

Are people willing to buy natural disaster insurance in China?

Risk awareness, insurance acceptance, and willingness to pay

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ABSTRACT

After the Wenchuan Earthquake (magnitude 7.9, May 12, 2008), intensive debates on how China should establish a natural disaster insurance system were initiated among researchers, policy-makers, and insurance professionals. Our focus was the social aspects of disaster insurance, explored in China through a nationwide survey. Our questionnaires investigated people's risk awareness, insurance acceptance, their opinions on governmental measures for disaster management, and their willingness to pay for disaster house insurance. We analyzed the results at both regional and individual scales. We found that the integrated hazard index and respondents' experience of insurance (considered objective factors), and their opinions on the importance of insurance and government responsibility (considered subjective factors) showed strong correlation with the regional overall acceptance of disaster insurance. An individual's decision to participate highly depended on his/her experience of both insurance and disaster and his/her opinion on the importance of insurance as a coping mechanism. Respondents from poverty stricken or less developed counties were not necessarily more reluctant to accept natural disaster insurance, although they exhibited relatively lower ability to afford insurance. In general, respondents had correct perceptions of natural disasters in their areas; however people from regions with a greater multi-hazard threat showed less willingness to accept disaster insurance because they tended to expect the government to undertake to cover losses and considered insurance to be less important. People's willingness to pay for an assumed disaster house insurance was also investigated and analyzed. We consequently discuss the policy implications for developing a disaster insurance system in China.

Keywords: disaster insurance, risk awareness, acceptance, willingness to pay, survey

1. INTRODUCTION

China is one of the countries that has suffered the most from frequent natural disasters. Compared with developed countries, China has tremendous room for improvement in financial management of risks from disasters. A disaster insurance system should be established on a scientific basis, with social risk awareness and prevention as its premise. Needing cooperation between government and the insurance sector, this would be an integrated risk governance system with clear-cut policies and divisions of duties.

Natural disaster insurance has had a late start in China. Since 2004, a new round of a trial programs for agricultural insurance has been explored and has gradually materialized with the support of a series of relevant policies. In 2007, the central government approved RMB 1 billion Yuan as an agricultural insurance subsidy fund, and six provinces (Jilin, Sichuan, Hunan, Neimenggu, Xinjiang and Jiangsu) launched the agricultural insurance trial. In this program, seven natural disasters (rainstorms, floods, waterlogging, windstorms, hail, ice storms, and droughts) and certain diseases in crops and livestock were covered. Premium rates varied from 3 to 10 percent of the insured amount depending on the agriculture products and perils covered, and premium rates were not differentiated by region. Premium subsidies were provided to participating farmers by all levels of government (central, provincial, municipal, and county), and farmers received a discounted premium when they participated in the insurance program. The total subsidies from both central and provincial governments usually exceeded 50 percent of the premium amount. Subsidies from municipal and county governments varied between 10 and 30 percent depending on the local economy. Participating farmers were required to pay the remainder of the premium. This new round of the trial showed vitality and rapid uptake. In 2007, the total premium collected from agricultural insurance increased by 612% and reached RMB 5.2 billion Yuan (2.7 billion indemnity payout). These numbers continued to grow rapidly, and the premium reached RMB 11 billion Yuan in 2008 (7 billion indemnity payout), and RMB 13.4 billion Yuan in 2009 (9.5 billion indemnity payout)⁽¹⁾. By 2010, the new agricultural insurance program had been introduced into 25 provinces and autonomous regions. Wang et al.⁽²⁾ gave a comprehensive introduction and review of the current agricultural insurance trial program. They pointed out that several aspects needed more careful investigation, including the moral hazard issues raised by the heavy subsidy, efficiency and equity issues in the subsidy fund, and major difficulties faced by various stakeholders in the operation model. However, the policy and subsidy support

from multilevel government had promoted the emergence of a vigorous agricultural insurance market in China, and more and more farmers received financial protection against natural disasters through this program.

The natural disasters insurance market for residential houses has not been well developed in China. In the 1980s, the Chinese Ministry of Civil Affairs promoted the rural cooperative insurance trial program for natural disaster relief in selected counties/cities. In this program, each farmer paid RMB 10 to 30 Yuan to insure their crops, houses, laborers' compensation, and large livestock against natural disasters after subsidies were provided by government and communities. The insured amount for each household was RMB 3000 Yuan. The trial program was introduced in a very limited number of counties/cities, and was terminated in 1999 due to its high loss ratio. In 2007, some regional trials of farmers' house insurance were launched under the support of local government. Zhejiang Province has been vigorously promoting farmers' house insurance against natural disasters, which was designed to ensure farmers' capacity for recovery and reconstruction after disasters. The entire Zhejiang Province was divided into two major hazard zones, with a basic premium of RMB 10 or 15 Yuan per household per year. Premiums were mostly subsidized by provincial and municipal governments, while farmers paid RMB 3 to 5 Yuan. This insurance program covered the main natural disasters and accidents, excluding earthquakes and nuclear explosions. The insured amount was RMB 3600 Yuan per house and up to RMB 18,000 Yuan per household. Since 2007, the city of Chenzhou in Hunan Province promoted a farmers' house insurance program that was similar to the one in Zhejiang Province. The main difference was that the Chenzhou program was mandatory and 100% of the premium was subsidized by both city and county-level governments. The premium for each household was RMB 11 Yuan; in which 10 Yuan was for house coverage and 1 Yuan was for post-disaster living cost coverage. The insured amount was RMB 5000 Yuan for the house and 1000 Yuan for living costs. The take-up rates of these two programs were high because of promotion and support of local government. However, large-scale disasters like Typhoon Setpa in 2007, and the South China snow storm and freezing rain disaster in 2008 created high insured loss and raised the question of sustainability in these governmental policy-oriented insurance programs.

The Emergency Response Law of the People's Republic of China passed in 2007 stipulates that "the country is to establish an insurance system for large-scale disasters with national fiscal support, and encourage organizations, companies, and citizens to participate in the insurance program." However, this kind of

insurance system has not been established in China, and governmental support and incentive mechanisms remain unclear.

An international overview⁽³⁾ shows that in the aftermath of large-scale disasters, authorities, the private sector, and the general populace tend to raise the question of how a country or region should design its disaster reduction and mitigation systems, to cope with future disasters. The 1964 Niigata earthquake in Japan encouraged the government to work closely with the insurance sector. The Japan Earthquake Reinsurance Co., Ltd. was established in 1966, through which the Japanese government shared risk in Japan's earthquake insurance pool. The Northridge earthquake that struck California, USA, in 1994, motivated the Californian state government to pass legislation to establish the California Earthquake Authority (CEA) in 1996; this was designated the management authority for earthquake insurance. The 1999 Marmara earthquake forced the Turkish government to issue a decree on December 27, 1999, on compulsory earthquake insurance, making home earthquake insurance compulsory from 2000. In 2004, Grenada and the Cayman Islands suffered significant losses nearly double their GDP, and these island governments realized their national economy and sustainable development faced substantial disaster risks. It was with this background that the Caribbean Catastrophe Risk Insurance Facility (CCRIF) was established.

After the Wenchuan Earthquake in 2008, intensive discussion on how China should establish an insurance scheme for natural disasters was initiated among researchers, policy-makers, and insurance professionals. These discussions mainly focused on the institutional design of a disaster insurance system, with an emphasis on international experiences and insurance importance for financial protection. So far, very little research has been conducted in China, to reveal people's understanding of or opinions about disaster insurance, or their willingness to pay (WTP).

In the 1970s, Lichtenstein et al.⁽⁴⁾ observed systematic bias in the judged frequency of lethal events. This finding suggested the importance of investigating societal risk perceptions and sources of judgment error. A study by Johnson et al.⁽⁵⁾ showed that distortion in people's risk perception and framing effects existed in both the real world and in experimental settings, and affected consumers' decisions about insurance purchases. People tended to buy more insurance against moderately-high-probability, small-loss events than low-probability, high-loss events.⁽⁶⁾ The experiments conducted by Schoemaker and Kunreuther⁽⁷⁾ highlighted

people's limited abilities to process risk information and limited sensitivity to low probability events, and suggested future research on factors affecting insurance purchasing decisions. Understanding how consumer characteristics affected insurance decisions and how individuals made decisions on various types of insurance, were important for both public and private sectors⁽⁸⁾. The theoretical and experimental investigations conducted by Slovic et al.⁽⁶⁾, Hsee and Kunreuther⁽⁹⁾, Sherrick et al.⁽¹⁰⁾, Makki and Somwaru⁽¹¹⁾, Goodwin et al.^(12,13) and many other contributors⁽¹⁴⁻¹⁷⁾ have allowed detailed understanding of people's insurance decision-making.

Different people have different awareness and perceptions of disaster or environmental change, and these differences greatly influence disaster reduction decisions, measures, and efficiency.⁽¹⁸⁻²⁰⁾ Ming-Chou Ho et al.⁽²¹⁾ discovered that disaster type, gender, and previously experienced disasters are good predictors of victims' attitudes toward natural disasters. Zhai et al.⁽²²⁾ found that flood risk acceptability and home ownership were two major, statistically significant determinants of WTP to avoid evacuation inconvenience in Japan. Kunreuther and Pauly⁽²³⁾ provided a theoretical explanation of why people did not usually insure against large-scale losses with low probability of occurrence, and made suggestions to insurance suppliers and state regulators on policy options that might affect buyers' decisions.

Not only individual homeowners but also the insurance industry faces considerable catastrophic risk in extreme events. However, market competition and the short-term financial perspective of the insurance industry does not create a favorable environment for the growth of natural disaster insurance in the private sector. Without strong incentives and governmental support, a shrinking natural disaster insurance market is inevitable.⁽²⁴⁾ Smolka⁽²⁵⁾ pointed out that super-disasters should not be treated differently from more common natural disasters such as earthquake, windstorms, and floods, and that existing risk-financing mechanisms should be further enhanced and applied to less well investigated and less frequent extreme disasters. A public and private partnership in dealing with natural disasters and innovative financial instruments should therefore be emphasized.⁽²⁶⁾

Our intention was to investigate the social basis for establishing a disaster insurance system in China, by conducting a nationwide survey. Objective and subjective factors that may affect people's acceptance of homeowners' disaster insurance were collected and analyzed. We aimed to answer the following questions:

- 1) What are the most frequent and severe disasters that Chinese people have experienced?
- 2) How does the spatial distribution of hazard awareness compare with disaster maps generated from historical records?
- 3) How do disaster experience, geographic location, risk awareness, and other factors affect people's acceptance of disaster house insurance?
- 4) What is a typical resident's WTP for disaster house insurance in China, and how does it vary by region?

Section 2 describes the design of questionnaires and the implementation of the nationwide survey. In Section 3, we present: the statistical results of our survey and discuss the spatial variation in hazard awareness; people's opinion on governmental measures of disaster reduction and mitigation; insurance acceptance and WTP; and reasons of not being willing to participate. In Section 4, we further uncover the statistically significant factors that affect overall acceptance at a regional scale and create a regression model to illustrate the dominant variables for individual insurance decisions. Based on our findings in Sections 3 and 4, Section 5 discussed policy implications toward developing a disaster insurance system in China; this is followed by the concluding Section 6.

