International Journal of Disaster Risk Reduction 21 (2017) 85–98

Contents lists available at ScienceDirect

International Journal of Disaster Risk Reduction

journal homepage: www.elsevier.com/locate/ijdrr

Disaster coping capacity of a fire-prone historical dong village in China: A case study in Dali Village, Guizhou

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ARTICLE INFO

Keywords:
World heritage tentative list
Historical Dong village
Mountainous area
Fire risk
Community disaster coping capacity

ABSTRACT

The Dong villages are the representative of the cultural landscape of Chinese ethnic minority villages and have been included in the World Heritage Tentative List because of their outstanding universal value. However, because of the compact layout of wooden buildings, Dong villages are highly vulnerable to fire accidents. Since it is difficult for public emergency services to provide timely emergency response to remote mountainous areas where Dong villages are usually located, community disaster coping capacity (CDCC) becomes increasingly important. Thus, from a typical Dong village named Dali in Guizhou, we attempted to identify the features of its CDCC that contribute to the safety of the village. This study investigated the CDCC by looking at three topics: individual disaster coping capacity (IDCC), actual community disaster coping capacity (ACDCC), and potential community disaster coping capacity (PCDCC).

The IDCC was examined based on three factors: risk awareness, disaster preparedness, and potential disaster coping ability. The IDCC of Dali Village represents a predicament between high fire risk awareness and limited countermeasures and deficient potential coping ability. The ACDCC was examined based on three factors: disaster risk reduction planning, community firefighting organization, and fire protection measures. The ACDCC of this village has preliminarily progressed due to the firefighting measures and the establishment of a volunteer firefighting troop. However, due to lack of integrated fire risk reduction planning, the fire protection measures tend to be uncoordinated and some are even ill-considered. The PCDCC was examined based on three factors: basic community property, community connection, and potential coping ability of the community. The PCDCC of this village is characterized by strong community cohesiveness and ample potential responding ability.On the whole, the CDCC of Dali Village tends to be hampered by the lack of integrated planning and community involvement.

1. Introduction

1.1. Research background

The Dong ethnic minority, which is the 12th largest ethnic minority in China in terms of population, lives mainly in the mountainous areas of Southwest China. The Dong villages vary in their village landscapes and cultural characteristics, which organically constitute a complete cultural value system that is distinct from other village cultural landscapes or agricultural landscapes within and outside China [1]. Twenty Dong villages encompassing the settlements where the cultural traditions of the Dong ethnic minority have been well preserved have been included in the Tentative List of properties for consideration of nomination to the World Heritage List because of their outstanding universal value.

However, these Dong villages are extremely prone to fire. Among the 33 major fire accidents which occurred in historical villages in China during the last two decades, 25 fire accidents happened in Dong villages [2]. Moreover, one is among the Dong villages on the World Heritage Tentative List while others are in registered Chinese historical villages. The fires caused not only the loss of cherished historical buildings and landscapes but also considerably disrupted the communities' socio-cultural environment. Thus, fire risk management is a crucial and urgent topic related to the conservation and development of Dong villages. Since it is difficult for public emergency services to provide timely emergency response to the remote villages in mountainous areas, it is important for Dong villages to develop their community disaster coping capacity (hereinafter referred to as CDCC).

1.2. Research purpose and objectives

This study focused on the Dali Village in Guizhou Province, one of

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http://dx.doi.org/10.1016/j.ijdrr.2016.10.016
Received 27 May 2016; Accepted 29 October 2016
Available online 17 November 2016

the 20 Dong villages in the World Heritage Tentative List. The purpose of this study is to identify the features of the current CDCC of Dali Village in order to contribute in developing specifically targeted measures for CDCC enhancement.

1.3. Previous studies and positioning of this research

1.3.1. Research on fire issues in historical villages

Although the fire protection of historical buildings is an established research topic [3–6], extending the scope to historical districts or settlements is a relatively new concern. Some researchers paid attention to the fire safety of traditional villages in Thailand, Turkey, and Korea [7–10]. Okubo [11] introduced the fire prevention and mitigation measures of Japanese historical settlements. Ochiai [12] and Makiko, Ochiai [13] focused on community and mutual-help disaster risk management in Japanese historical villages. A number of studies concentrated on fire risk identification, assessment, and countermeasures in Chinese historical villages [14–21]. Some studies specifically targeted Dong villages. For example, there are studies that discussed the indigenous knowledge on fire prevention and mitigation [2,19,22–24]. They examined the traditional belief in a fire god and how this belief regulated the use of fire in the village; the custom of collective emergency response; the traditional firefighting water system; and the mutual-help between neighboring villages. Some studies analyzed the vulnerabilities of Dong villages [2,14–16,22,23,25,26], such as the remarkably low fire-resistant compact wooden buildings without fire compartmentalization, the tradition of firewood utilization, the aged electrical wiring system, the insufficient firefighting water resources, the undeveloped infrastructure such as firefighting water system, the insufficient firefighting facilities, etc. Some studies analyzed fire risk mitigation policies, regulations, and programs [22–24] such as “fire protection regulations” and “fire protection pilot projects” which aimed at improving the kitchen, wooden buildings, fire compartments, electrical wiring system, and water system in rural villages. However, Tang [22] also frankly pointed out that top-down countermeasures mismatched with the traditional communities' unique sociocultural characteristics. Some studies proposed fire countermeasures [14–18,22,23,27], including revising and establishing laws and regulations; developing the fire insurance system; improving the infrastructure and firefighting facilities; enhancing the fire resistance of traditional wooden buildings; developing the personnel and organization; etc. Liao [23] also pointed out that the local community should be respected and involved in fire-related activities.

