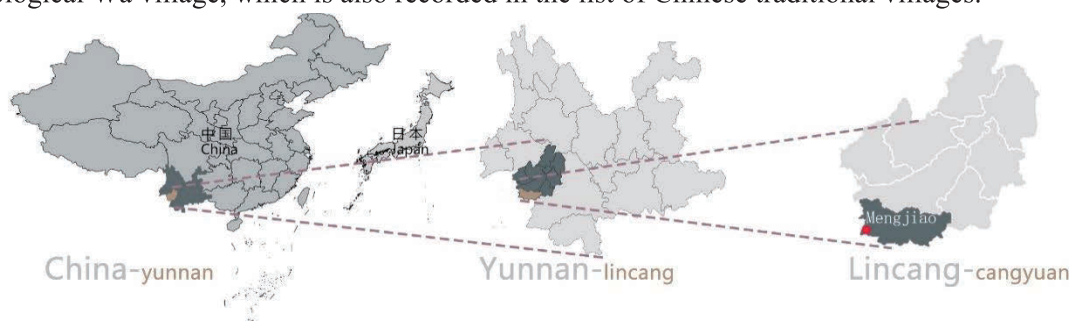


Fig.1 Location of Mengjiao Township (drawn by the author)

Wengding has been built for more than 400 years, the ' Wa Wooden Drum Dance ' and ' Tale of Sigangli ' are included in the list of national intangible cultural heritage representative projects of China. 'Wengding Wa Traditional Cultural Reserve ' and ' Technique of Wa Woodcarving Production ' are in the list of provincial intangible cultural heritage representative projects. There are a total of 120 cultural relics in the village, including 105 traditional residential buildings and 15 historical environmental factors<sup>1)</sup>. Its original sacrifice, belief, epic, totem and living environment, inherit the ecological wisdom of harmonious coexistence between man and nature, which leads to great cultural value.



Fig.2 Wengding Village<sup>2)</sup>

## **(2) Serious situation of village fire**

In recent years, frequent fires have seriously threatened the safety of villages worldwide. In 2016, 60 houses were burned in Miao Village of Guizhou Province, China. In 2021, Liton Village, British Columbia, Canada suffered a serious fire, 90% of the buildings in this village were destroyed, and at least two people died<sup>3)</sup>. In 2022, a fire broke out in the water log cabin village in Sabah, Malaysia, causing at least 700 log cabins to be burned<sup>4)</sup>. Compared with ordinary villages, traditional villages formed earlier. The living environment of it contains traditional wisdom shown in site selection of ancestors, utilization of local resources and environmental utilization, etc. It is an important resource of local cultural heritage and carries the essence of traditional culture. However, most of the buildings in such villages are mainly wood structures which leads to high fire risk. Therefore, to avoid similar tragedies in other villages, it is necessary to strengthen the research on fire in traditional villages and fully understand the fire management problems.

## **2. Overview of fire damage and existing disaster prevention measures in Wengding**

### **(1) Overview of fire damage in Wengding**

Affected by the fire, a total of 104 houses in Wengding Village were burned, including two gates and four toilets, resulting in direct property loss of CNY 8.134,800<sup>5)</sup>. The fire was caused by an 8-year-old child who played with fire. It took only about 25 minutes from the collapse of the first building to the full village burning, and the old village was razed to the ground in a few hours. At first, the fire occurred in an uninhabited house, which was not found until it has burned to the roof. At the same time, the wind reached level 6 that day, which let the burning grass on the roof fly to nearby houses and quickly cause the fire in the whole village. On the second day, thatched houses in the old village of Wengding was almost burned out with only frame and roof frame left. Looking over the whole village from the sky, it has become a heap of ashes.