2. NATIONWIDE SURVEY

Kunreuther⁽²⁷⁾ and Slovic et al.⁽⁶⁾ found that insurance purchase decisions consisted of three stages: first, being aware of hazards and their potential for losses; second, considering insurance as a coping mechanism for disasters; third, collecting and processing insurance related information. The design of the questionnaires adopted these three stages of decision making and questions were asked based on the following three categories: first, hazard awareness and disaster experience; second, insurance experience and opinions on insurance as a coping mechanism; third, insurance acceptance and willingness-to-pay (WTP).

The questionnaires began by clarifying respondents' geographic locations. Respondents were asked to specify the city or county in which they resided. The 11 questions are listed below in the three categories.

Hazard awareness and disaster experience

1). *Please specify up to three most frequent disasters in your locality (Flood, Landslides, Mud Flow, Rainstorm, Sandstorm, Earthquake, Typhoon, Storm Surge, Hail Storm, Wildland Fire, Structural Fire, Snow Storm and Freezing Rain, Drought).*

2). Please specify the most destructive disaster you have experienced in your locality in the past 10 years:

To what extent was your house damaged during that disaster? (Collapsed, Severely Damaged, Moderately Damaged, Slightly Damaged, No Damage).

3). Please specify your perception of the trend of future disaster occurrence (Decrease, No Change, Increase, Have No Idea).

Insurance experience and opinion on insurance as a coping mechanism

4). Have you at some time purchased any kind of insurance? (Yes, No)

5). If you have at some time purchased insurance, please specify the type(s) of insurance: (Residential House, Household Property, Life, Medical, Endowment, Education, Accident, Agricultural, Other).

6). How important is insurance as a coping mechanism for disaster? (Very Important, Relatively Important, Neutral, Unnecessary).

7). Who should take the major responsibility to undertake the burden of disaster losses and pay the bill? (Government, Insurers, Local Community, Individual Family).

8). Please specify up to two priorities for governmental measures for disaster reduction and mitigation (Government provides subsidy for insurance program, Government provides subsidy to help people move out of high-risk areas, Government provides investment to improve local infrastructure capacity against disasters, Government provides compensation as disaster relief).

Insurance acceptance and WTP

9). If there existed a disaster house insurance program in which the government partially subsidizes the premium, would you be willing to purchase this kind of insurance? (Yes, No)

10). If you are willing to purchase this kind of insurance, what is your acceptable premium (the premium that you would have to pay), if the insured amount¹ is RMB 50,000 Yuan per house? If the insured amount is increased to RMB 100,000 Yuan, what is your acceptable premium (the premium that you would have to pay)?

¹ The insured amounts (RMB 50,000 Yuan and 100,000 Yuan) were determined based on the national average replacement cost of houses in rural and urban areas in China. The national average number of persons per household is 3.13. The national average living space per person is 28.7 m². The national average replacement cost is 538 Yuan/m² in rural areas and 1463 Yuan/m² in urban areas. So the replacement cost of a house is 48,303 Yuan in rural areas and 131,377 Yuan in urban areas. We thus decided to use 50,000 Yuan and 100,000 Yuan as insured amounts.

11.) *Please specify up to two main reasons for being reluctant to purchase this kind of insurance (Lack of insurance knowledge, Do not trust insurance companies and be afraid of getting no payment after disasters, Cannot afford premium, There will be no severe disasters in future, Insurance is not necessary because there is disaster relief from government, Other reasons)*

Since we aimed to conduct a nationwide survey, it was necessary to choose an effective method of implementation and collect sufficient samples to make the study representative. One challenge in this survey was how to reflect the ‘typical’ Chinese population from a social perspective. The other challenge was efficient sample collection with a given resource (time, funds, and number of students). In response to these challenges, we decided to conduct a face-to-face survey on trains and at railway stations. We believed that train passengers in China are highly diversified socio-economically, as trains are still the most common and convenient transport to reach most areas of China. Our choice of trains varied from slow/ordinary trains to express/high-speed trains, and each were preferred by consumers with differing economic conditions. We also took this into consideration when deciding the survey routes.

Before we started the nationwide survey, we conducted a trial in the waiting rooms of Beijing Western Railway Station. The questionnaires were revised based on the feedback of this trial-run. The major revision was to remove some sensitive questions that could easily make respondents feel uncomfortable and refuse to answer the questions. These questions were related to respondents’ personal characteristics such as income, age, education, occupation, and so on. The compromise of removing these questions did significantly reduce the refusal chance in the later nationwide survey.

Our survey was conducted using face-to-face interviews on trains and at railway stations in the summer of 2009, and respondents were randomly selected. Three survey teams were formed. The first survey team traveled by trains connecting the following cities: Beijing – Xi’an – Shanghai – Guangzhou – Shenzhen – Beijing (orange line in Fig. 1); thus covering middle and southeastern China. 1122 valid questionnaires were collected by the first survey team. The second team traveled by trains connecting the following cities: Beijing – Kunming – Jinghong – Yao’an – Lijiang – Kunming – Chengdu – Chongqing – Lanzhou – Dunhuang – Xining – Yinchuan – Beijing (blue line in Fig. 1); covering northwestern and southwestern China. 3126 questionnaires were collected by the second survey team. The third team traveled by trains connecting the

following cities: Beijing – Kunming – Jinghong – Yao’an – Lijiang – Kunming – Chengdu – Chongqing – Xiamen – Hangzhou – Shanghai – Nanjing – Wuhan – Beijing (green line in Fig. 1); covering southwestern and southeastern China. 3211 questionnaires were collected by the third survey team. In total, 7459 valid questionnaires were collected. The samples covered 856 different cities and counties, and represented 36.0% of all cities and counties in China. The red areas in Fig. 1 show the sample coverage from the survey.

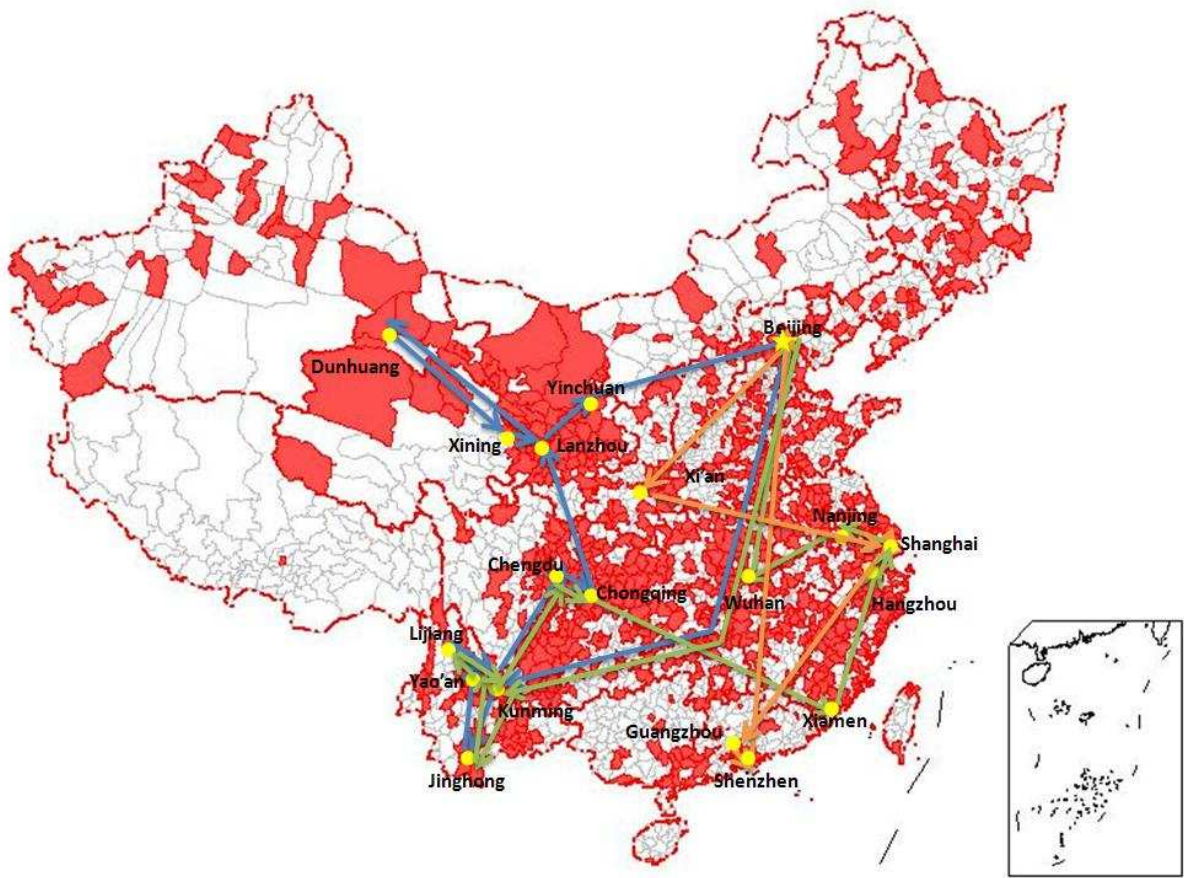


Fig. 1 Survey routes and locations

3. ANALYSIS OF SURVEY RESULTS

The sample density was plotted on the regionalization map of natural disasters in China². Table I lists the definitions, characteristics, and descriptive statistics of the survey.