Most of the previous studies focused on the government's activities and some studies have revealed the limitation of the top-down approach. A new view of enhancing the local community's capacity for fire risk reduction is necessary.

1.3.2. Community disaster coping capacity (CDCC)

Although disaster risk is commonly defined as a function of hazard, exposure, vulnerability, and capacity, only a few studies have clarified in detail capacity at the local community level. Bollin [28] evaluated the capacity of the local community based on physical planning and engineering, societal capacity, economic capacity, and management and institutional capacity. In Japan, the terminology of community disaster coping capacity (CDCC) is widely used as the local community's comprehensive capacity of coping with disaster [29]. Regarding the framework for the qualitative assessment of CDCC, Okanishi and Sadohara [29] initially proposed two components: actual community disaster coping capacity (hereinafter referred to as ACDCC) and potential community disaster coping capacity (hereinafter referred to as PCDCC). The Tokyo Fire Department [30] explicitly stated the terminology of individual disaster coping capacity (hereinafter referred to as IDCC). Takeuchi et al. [31] proposed an assessment framework for CDCC of remote villages in a mountainous area, taking into consideration isolation risk, basic community properties related to disaster risk management and the implementation of disaster risk mitigation measures. Nagamatsu et al. [32] summarized the CDCC studies in Japan as focusing on individual risk awareness, ACDCC, and PCDCC.

Regarding IDCC, the Tokyo Fire Department [30] proposed its components as individual disaster preparedness, knowledge of evacuation site and route, etc. Other studies proposed individual-related components of CDCC without mentioning clearly the terminology of IDCC. For example, Hori et al. [33] proposed individual disaster awareness and emergency coping capacity as components of IDCC. Hu et al. [34] summarized emergency behaviors to evaluate emergency response capacity. Matsuda [35] analyzed individual preparedness based on housing safety, knowledge of fire extinguisher usage, etc. Regarding ACDCC, Okanishi and Sadohara [29] defined the terminology and used disaster countermeasure activities to explain this concept. Without mentioning the terminology of ACDCC, other studies proposed CDCC components with actual disaster countermeasure activities that present similar scope as ACDCC. For example, Takeuchi et al. [31] proposed disaster risk reduction plans and infrastructure and facility improvements as components of ACDCC. Regarding PCDCC, Okanishi and Sadohara [29] explained it using daily activities and disaster-related activities as examples. Without mentioning the terminology of PCDCC, Kaji [36] proposed social capital as a part of CDCC. Hori et al. [33] mentioned fundamental community property as a basic component of CDCC. Takeuchi et al. [31] emphasized community cohesion as a measure of CDCC. No widely accepted framework of CDCC has been developed.

1.4. Research methodology

According to the previous studies reviewed above, CDCC can be explained by IDCC, ACDCC, and PCDCC. Therefore, this research proposes an integrated framework of CDCC (Table 1) based on the previous studies. IDCC, which is defined as the individuals' comprehensive capacity of coping with disaster, can be examined based on risk awareness, disaster preparedness, and potential responding ability of individuals. ACDCC, which is defined as the visible capacity represented by actual community disaster risk reduction measures, can be examined based on disaster risk reduction planning, community disaster risk reduction organization, and disaster risk reduction measures. PCDCC, which is defined as the inherent potential capacity rooted in community cohesion that might empower the community cooperation for coping with disaster during an emergency, can be examined based on community property, community connection, and potential responding ability.

1.5. Outline of field survey

In order to identify the features of Dali Village's CDCC, this study conducted research activities as follows. We surveyed the natural and social situations, understood its spatial and architectural features, investigated the fire accidents that had happened there. Then we investigated the IDCC, ACDCC, and PCDCC of Dali Village according to the proposed framework. This study is based on literature review and on the field surveys conducted in July 2015 and in February 2016, which included interview surveys and spatially uniform sampling questionnaire and measurement surveys (Table 2).

2. Outline of study area: Dali Village

2.1. Location and socio-cultural characteristics of Dali Village

Located in the southeast autonomous prefecture of Miao and Dong Minority, Southeast Guizhou (Fig. 1), Dali Village, which was established during the 1730 s, has 309 households and 1308 Dong ethnic minority residents at present. Most of the them are relying on