Fig.3 Comparison of satellite images before and after fire<sup>2)</sup>



Fig.4 Damaged thatched house<sup>2)</sup>

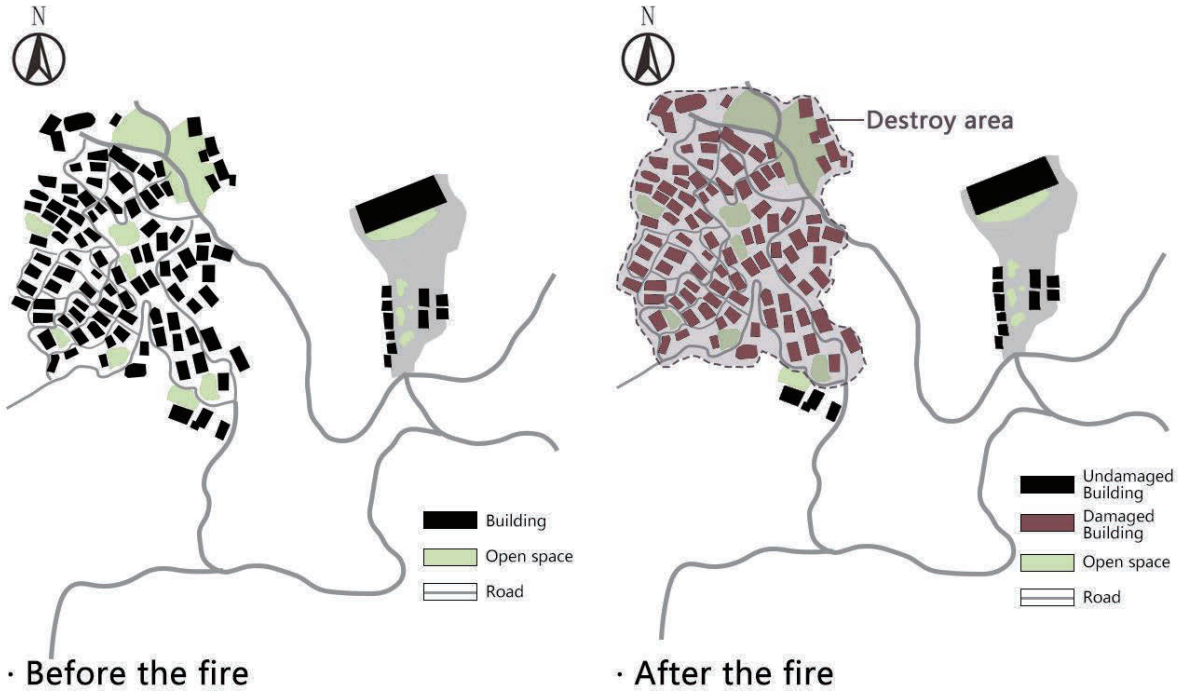


Fig.5 Analysis of village damage before and after the fire (drawn by the author)

## (2) Existing fire prevention and mitigation measures

### a) Patrol system in dry season

This is an effective fire prevention system gradually formed under the requirements of the government after 1950 due to frequent occurrence of local fires which seriously affected their production and life. The mainly work content is to send a daily patrol guard during the dry season (January-June), checking the sparks, water, doors, windows and reminding children not to play with fire.

### b) Fire work during festival

The New Fire Festival is an important traditional festival of the Wa Nationality. On that day, the villagers will extinguish the fire in old days, and then the respected elderly will make new fire by drilling wood. Everyone in the village will go to the place where the new fire is made and take it home which foreshadows health for new year. The festival can be divided into three days : people extinguish the fire in Chinese New Year's Eve , and take new fire from the place worshipping Fire God in the village in Lunar New Year's Day. On the third day, comprehensively examined all fire risks in the village, including inspecting fire, repairing ponds, cleaning ditches and so on. All these measures can effectively reduce the probability of fire.

## 3. Problems of fire risk management in Wengding

### (1) Low fire resistance itself and lack of fire safety standards

Wood is the main building material in many traditional villages. After years of rain erosion and sunshine



exposure, the wood components are cracked, deformed and corroded, which leads to poor fire resistance. Moreover, the fire control standards such as Fire Separation Distance and Firebreak Belt are difficult to meet the current village standard<sup>(67)</sup>. When fire occurs, it is difficult to take effective measures to control. Wengding village has the original form of residential buildings, all thatched houses with full wood structure which can be very flammable<sup>(8)</sup>. The main traditional architectural types of the village can be divided into 'large-scale pillar type' and 'shed type', which are shown in Figure7 and Figure8. There are two types of the 'large-scale pillar type': 'four large-scale pillars' and 'eight large-scale pillars', and the difference between these two types is that they only lie in the size of indoor space. At the same time, every single building is built along the mountain and densely arranged. So there is a lack of shelter and space between buildings<sup>(9)</sup>.