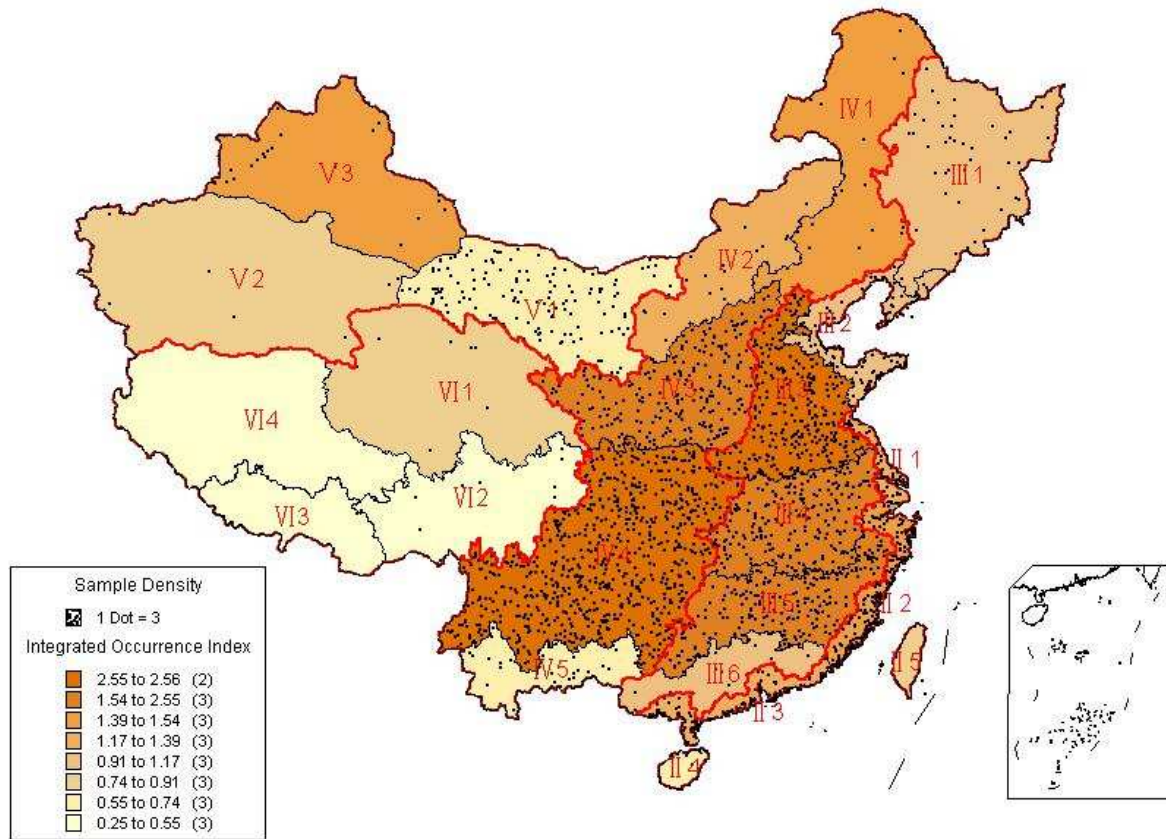


Fig. 2 Sample density plotted on the regionalization map of natural disasters in China

² The regionalization map was developed using the disaster system concept and based on the frequency and impact of historical natural disaster events⁽²⁸⁾. China was divided into 6 main regions and 26 sub-regions, as shown in Fig. 2. Region I is the ocean disaster region where oceanic hazards dominate. Region II is the southeast coastal disaster region where typhoon and typhoon-induced rainstorm and flooding dominate. Region III is the eastern mainland disaster region where rainstorm, flooding and drought dominate. Region IV is the central mainland disaster region where earthquake and rainstorm dominate. Region V is the northeast mainland disaster region where drought, sandstorm and cold wave-induced hazards dominate. Region VI is the Qinghai-Xizang Plateau disaster region where earthquakes and cold wave-induced hazards dominate.

Table I. Frequency distribution of variables in the survey

Variables	Frequency								
	Total	0	1	2	3	4	5	6	7
GEOGRAPHIC LOCATION:									
1= Northeast; 2=North; 3=East; 4=Central; 5=South; 6=Southwest; 7=Northwest	7437	-	164	696	1820	989	176	2325	1267
REGIONAL DEVELOPMENT LEVEL:									
1=poor counties; 2=average counties; 3=county-level cities; 4=average cities; 5=36 major cities	7416	-	647	545	1138	3201	1885	-	-
HOUSE DAMAGE:									
1=collapsed; 2=heavily; 3=partly; 4=slightly; 5=no damage	6079	-	152	442	1145	1786	2554	-	-
DISASTER TREND:									
1=decreasing; 2=unchanging; 3=increase; 4=unknown	7354	-	1178	514	3236	2426	-	-	-
INSURANCE EXPERIENCE:									
0=no; 1=yes	7431	2145	5286	-	-	-	-	-	-
IMPORTANCE OF DISASTER INSURANCE:									
1=unnecessary; 2=neutral; 3=relatively important; 4=very important	7347	-	292	1582	2923	2550	-	-	-
MAIN RESPONSIBILITY HOLDER:									
1=government; 2=insurance company; 3=community; 4=family	6542	-	4558	1554	164	266	-	-	-
GOVERNMENT PRIORITY:									
1=insurance system with subsidy; 2=help move out of high-risk areas; 3=disaster relief; 4=capacity building	11493*	-	2586	1871	2167	4869	-	-	-
ACCEPTABILITY OF INSURANCE:									
0=no; 1=yes	7333	1994	5339	-	-	-	-	-	-
REASONS NOT TO ACCEPT:									
1=lack of insurance knowledge; 2=discredit insurance company; 3=cannot afford insurance amount; 4=no disaster in the future; 5=expect government disaster relief; 6=other	2978*	-	718	686	316	938	204	116	-

*Respondents were asked to choose up to two items.

3.1 Disaster Experience and Hazard Awareness

In our survey, we tried to obtain people's perceptions of the most frequent and destructive natural disasters they had experienced. Statistical analysis showed that the most frequent three natural disasters respondents had experienced were droughts (37.8%, i.e. 37.8% of respondents considered "droughts" in the top three most frequent natural disasters they had experienced), rainstorms (34.0%), and floods (28.8%). The

natural disaster events that respondents said caused the most damage were floods (20.0%, i.e. 20.0% of respondents considered flooding the most severe disaster they had experienced), earthquakes (18.6%) and sand storms (13.3%).

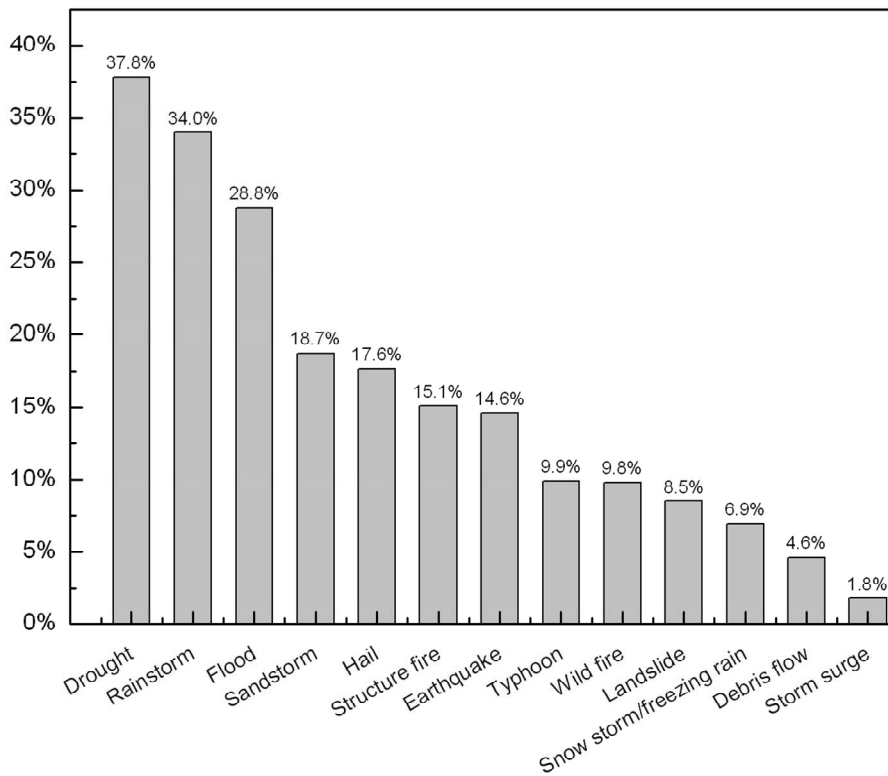


Fig. 3 Disaster experiences of respondents

Respondents were further asked what kind of house damage they had experienced in the most severe disasters they had experienced (Fig. 4). Among the 18.6% who considered earthquake the most severe disaster experienced, 19.4% had experienced total collapse or severe damage to their houses. Other disasters experienced had caused relatively less house destruction.

To investigate the geographic variation in frequency of major disasters (earthquakes, rainstorms, floods, and typhoons), based on respondents' perceptions, we mapped the survey results onto the 23 sub-regions, according to the regionalization of natural disasters in China⁽²⁸⁾. In each sub-region, the percentage of respondents choosing a specific disaster as the most frequent disaster was considered the perceived frequency

of that disaster. We used this to assess the relative likelihood of occurrence of each disaster across the different sub-regions, based on people’s hazard awareness. The spatial variation of hazard awareness (Figs. 5, 7, 9, and 11) showed similar spatial distribution to the disaster frequency maps generated from the past fifty years of disaster data (Figs. 6, 8, 10, and 12). The similarity between the maps generated from survey results and those from historical records indicates that respondents generally had correct perceptions of various natural disasters in their areas.

Forty-four percent of respondents agreed that there would be an increasing number of disasters in their area in the future. 33% respondents had no idea whether the trend would show an increase or decrease. Respondents’ perceptions of disaster trends showed little geographic variation, in contrast with the results of perceptions of disaster frequency as this showed obvious spatial variation. People from different geographic locations where natural disaster frequency is completely different may have very similar perceptions of disaster trends. People who live in an area with a high frequency of natural disasters do not necessarily expect increasing occurrence, although very likely they are well aware of the disasters they are facing.

