The Approach-Avoidance Behaviors of the Residents in Disaster-Isolated Areas ---From the Perspectives of Disaster Risk and Social Vulnerability

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Abstract: It is vital to study how the disaster risk, social vulnerability, and the residents' approach-avoidance behavior impact the efficient disaster prevention strategies in disaster-isolated areas. Interviews with the local residents of San-Zhan Tribe in Hualien were conducted to study the community's disaster risks and social vulnerability. Based on the results, an empirical model was established to evaluate the approach-avoidance behaviors of the residents in disaster-isolated areas. Reliability analyses were performed to ensure the effectiveness of the selected indices. Independent samples were used to test the significance of the effects among individual households' social vulnerability and approach-avoidance behaviors on their tendency to participate in community disaster prevention measures.

Keywords: Approach-Avoidance Behavior, Disaster Risk, Social Vulnerability

1. INTRODUCTION

Under severe climate variability, engineering control methods in the past couldn't always defense to the nature power. Many record-high rainfalls destroyed one after another engineering facilities or constructions. Hence, engineering-oriented mitigation should not be the only option to protect the residents; but, the "people-oriented", the non-engineering disaster prevention strategies to cope with future extreme weather should play an important role.

To study the community's disaster risks and social vulnerability, we conducted face-to-face interviews with the residents in San-Zhan Tribe in Hualien. All perceptions of social vulnerability items were scored using a 5-point scale ranging from 1 is strongly disagree to 5 is strongly agree. An on-site survey was conducted using purposive sampling in the San-Zhan Tribe in 2011. A total of 134 valid questionnaires were collected and analyzed with the frequency analysis. According to statistical results, 77 are female (57.5%), and 57 are male (42.5%). The number of married is 117 (87.3%) which is higher than unmarried (12.7%). A large percentage of respondents (94.8%) are indigenous people. A 59.7% of the samples have the highest grade level less than the 12th grade. A 90.3% of the samples do not have natural disaster insurance. Nevertheless, over 53% of the samples do not join any of the community organization.

This study was tested with reliability analysis with the Cronbach's α to evaluate the indices, such as, sense of place (SOP) (0.805), disaster prevention consciousness (DPS) (0.770), disaster risk perception (HRP) (0.612), social support (SS) (0.643), and averting behavior (AB) (0.703). The results showed that the social vulnerability was moderate reliability.

Furthermore, the findings showed that there was a mean difference between "whether join the community organization" and the "social vulnerability indexes" by using the individual sample T test. The results show that the residents who participate in community organizations have better disaster prevention consciousness in disaster risk perception, social support, and averting behavior.

By utilizing linear regression to test the approach-avoidance behaviors model, this study analyzed impacts on averting behavior and examined the differences among all social vulnerability indexes. The findings showed a positive and significant correlation in averting behavior models with the variables of SOP, DPS, SS, and have-child household (HCH) (P<0.01). The most important factors that affect the approach-avoidance behaviors of the residents in disaster-isolated areas are disaster prevention awareness, social support, community identity, have-child household and household social vulnerability (HSV). However, there was a significantly negative correlation between the social household vulnerability and the averting behavior models (P<0.01). The residents may not have been averted while the disaster happened, since they have a lower social household vulnerability.

To sum up, the government and relevant center for disaster prevention and reduction could make efficient awareness strategies by understanding the conditions of topography, disaster prevention consciousness, disaster risk perception, and the residents' averting behavior in disaster-isolated

areas.

2. BACKGROUND

Schmidtlein, Deutsch, and Cutter (2008) declared that the Social Vulnerability Index was created by Cutter (2003). Cutter emphasized on the impacts of human geography and applied vulnerability to environmental hazards which were conducted from a viewpoint of nation level within the United States. The study examined spatial patterns of social vulnerability to describe and understand the social burdens of risk.

Eakin and Luers (2006) provided a great insight into the manner of which the decisions influent differential experience of hazard events. Considering many important theoretical and conceptual aspects of social vulnerability, Eakin and Luers stated that the social vulnerability study, allowing researchers to access human resources and their economic constraints related to physical infrastructure at target areas.

The social composition of each region is different. The residents varied in perception and cognition of disasters which lead to an uneasy task to form an applicable rule. Therefore, the factorial ecology is needed to be analyzed to make a more coherent theoretical narrative about the ideological reasons for a Disaster-Isolated Areas, such as the population, land use, economy, environment, social statistics, and social area analysis (Spielman and Thill, 2008).

Omera, Bakb, and Schreckc (2010) identified three key issues which were based on the study of household scale and analysis of the different ethnic groups; (a) the study area needs to be in a census due to the heavy load of survey visits to the number of household; (b) the resident privacy regarding to the public information for the households; and (c) lacking appropriate interpretation from the abundant variability which require a complex processing as well as analysis method. Essentially, it should be cautious about handling the human subject issues because of the content of privacy and security.

2.1 Study Area and Scale

San-Zhan Tribe is located in Hualien County, Sioulin Township, Jing-Mei Village where is closed to the downstream of the San-Zhan Stream (formerly known as Bala Dan River) near to the import the Pacific Ocean (Figure 1). The terrain is surrounded by mountains of Lou-Shuang Hill (731m) in the north, Ou-Cyu Hill (802m) in the south, Lun-Wai Hill (1120m) in the west. It is located in the southeast of the Taroko National Park where is famous for its Golden Canyon.