Fig.6 Local folk houses and environment in Wengding<sup>(10)</sup>

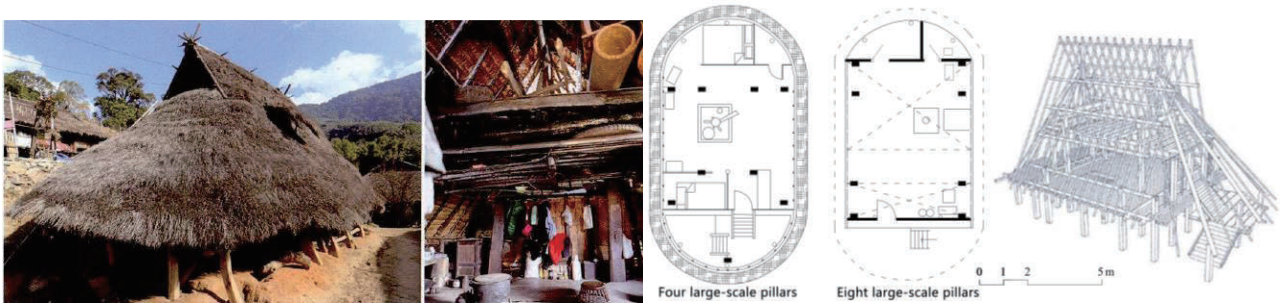


Fig.7 'Large-scale pillar type' thatched house (drawn by the author according to reference<sup>(11)</sup>)

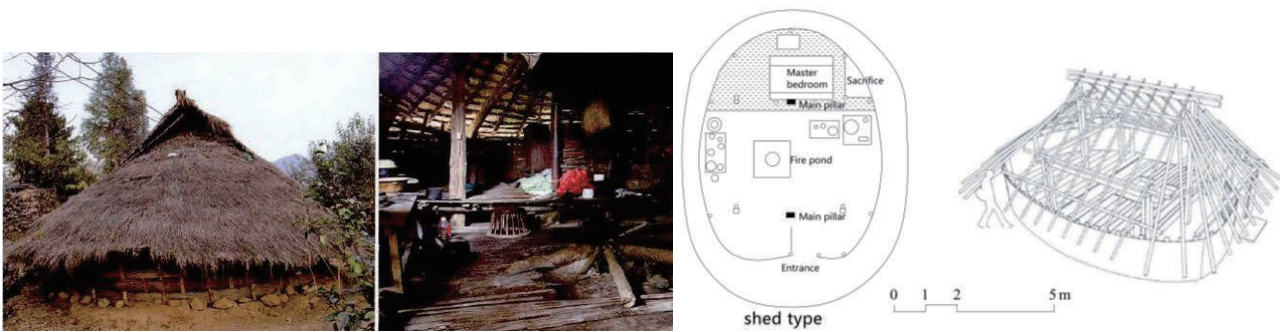


Fig.8 'Shed type' thatched house (drawn by the author according to reference<sup>(11)</sup>)

## (2) Poor construction of fire-fighting infrastructure

Due to the limitation of geographical location and terrain environment, the fire-fighting infrastructure in some traditional villages are poor. There are three high water pools and nine outdoor fire hydrants in Wengding Village. The high-level water tank is connected by two water pipes to supply water for fire hydrants and daily life of residents. The water supply network is a 65 mm branch pipe network, which does not meet the requirement of '100 mm' in 'rural fire prevention code'. There are no reliable measures to ensure the use of water against fire. So when the villagers open multiple fire hydrants to save their own house, water supply can be seriously insufficient.