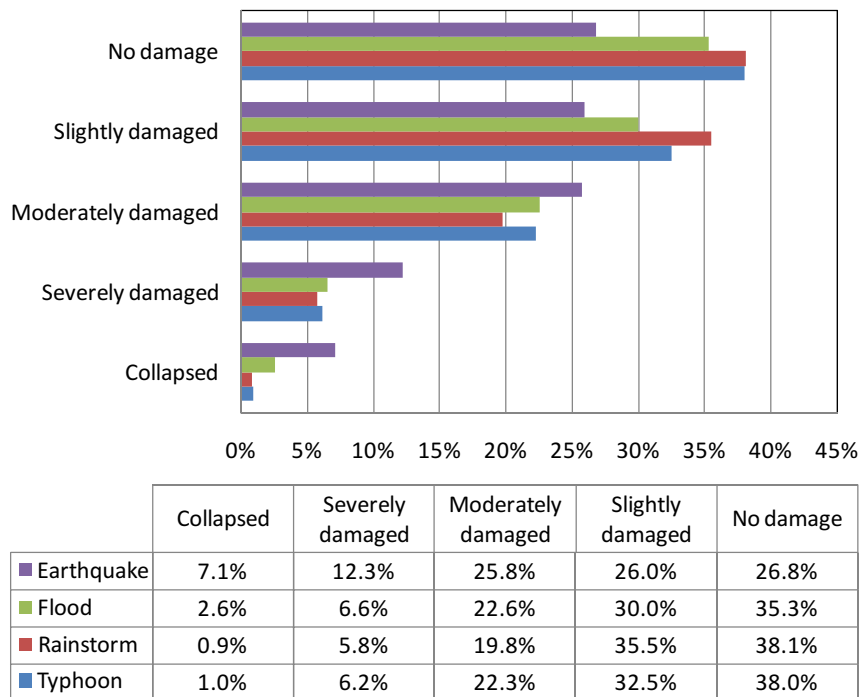


Fig. 4 Damage to houses as a result of major natural disasters

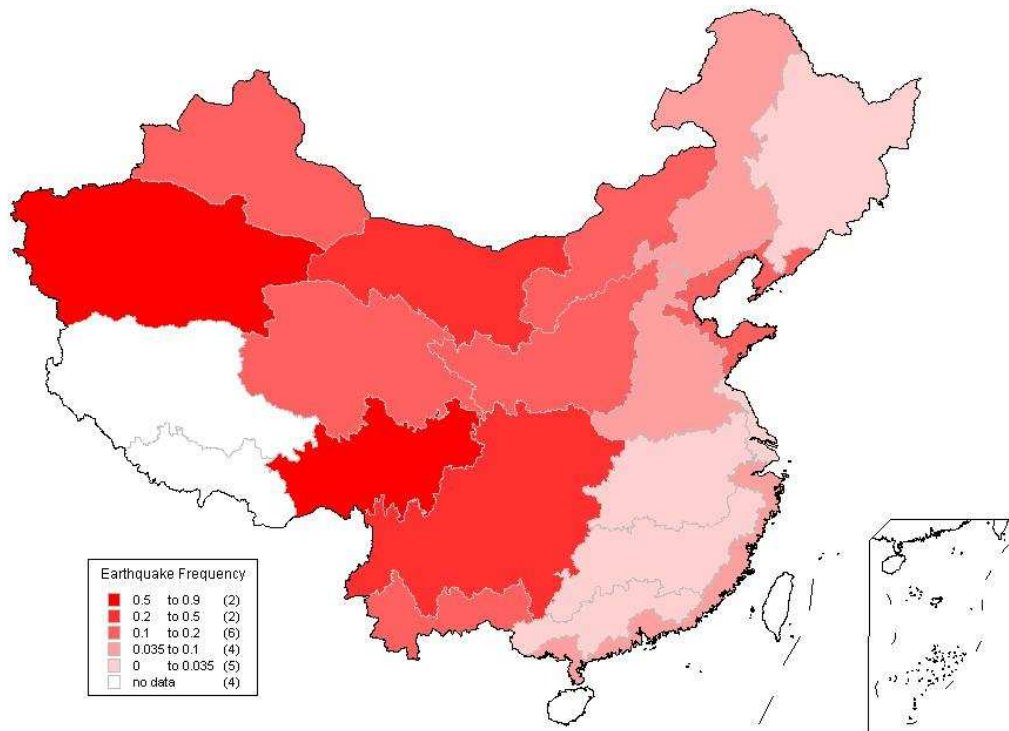


Fig. 5 Spatial variation of earthquake awareness as suggested by respondents

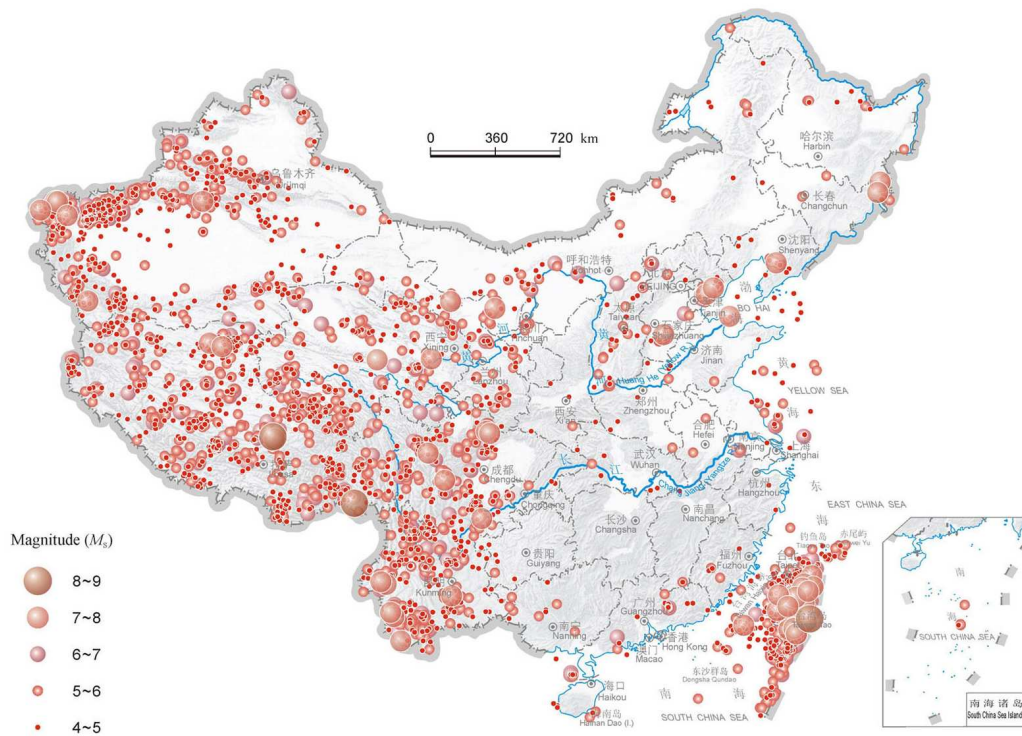


Fig. 6 Epicenter distribution in China (1949–2000)⁽²⁸⁾

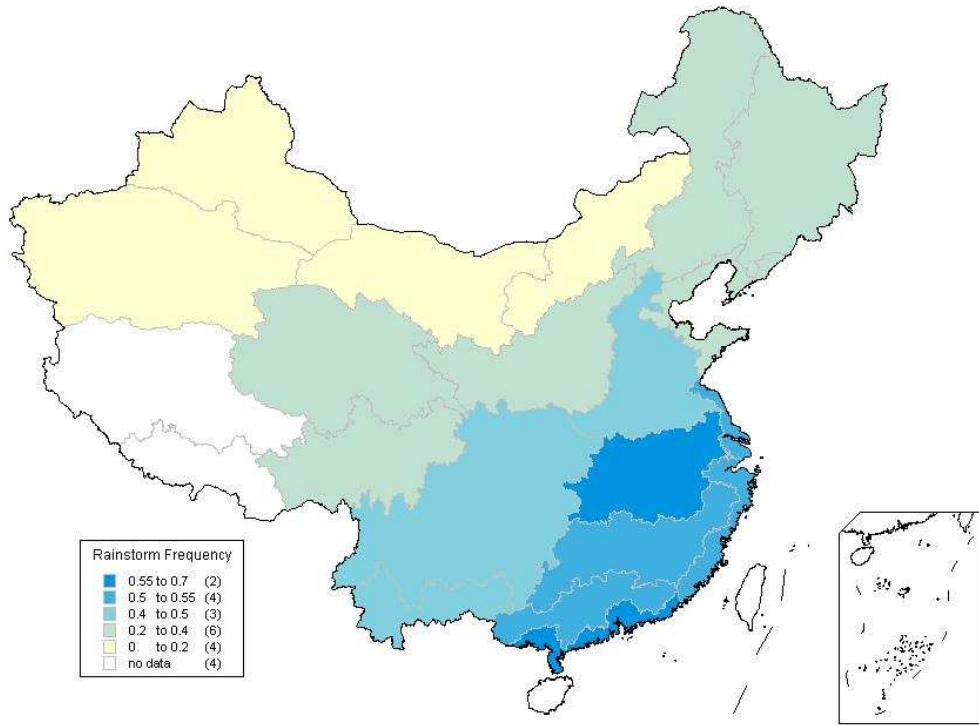


Fig. 7 Spatial variation of rainstorm awareness as suggested by respondents

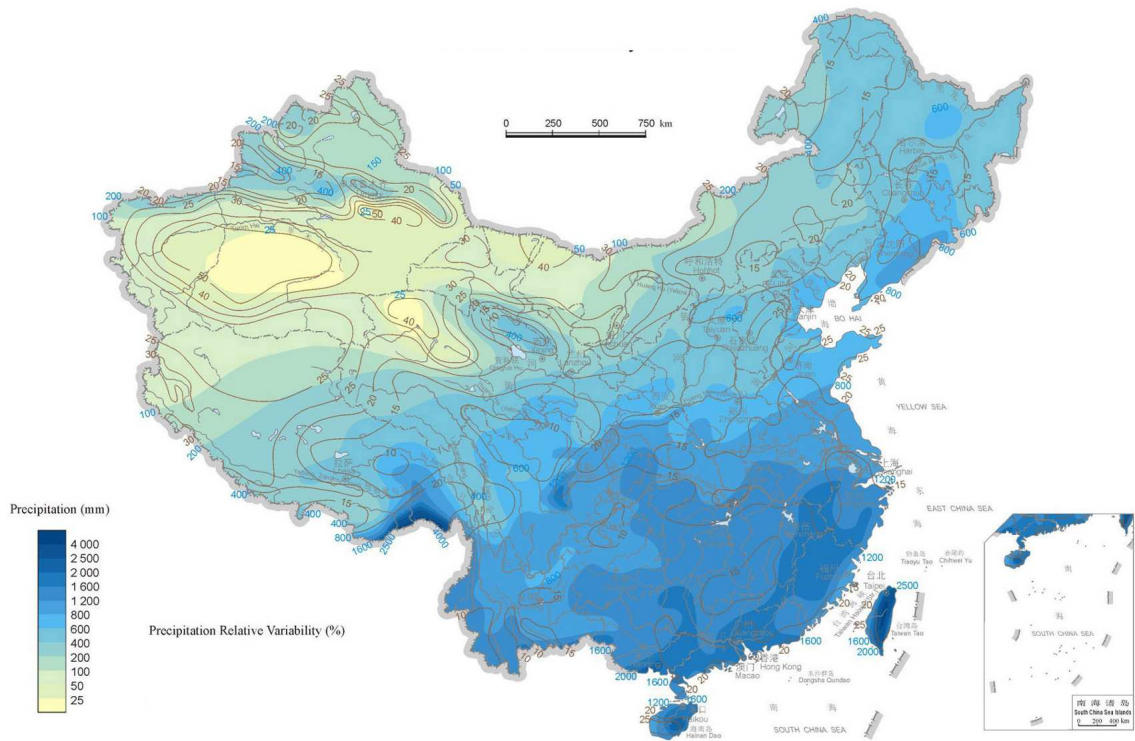


Fig. 8 Mean annual precipitation in China⁽²⁸⁾.