Figure 1 Map of San-Zhan Tribe
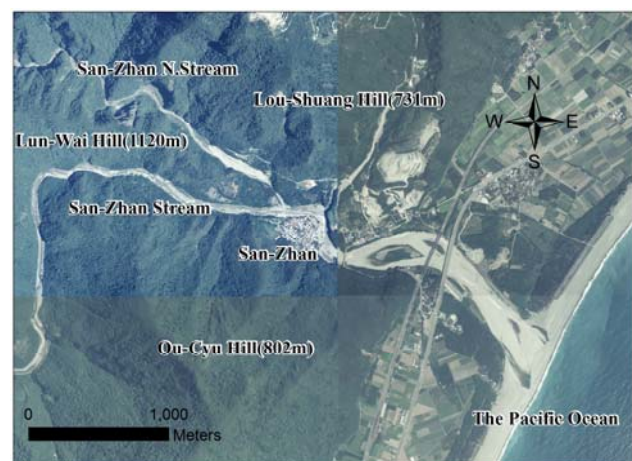
San-Zhan Stream is originated from two streams; one is from the Patuolu Mountain (3101m) with a 24 km length at southern part and the other is at the north stream from the southern of Tashan Mountain (2482m) with a total length of 8 km. The streams incise marble-rocky mountains and create the

formation of green stream and canyon terrain. The landscape is well known as a Small Taroko National Park.

2.2 Nature Resources and Potential Environmental Risk

According to the Hualien County Government survey, a total of 68 kinds of fish, 22 kinds of shrimp, and 10 kinds of crabs inhabit in Hualien County. San-Zhan Tribe has inhabited 36 kinds of fish, 9 kinds of shrimp, and 4 kinds of crabs. Among 6 streams develop eco-tourism this study area shows the biological richness than the other stream.

There are four small streams surrounding the San-Zhan Tribe. The Water Conservation Bureau designated those four small streams as the dangerous potential of streams. Three of them are listed as the most dangerous stream in Taiwan which are coded as County DF016, County DF018, and County DF019. All of these cases of risk rating streams were based on recurrence characteristics of landslides.

3. METHODOLOGY

Based on the past disaster awareness, social support, risk perception, the residents' approach-avoidance behavior, community identity, and literature reviews, we designed indicators to assess social vulnerability. The reliability analysis of Cronbach's alpha value was tested and showed that the social vulnerability indicators are greater than 0.6 with a high value of reliability (Table 1, Nunnally, 1978; Hair, et al, 2006). It is proved that the indicators identified from this assessment can be applied to the follow-up analysis of "participate in disaster prevention activities of the Organization" within the cognitive differences in the degree of social vulnerability. Furthermore, this evaluation

indicator can be applied to follow-up study, to have a avoidance behavior related factors as knowing residents participating in disaster prevention activities of the community organization.

Table 1 Social vulnerability indicators with appropriate analysis

Social vulnerability index	Subject Code	Cronbach's α
DPS	8	0.770
SS	5	0.643
HRP	5	0.612
AB	11	0.703
SOP	6	0.805

The independent sample T tests were utilized to explore the participation in disaster prevention activities from the residents in San-Zhan community. In the 1% level of significance, the residents participated in disaster prevention organizations and activities in disaster prevention and awareness, social support, risk perception, avoidance behavior, community identity, and social vulnerability of households are showing a significant impact in the San-Zhan community (Table 2).

The findings showed that "residents who join the community disaster preparedness organizations and activities in disaster prevention" the awareness, social support, cognitive risk perception, avoidance behavior and community identity are higher than those who do not join the community disaster preparedness organizations". In addition, "residents who join the organization and activities of community disaster preparedness their household social vulnerability also lower".

Table 2 Social vulnerability of cognitive differences in "participate in community disaster prevention organizations and activities"

The SV index	Participate in disaster prevention organization	Mean	T value	P value
DPS	Y	4.32	4.36	<0.0001***
	N	3.84		
SS	Y	4.52	5.87	<0.0001***
	N	3.82		
HRP	Y	4.04	2.86	0.005***
	N	3.68		
AB	Y	4.56	4.40	<0.0001***
	N	4.07		
SOP	Y	4.52	5.87	<0.0001***
	N	3.81		
HSV	Y	2.24	-6.94	<0.0001***
	N	3.69		

The multiple regression analysis was also applied to analyze the impacts of isolated disaster-isolated area where residents' averse behavior factors. Aforementioned, the vulnerability assessment of the various social indicators were explored and formed into a model. The results show that the value under 1% level (which means F value significant), the avoidance behavior has a positive relation (Table 3).

This empirical model was proved to be a reliable assessment for the residents in isolated disaster-inflicted area. In the 1% level of significance, there was a positive significant efficiency for the disaster awareness. The study concludes that the residents of disaster avoidance behavior are more active when the respondents of San-Zhan community residents have a higher awareness of disaster prevention. It is also proved that when the San-Zhan community residents have a

more positive social support cognitive, it results in a positive disasters avoidance behavior.

Table 3 Study on influence factors of the residents in isolated disaster-inflicted area

Independent variables	Coefficient	T value
Constant	1.669	5.120***
DPS	0.256	4.389***
SS	0.220	3.241***
SOP	0.124	2.250**
HRP	1.46E-03	0.030
HCH	0.168	2.340**
HSV	-0.438	-3.052***
R value		0.717
R^2		0.491
F value		22.371***

Community identity variable coefficient value is positive and has 1% level of significance shows that communities have a higher recognition of the respondents at residents of San-Zhan Tribe. As a result those residents will have a positive disaster avoidance behavior. Meanwhile 1% significance level at the "have-child (under 12-years-old) household" variable coefficient is positive and shows a significant T values, which means if the respondents of San-Zhan Tribe with have-child household, the awareness would be a positive aversion of disasters behaviors. However, household social vulnerability variable coefficient is resulted in negative and significant, shows within the tribe those residents with a low household social vulnerability,

their disaster avoidance behavior is passive.

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