### **(3) Insufficient fire fighting personnel**

Wengding village is divided into two parts: the old village and the new village. After the development of tourism, most of the villagers moved from the old village to the new village, only 17 families with the majority of the elderly who could not be insensitive to fire left in the old village. There used to be a six-person fire brigade in the village which equipped with a fire truck. But the team members are all villagers with poor corresponding ability, lack of training and organization. Only four people were on duty in the fire brigade that day, and the fire truck did not start until 10 minutes after the fire. The full-time fire brigade in Mengjiao Township where Wengding is located, was 15 kilometers away from the scenic spot and took about 46 minutes to reach the village. At this time, the fire has been fully developed and spread, and it is difficult to be effectively controlled.

## **4. Suggestions on fire risk management in traditional villages**

### **(1) Fire monitoring and early warning in traditional villages**

Traditional human-based fire prevention measures are still used in many villages as Wengding Village, which is unable to monitor and warn fire, resulting in delayed response. Therefore, it is necessary to promote the informatization process of fire management in traditional villages, strengthen the application of advanced technology, introduce Internet technology, and use wireless equipment. Through these, the fire prevention monitoring system of the village can be constructed, which is able to complete the work such as assignment, early warning, inspection, etc. The relevant information collected will be used to set up a database, build a complete set of traditional village fire prevention monitoring and protection system, and focus on the prevention and control of high fire risk areas.

### **(2) Fire assessment and early warning in traditional villages**

In terms of fire risk assessment of traditional villages, it is necessary to build and improve risk assessment mechanism, to quantify the fire risk data. For example, drawing a village fire risk map will assist people to visualize the probability of disasters in current scale and potential harm in a specific area. At the same time, financial investment should be increased to deepen the research on fire assessment technology of traditional villages and to establish fire assessment models for villages in different types: on the one hand, it simulates the disaster situation before the fire. And on the other hand, under the condition of obtaining some disaster information, it carries out the dynamic assessment of fire, which provides scientific basis for fire prevention and reduction.

### **(3) Fire disposal in traditional villages**

In terms of fire disposal, to reduce the fire possibility of the next fire, it can be divided into three stages: post-disaster risk re-identification and field investigation, village reconstruction and fire performance re-evaluation. Firstly, make classified list of various protection contents in the affected area, divide the damage degree into zones, and investigate the number of casualties and financial losses. Secondly, based on the principle of “minimum intervention”, restoring the village as old, and strengthening fire performance while maintaining the traditional style. Finally, re-evaluate the village to make sure whether the fire protection performance of the village was up to standard, so as to better deal with the fire risk.

### **(4) Fire plan for traditional villages**

First, take the form of government as the main body and multi-party participation, and organize professionals. Since traditional villages in different regions are quite different and most of them cannot meet the requirements of the current fire code, it is necessary to formulate targeted fire prevention countermeasures and emergency plans. In addition, deepen public participation and pay attention to the job

in grass-roots level which can not be ignored. Strengthen the propaganda of fire prevention work, especially the safety knowledge of fireworks and firecrackers in holidays. All these will improve the fire awareness of villagers and tourists, meeting the needs of rapid extinguishing and reducing fire spread of general fires.

## 5. Conclusion

The fire accident in Wengding village in 2021 is irreversible. Although the village has taken fire prevention measures nowadays, but most of them based on people which can not meet the need of current village development under the background of fire prevention and mitigation. It is advisable to take preventive protection as the core and improve village fire management from four aspects: fire monitoring and early warning, village assessment, post-disaster disposal and fire plan, which is effective to reduce the risk of fire and the degree of disaster damage.

Japan, located in Asia, has a long history and a great large number of villages with mostly wooden structures which are also threatened by fire risk. Therefore, through the analysis of the damage and causes of the fire in Wengding Village, this paper explores the corresponding fire risk management to reduce the probability of village fire. Hope it play a certain reference for the prevention and mitigation of village fire for Japan and nations around the world.

**Acknowledgment:**This research is supported by National Key R&D Program of China (課題番号 : 2019YFC1520800), Subject of Science and Technology Department of Sichuan province (課題番号 : 2021YFS0367).We would like to thank the various people who provided useful advices and helpful assistance during the whole writing process. Special appreciation goes to the all members of WHRC (World Heritage Research Center in Southwest Jiaotong University 西南交通大学世界遺産研究センター), for their intelligent insights and rigorous analysis. This article is part of the WHRC in SWJTU research results.

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