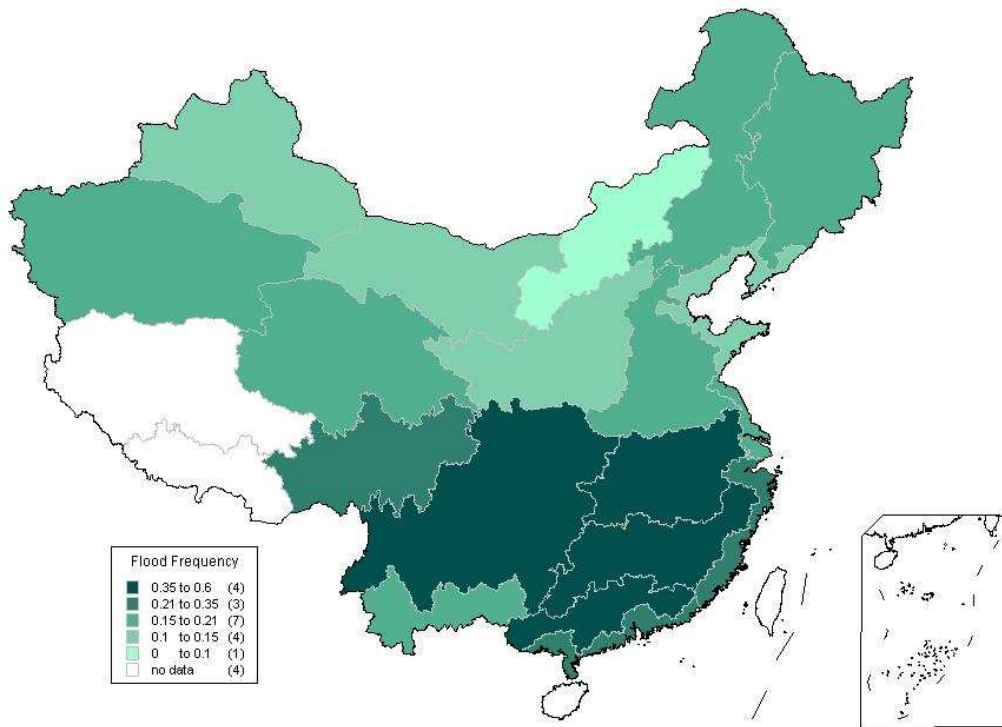


Fig. 9 Spatial variation of flood awareness as suggested by respondents

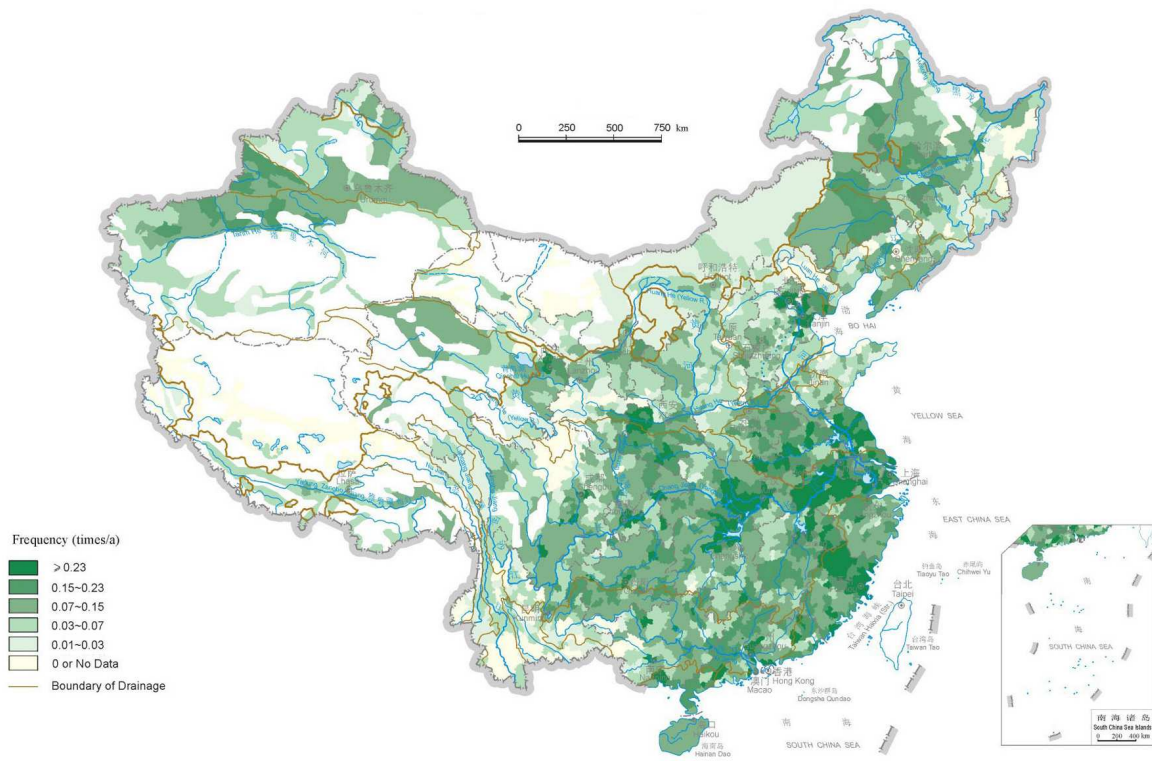


Fig. 10 Frequency of flooding in China (1949–2000)⁽²⁸⁾.

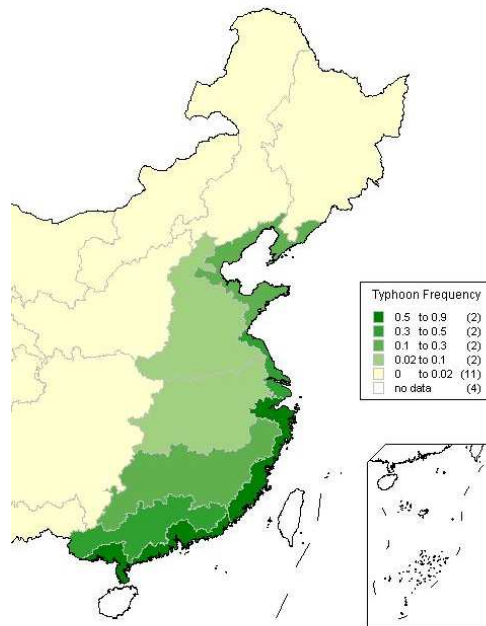


Fig. 11 Spatial variation of typhoon awareness as suggested by respondents

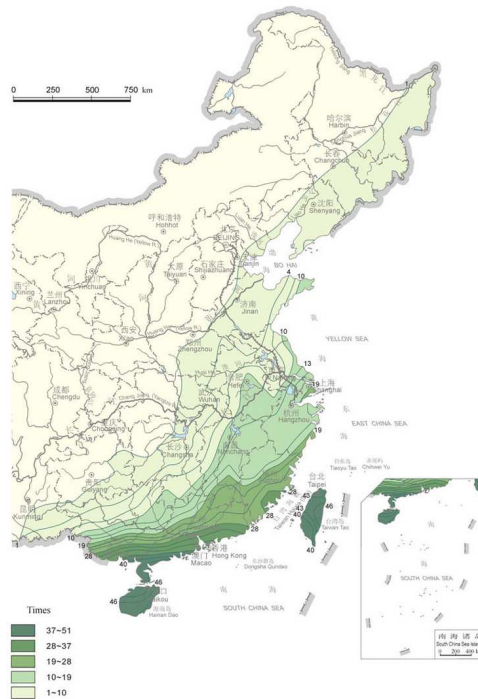


Fig. 12 Numbers of severe typhoons (1949–2000)⁽²⁸⁾

3.2 Insurance Experience

Our survey indicates that 71.1% of respondents had at some time purchased insurance products, while 28.9% had never done so. Among the 71.1% respondents with insurance experience, 57% had at some time bought medical insurance, 31% had at some time bought accident and injury insurance, and 25% had at some time bought endowment insurance (Fig. 13). As mentioned previously, the insurance market for residential houses has not been developed in China, and the current trial programs promoted by local government are limited to very few regions and apply only to farmers. This is why only 4% had at some time bought house insurance. The relatively high rate of medical and accident insurance may correspond to new progress in some policy-oriented insurance programs under governmental support. The New Rural Cooperative Medical System (CMS) was launched in July 2003, and 2,729 counties were participating in the program by 2008. In 2008, the China Insurance Regulatory Commission (CIRC) promoted micro insurance experimentation on accident and injury for farmers and migrant workers. More than 10 products became available, and 19 provinces were participating in this program by 2009. This helps to explain why we saw a high participation rate in medical and accident insurance products.

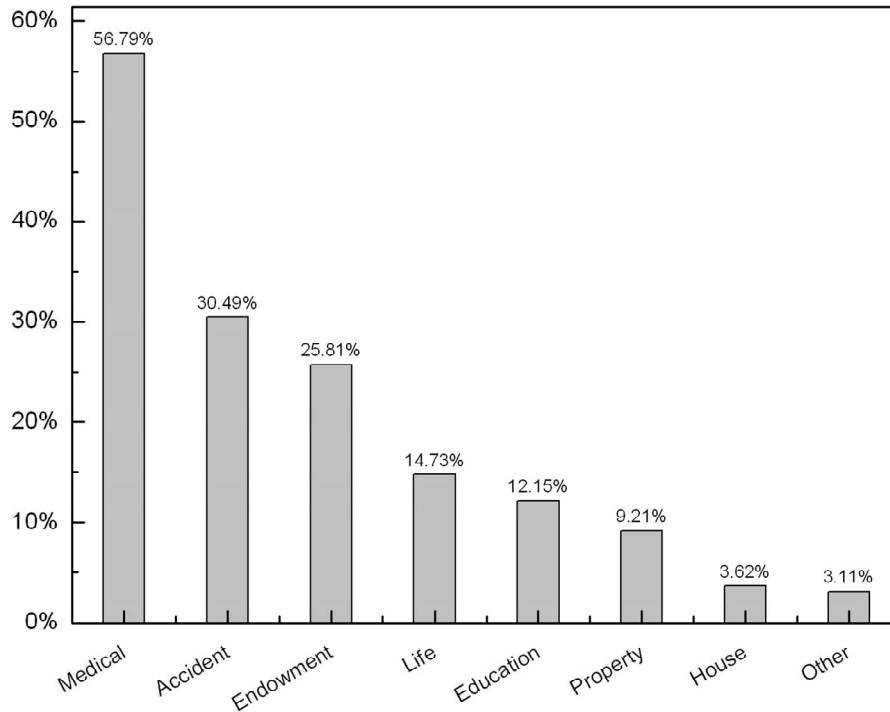


Fig. 13 Respondents' insurance experiences

3.3 Opinions on Governmental Disaster Reduction and Mitigation Measures

In the questionnaires, we asked “who should take the major responsibility to undertake the burden of disaster losses and pay the bill?” 69.7% of respondents indicated that the government should take the major responsibility and undertake to cover disaster losses. Only 6.6% of respondents chose community or individual families as primarily responsible. 42% of respondents indicated that governmental investment to build stronger infrastructure capacity against disasters is the most important and effective measure, and that it should be the top priority of government work on disaster reduction. 23% of respondents were in favor of disaster insurance with policy and fiscal support from government. From the perspective of the respondents, measures taken to build a safer society before severe disasters occur are the best solution to reduce and mitigate disaster impact. China has huge rural populations and rural lands, and these areas are extremely vulnerable to natural disasters. The establishment of a disaster insurance system should be based on a certain level of regional capacity against disasters, and should be highly coordinated with local and central investment to construct and strengthen basic

infrastructure and facilities to cope with disasters. Most respondents were not in favor of moving out of high-risk areas even with the government’s help, and believed that continuous governmental investment into infrastructure and facilities can build up sufficient local capacity against disasters.

We further investigated respondents’ opinions on governmental measures by grouping people into five classes according to the level of urbanization and economic development of the counties and cities in which they lived. There was little variation among respondents from these five different classes (Fig. 14). No matter what their location; whether in poverty stricken counties or in highly developed major cities, in general respondents had very similar opinions on the priority of governmental measures for disaster reduction and mitigation. It should be noted that disaster insurance as a coping mechanism is considered to be equally important as disaster relief based on people’s opinion. This result should have strong governmental policy implications for the establishment of a disaster insurance system, as the disaster relief mechanism has been functioning with a relatively generous government budget over the past thirty years in China.

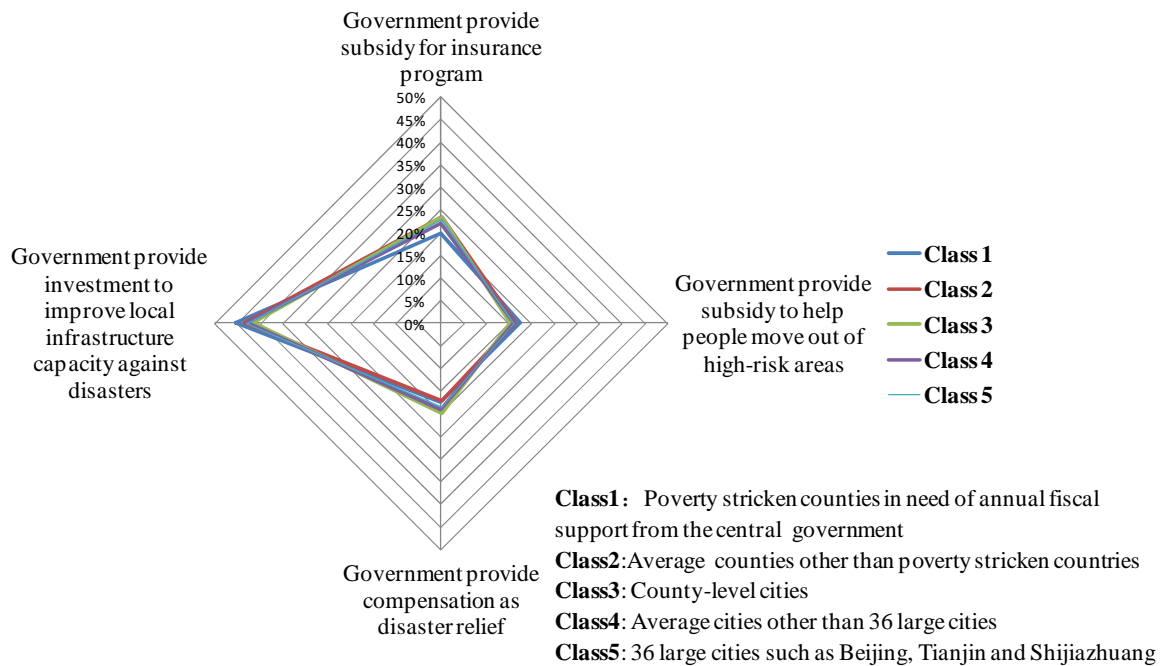


Fig. 14 Opinions on the priority of governmental measures for disaster reduction and mitigation

3.4 Disaster Insurance Acceptance of and WTP

34.7% and 39.8% of respondents believed that disaster insurance is very important and relatively important in all measures of disaster reduction and mitigation. Only 4.0% of respondents considered insurance to be unnecessary. This indicates that most people would accept disaster insurance. 43.2% of the respondents from poverty stricken counties (Class 1) chose “very important” when answering this question; much higher than in the other classes (Classes 2 to 5) where the range was 31.8% to 34.7%. This indicates that people from poverty stricken counties fully understand that they are greatly vulnerable to natural disasters and that the associated losses can significantly influence their basic living status.

After a brief introduction to an assumed disaster house insurance program, with premiums partially subsidized by the government (similar to the current agricultural insurance program in China), 72.8% of respondents expressed a willingness to purchase this kind of insurance, while 27.2% did not. If we consider the percentage of acceptance in each class (Classes 1 to 5, from poverty stricken counties to 36 major cities), this varies between 70.6% and 75.7%, and is lowest in Class 5 (36 major cities) and highest in Class 1 (poverty stricken counties). This indicates that the people who live in poverty stricken counties are not necessarily more reluctant to accept disaster insurance, although the required premium may have lower affordability.

Respondents who were willing to buy disaster house insurance were asked about their WTP premiums. Because we aimed to obtain people’s WTP based on their true beliefs and feelings, any pre-assumed ranges of premium could have misled respondents’ judgment. We therefore used open-ended questions to enquire WTP. Some inaccurate answers might exist from the open-ended questions. Our team members took extra effort to explain these questions and conduct quality control by double checking with respondents who answered with unreasonably large numbers. Our results showed that respondents were willing to pay an average of 288 Yuan per year and a median of 100 Yuan per year, if the insured amount was set at RMB 50,000 Yuan. If the insured amount was set at RMB 100,000 Yuan, respondents were willing to pay an average of 531 Yuan per year and a median of 200 Yuan per year. This implies that the acceptable average premium rate for the buyer’s share was approximately 0.55% of the insured amount, with a median of 0.20%.

During the face-to-face interviews, some respondents were hesitant to write down their WTP. They were concerned that the insurance amount was too low to cover the loss caused by a disaster. To make the insurance products more rational, we needed to take regional differences into consideration, including construction

methods, regional economic development, and urbanization levels. However, the scheme we discuss here focuses on providing financial protection to meet people's urgent needs after disasters. This program does not intend to provide full coverage of property losses in disasters. Those who need full coverage should be encouraged to purchase commercial insurance products in addition to the disaster house insurance supported by government policy and subsidy.

3.5 Why Are Some Respondents Not Willing to Buy Disaster Insurance?

Of the respondents who were not willing to purchase disaster house insurance, 24.1% indicated that the main reason was that they knew very little about insurance, and 23.0% indicated that they did not trust insurance companies and were afraid of getting no payment after disasters. 31.5% indicated that there was no need to buy insurance because they had never experienced a large natural disaster and they believed that they would not be affected by a severe natural disaster in the future. These were the three main obstacles to insurance purchase. Only 10.6% of respondents indicated that they could not afford to buy insurance, and 6.9% of respondents believed that insurance was not necessary because the government would provide compensation for disaster relief.

Our survey reveals the importance of the insurance industry in terms of educating the market and gaining trust from people by increasing transparency and efficiency during loss adjustment and claim settlement. The reasons discouraging respondents from accepting insurance show some variation among the five classes according to levels of urbanization and economic development (Fig. 15). Respondents from poverty stricken counties (Class 1) had less insurance knowledge and lower ability to afford insurance. In general, branches of insurance companies have not extended to most villages and towns of Class 1 counties, and the people there have had less opportunity to experience commercial insurance products. Cultivating and educating the market in rural areas becomes the top priority for the insurance industry, to increase the penetration rate of disaster insurance in these counties. On the other hand, the government should consider a higher subsidy for people in poverty stricken counties, to encourage participation from the low-income population.

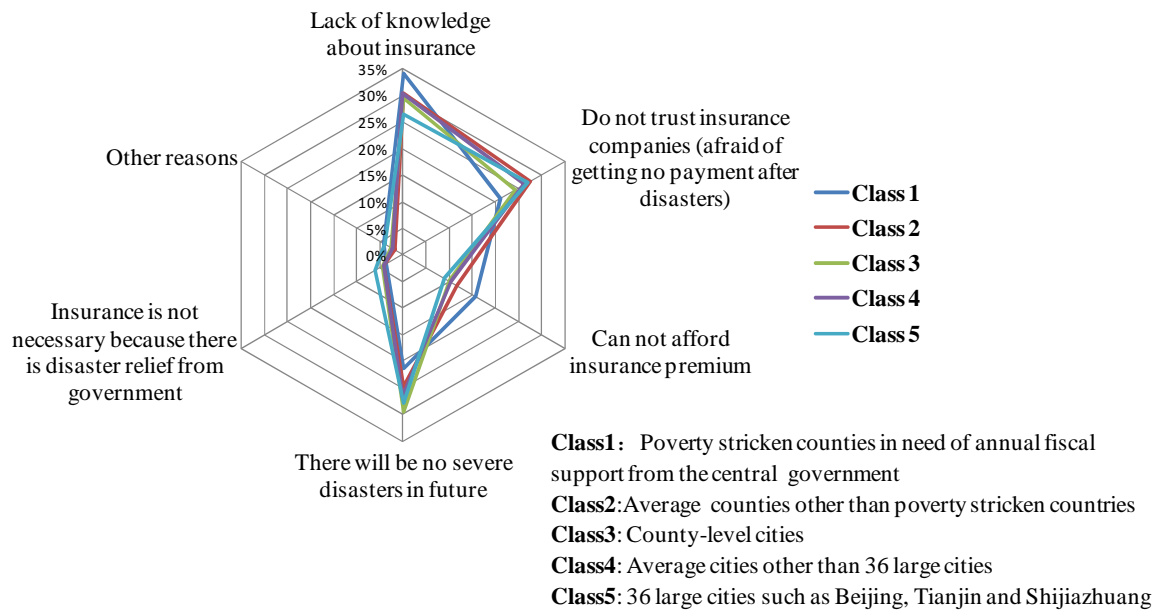


Fig. 15 Reasons for not accepting disaster insurance (grouped into classes)

4. INFLUENTIAL FACTORS AND THE REGRESSION MODEL

We analyzed the survey data at two scales: regional and individual. We believed that the average acceptance rate of disaster insurance in a region was dependent on the regional development, hazard profile, overall disaster and insurance experience, and opinion regarding insurance as a coping mechanism for disasters. The analysis at regional scale tended to discover dominant factors and reveal regional variation in WTP. Whether an individual accepted disaster insurance also depended on personal conditions like his/her origin, personal disaster and insurance experience, and other subjective understandings and judgments of governmental measures. The analysis at an individual scale tended to uncover important factors that affected personal insurance decision-making.

4.1 Factors Affecting Overall Insurance Acceptance at the Regional Scale

Based on geographic location, all respondents were grouped into the 26 disaster sub-regions defined in the regionalization of natural disasters in China (Shi P., 2003). Seven main factors, including four objective factors (Hazard_Index, Urbanization_Index, Disaster_Experience, Insurance_Experience), and three subjective factors

(Disaster_Perception, Insurance_Importance, Government_Responsibility), were chosen for analysis of correlation with acceptance of disaster house insurance. At the regional scale, all individual data in one sub-region were converted into a percentage number to represent the overall index. For example, the index of Insurance_Experience of a sub-region denotes the percentage of respondents who had at some time purchased insurance. Pearson's correlation method was used here, and Table II shows the results.

Table II. Factors affecting regional acceptance of insurance and intercorrelations

	1	2	3	4	5	6	7	8
1. Hazard_Index ³	1	0.260	-0.132	-0.487*	0.280	-0.732**	0.468*	-0.573**
2. Urbanization_Index ⁴		1	-0.660**	-0.106	0.194	-0.180	0.165	-0.139
3. Disaster_Experience ⁵			1	0.406*	-0.159	-0.137	-0.241	0.190
4. Insurance_Experience ⁶				1	0.080	0.302	-0.308	0.549**
5. Disaster_Perception ⁷					1	-0.287	0.297	0.111
6. Insurance_Importance ⁸						1	-0.468*	0.624**
7. Government_Responsibility ⁹							1	-0.530**
8. Acceptance ¹⁰								1

* Significant at the 0.05 level. ** Significant at the 0.01 level.

Among the four objective factors, Hazard_Index and Insurance_Experience were two statistically significant factors for the regional acceptance of disaster insurance. Insurance_Experience showed a strong positive correlation with Acceptance, and this implied that a region where more people had at some time purchased insurance products tended to have a higher percentage of overall acceptance for disaster house insurance. This verifies our understanding that people with insurance experience usually have a higher level of risk awareness and consider insurance as an important coping mechanism for disasters. Hazard_Index showed a strong negative correlation with Insurance_Experience and Insurance_Importance, and a strong positive

³ The integrated hazard index [Shi 2003]; a higher value indicates a higher multi-hazard threat.

⁴ Index of urbanization level [Shi 2003]; a higher value indicates a higher level of urbanization.

⁵ Whether the respondent experienced severe natural disasters in the past 10 years (0 for No, and 1 for Yes).

⁶ Whether the respondent has ever purchased any kind of insurance product (0 for No, and 1 for Yes).

⁷ Perception of disaster occurrence trends in the future (1 for increasing, and 0 for others).

⁸ How important is disaster insurance in all measures of disaster reduction and mitigation (1 for very important or relatively important, and 0 for neutral or unnecessary).

⁹ Who should take major responsibility for the burden of disaster losses (1 for government, and 0 for others).

¹⁰ Whether the respondent is willing to participate in the disaster home insurance program with government subsidy (0 for No, and 1 for Yes).

correlation with Government_Responsibility. Hazard_Index, as used here, is an integrated index that considers diversity, intensity, and coverage areas of multiple natural hazards (Shi P., 2003), that reflects the multi-hazard threat in a given sub-region. Our survey illustrates that regions where people were facing higher multi-hazard threats had lower percentage of population who had insurance experience and considered disaster insurance to be important. Moreover, people from regions with a higher integrated hazard index showed less willingness to buy disaster house insurance. Instead, they tended to expect the government to cover major disaster losses. Neither Urbanization_Index or Disaster_Experience were statistically significant for Acceptance. We usually assume that people who live in urban areas and people who have experienced severe disasters have higher risk awareness, and are therefore more likely to accept insurance. However, our survey results do not support this opinion. Those who live in less developed regions are not necessarily more reluctant to accept natural disaster insurance, although they have relatively lower levels of ability to afford insurance.

Two statistically significant subjective factors are Importance_Insurance and Government_Responsibility. Regions where more people believed that disaster insurance was an important measure in disaster reduction and mitigation, tended to have a higher percentage of overall acceptance of disaster house insurance. Importance_Insurance thus showed a strong positive correlation with Acceptance. Regions where more people expected government to take the major responsibility for disaster losses tended to have a lower percentage of insurance acceptance. Disaster_Perception was not a significant factor for regional acceptance, and also did not have a strong correlation with any other factor. Therefore, regions where more people had perception of increasing disaster trend do not necessarily have higher percentage of insurance acceptance.

4.2 Factors Affecting Insurance Acceptance at the Individual Scale

The same seven factors were chosen for analysis of correlation with individual acceptance of disaster house insurance. Because acceptance decisions were two discrete outcomes (be willing to participate or not), a binomial logistic model was used to evaluate the participation decision. Table III shows the results of the regression model. Disaster_Experience, Insurance_Experience and Insurance_Importance were the statistically significant variables for the insurance participation decision. This suggested that a person who had experienced severe disasters and had at some time purchased any kind of insurance products would be very likely to accept the assumed disaster house insurance. A person who considered insurance as an important coping mechanism

for disasters would also be more likely to participate. Disaster_Experience was not a significant factor in the analysis at a regional scale, however, it became one of the dominant factors at an individual scale. All other factors showed relatively trivial effect on the insurance participation decision, as evidenced by our regression model.

Table III. Estimated parameters for the logistic model of insurance acceptance

Variables	Estimate	Std. Error	z value	Pr(> z)
Intercept	-0.1063	0.2528	-0.421	0.6741
Hazard_Index	-0.0839	0.0603	-1.391	0.1642
Urbanization_Index	-0.0110	0.0053	-2.064	0.0390*
Disaster_Experience	0.2789	0.0653	4.270	1.96e-05 **
Insurance_Experience	0.4029	0.0669	6.023	1.72e-09 **
Disaster_Perception	0.1312	0.0636	2.063	0.0391*
Insurance_Importance	0.5700	0.0375	15.186	< 2e-16 **
Government_Responsibility	-0.1362	0.0656	-2.077	0.0378*

*Significant at 5 percent level. **Significant at 1 percent level.

4.3 Regional and Individual Variation in WTP

We found that none of the 8 factors in Table II were statistically significant with the mean WTP premium at either the RMB 50,000 Yuan or 100,000 Yuan insured amount, in both regional and individual analyses. This result suggested that peoples' WTP were not simply dependent on factors such as disaster and insurance experience, and the regional hazard profile. We grouped all samples into disaster regions (Region II to VI), and compared the WTP premium in these regions (Fig. 16). The mean WTPs in Region V (northeast mainland disaster region) and Region VI (Qinghai-Xizang Plateau disaster region) were moderately higher than in the other three regions. The higher 75% percentile and median values in these two regions also suggested that more respondents accepted a higher premium. Regions V and VI represented the western areas of China where the economy is less developed. It was logical to further investigate how WTP varies according to regional economic development. We grouped all samples into the five classes (Class 1 represented poverty stricken counties and Class 5 represented 36 major cities as described in Fig. 14). The results (Fig. 17) showed that the mean WTP was relatively consistent across classes. Class 5 (36 major cities) with a higher 75% percentile

value for the 50,000 Yuan insured amount and a higher 90% percentile value for the 100,000 Yuan insured amount, implied that more respondents accepted a higher premium in these cities.

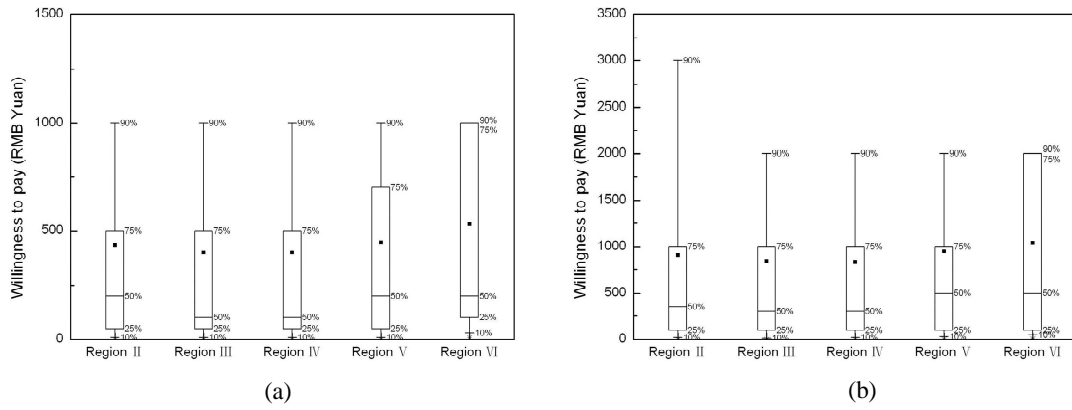


Fig. 16 WTP by disaster region for the insured amount of (a) 50,000 Yuan and (b) 100,000 Yuan

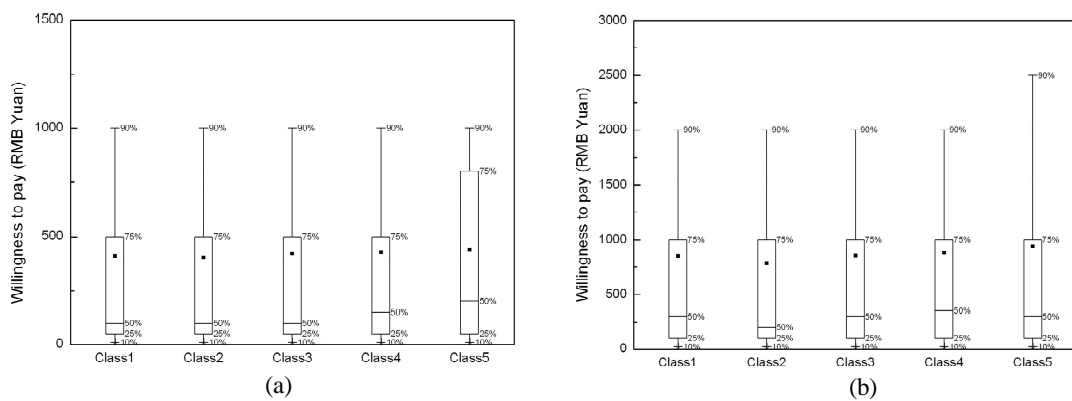


Fig. 17 WTP by Class 1 to 5 for the insured amount of (a) 50,000 Yuan and (b) 100,000 Yuan

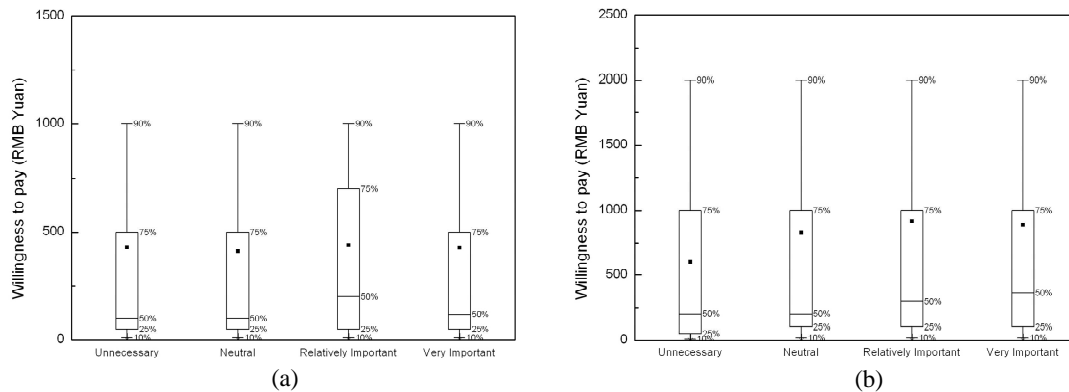


Fig. 18 WTP by importance of insurance for the insured amount of (a) 50,000 Yuan and (b) 100,000 Yuan

The survey results suggested that an individual's disaster experience, insurance experience, and opinion on importance of insurance as coping mechanism for disasters were dominant influences on the participation decision. However, these were not statistically significant factors for WTP. We grouped sample data into 4 categories based each individual's opinion on the importance of insurance (unnecessary, neutral, relatively importance, very important). The results (Fig. 18) showed that people who considered insurance unnecessary tended to have slightly lower WTP (median and mean values). However, WTP was not necessarily obviously higher for those people who recognized the importance of insurance.

5. DISCUSSION AND POLICY IMPLICATIONS

As discussed in Section 2.1, people generally showed correct perceptions of the frequency of occurrence of natural disasters in the areas in which they lived. This means that most people were aware of the threat of natural disasters in their areas, and we may further infer that people had a generally correct perception of the multi-hazard threat that is scientifically expressed as the integrated hazard index⁽²⁸⁾. People who sensed a greater threat from natural disasters did not necessarily accept disaster house insurance, as they expected the government to undertake more responsibility for reducing disaster risk, and they consequently considered insurance to be less important. However, it must be noted that people who had experienced extreme losses of their houses in past natural disasters differed from those who sensed a threat but had not actually experienced extreme house damage. People who had experienced collapse of their houses due to natural disasters, in

general recognized the great importance of disaster house insurance, and over 50% considered insurance “very important” (Fig. 16). In accordance with the previously discussed correlation between Insurance_Importance and Acceptance at both regional and individual scales, these people tended to accept disaster house insurance. In terms of reasons for not accepting insurance, people who had experienced collapse of their houses due to a natural disaster had an obviously higher percentage of choice of “cannot afford insurance premium” (Fig. 17). This supports the view that the houses of people who are struggling on the poverty line are usually more vulnerable to natural disasters. A higher percentage of impoverished people recognized the importance of disaster house insurance, although many of them might not be able to afford the premium.

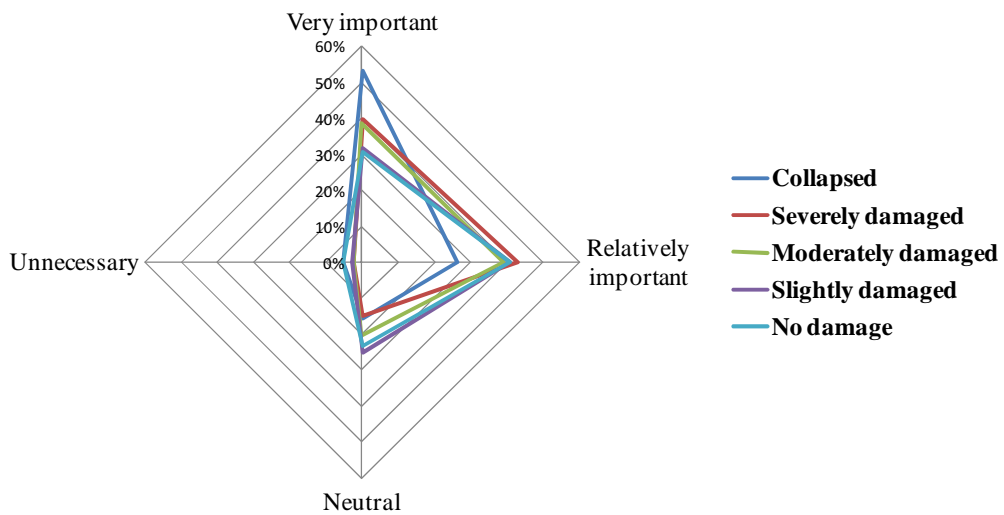


Fig. 16 Opinions on importance of disaster insurance (grouped by level of experience of house damage)

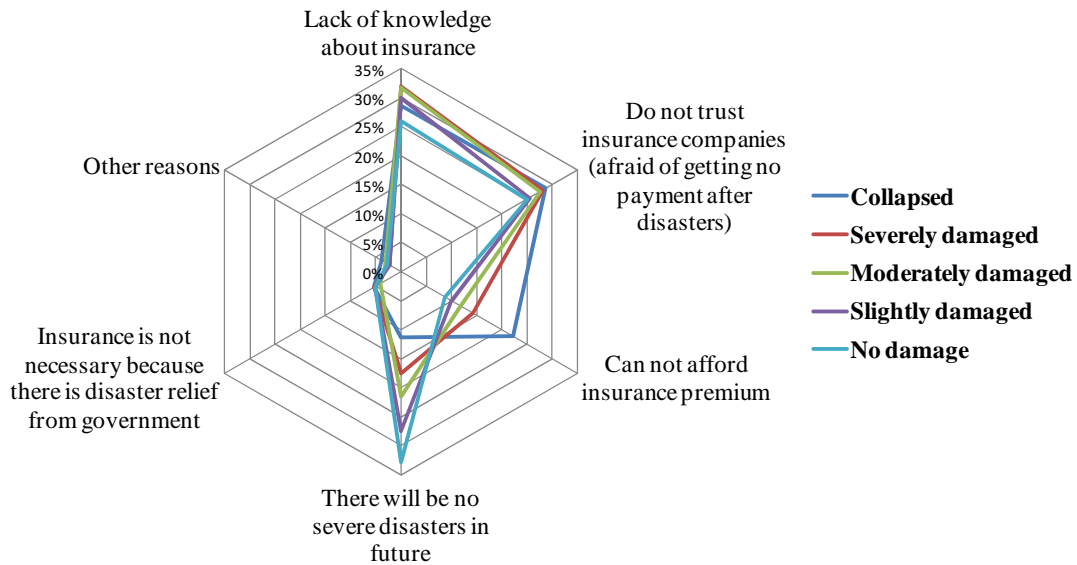


Fig. 17 Reasons for being reluctant to participate in disaster insurance (grouped by level of experience of house damage)

The development of a disaster insurance system for a country should meet the actual needs of people in terms of perils, premium determination, operation model etc., because the long-term sustainability of the insurance program highly depends on social participation. In China, the government needs to play an important role in cultivating the disaster insurance market by providing both policy and fiscal support. This has been specifically stipulated in the Emergency Response Law of the People's Republic of China. However, very limited progress in developing a disaster house insurance program is seen, although this topic has been actively discussed amongst all stakeholders. Our intention is that the survey results analyzed here will promote discussion of policy implications.

First, the most frequent disasters Chinese people have encountered were drought and rainstorm, and the most severe disasters that have caused damage to their houses were flood and earthquake. The impact of drought is mainly on agriculture and it has been covered by current policy-oriented agricultural insurance. Flood, earthquake, and rainstorm should therefore be prioritized if a disaster house insurance program is to be developed. Typhoon should be prioritized for coastal areas.

Second, house insurance is one of the least developed businesses in China, compared with medical,

accident and injury, and endowment insurance; these have higher penetration rates. The Chinese experience of policy-oriented insurance programs for medical, accident, and agricultural insurance, illustrates that the promotion of government is crucial in the early stages of development of a new program. Although most Chinese people believe that the priority of governmental measures in disaster reduction and mitigation should be on safety construction by investing in enhanced infrastructure, people consider disaster insurance to be equally important as a governmental coping mechanism. This opinion does not vary much between people from major cities or poverty stricken counties. Therefore, the national policy of comprehensive disaster reduction should address the function of insurance and allocate sufficient fiscal budget to develop a disaster insurance system; this would meet people's expectations.

Third, regions with better insurance penetration, are generally more likely to accept a disaster house insurance program. Regions with a higher integrated hazard index have more people who are not willing to participate in insurance, because more people in these regions tend to expect government to cover disaster losses. Therefore, the selection of regions to conduct a disaster insurance trial should not simply be based on the level of hazards. Although we believe that insurance can benefit people in high-risk regions more effectively, the promotion of a trial program may face difficulty in these regions because the expectations of most people there do not support this. Insurance penetration should be fully considered when deciding regions for a disaster insurance trial.

Fourth, Chinese people in general have a correct perception of the hazards in the areas they live. However, the perceived risk does not directly affect disaster insurance participation because those people who face higher disaster risk may not necessarily recognize the importance of insurance as a coping mechanism. Instead, they tend to expect government to undertake to cover the potential losses. Therefore, the government and insurance industry of China should work together to cultivate the disaster insurance market by publicizing insurance knowledge and increasing people's insurance awareness, especially through the many existing insurance programs that have reached large rural populations and remote areas. Moreover, the government needs to reinforce regulations for the insurance industry so as to effectively prevent the occurrence of fraud that has been discovered in some policy-oriented insurance programs. The loss of trust of the insurance industry will hurt not only existing but also new developing markets, and it would take years to recover trust.

Finally, poverty stricken counties show the same level of disaster insurance acceptance as major cities and other areas in China, if not higher. This implies that regions with less developed economies also have high demands for disaster insurance, although these regions have more people who cannot afford an insurance premium. The government therefore needs to provide sufficient premium subsidies in these regions to encourage people's participation. Moreover, people's WTP should be taken into account in the determination of subsidies and premiums.

6. CONCLUSION

A disaster insurance system should be established in China, based on the understandings of different people's opinions and expectations, regional differences, and degree of affordability. In this way, the insurance program could meet the needs of different people and attract more participants. We have investigated the social bases for establishing such a disaster insurance system in China, by conducting a nationwide survey of people's disaster and insurance experiences, their opinions on governmental measures for disaster reduction and mitigation, and their acceptance and WTP for disaster house insurance. We have summarized the statistical results and analyzed intercorrelations among objective and subjective factors that may affect people's acceptance at both regional and individual scales. Our survey indicates that people's experience of various hazards has obvious spatial variation and this variation agrees with the frequency maps of disaster occurrence generated from the numerous historical data. In contrast, respondents' perceptions of disaster trends did not show strong regional variation. The analysis at regional scale suggests that Hazard_Index and Insurance_Experience are the dominating objective factors and Insurance_Importance and Government_Responsibility are the dominating subjective factors that affect the overall acceptance of disaster insurance in a region. The regression model developed to predict individual participation decisions suggests that Disaster_Experience, Insurance_Experience and Insurance_Importance are dominating variables. Those who lived in regions with a higher integrated hazard index tended to expect the government to undertake responsibility for disaster losses, and this was the most important factor preventing them from accepting disaster insurance. From their perspective, the government's top priority should be to increase investment in infrastructure and facilities, so that disaster prevention capacity can be strengthened. People from poverty

stricken or less developed areas were not necessarily more reluctant to accept disaster insurance, although they showed relatively lower levels of ability to afford insurance. People who had at some time experienced significant losses of their houses had a higher ability to recognize the importance of insurance; this was the dominant subjective factor positively affecting people's acceptance of disaster house insurance. However, people who only perceived the threat of hazards while having experienced no severe impact showed a relatively lower percentage of acceptance of disaster insurance. The average WTP for disaster house insurance is approximately 0.55% (median 0.20%) of the insured amount for an all-in-one policy. The variation in WTP in various disaster regions or city/county classes (from poverty stricken counties to 36 major cities) was found to be insignificant. Factors such as Hazard_Index, Insurance_Experience, and Disaster_Experience do not have statistically significant effects on WTP at either regional or individual scales. We have discussed the policy implications of our results for developing a disaster insurance system in China. Since very little research has been conducted so far on the social aspects of risk and disaster insurance in China, there is an urgent need to build a larger literature on this topic and link them to existing theory and practice. Our research remains an initial attempt to tackle a highly complicated problem. Many issues, for instance, the influence on individual's insurance decision with regard to their socioeconomic profile (e.g., gender, education, income, occupation, etc.) which was omitted in our survey, remain unsolved, thus requiring future study.

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