



Insurance Approach for Financing Extreme Climate Event Losses in China: A Status Analysis

Haitao Yin



WorldFish



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The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support research and training in environmental and resource economics. Its objective is to enhance local capacity to undertake the economic analysis of environmental problems and policies. It uses a networking approach that involves attendance in courses and meetings, technical support, access to literature, and opportunities for comparative research. Member countries are Thailand, Malaysia, Indonesia, the Philippines, Vietnam, Cambodia, Lao PDR, China, Myanmar, and Papua New Guinea.

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INSURANCE APPROACH FOR FINANCING EXTREME CLIMATE EVENT LOSSES IN CHINA: A STATUS ANALYSIS

Haitao Yin

EXECUTIVE SUMMARY

China suffers a variety of natural disasters every year. The frequency and consequences of these disasters have risen due to climate change, resulting in increased economic losses.

This project first examines the existing public system of disaster relief and recovery including both direct government subsidy and public insurance system through extensive documentary study, focus group discussions and in-person interviews. We found that the usefulness of direct government subsidies is limited by the availability of public financial resources.

Direct government subsidies are largely reserved for those who do not have the capability for self-relief and recovery. For those who do receive government subsidies, the amount of assistance is only sufficient for basic housing needs instead of restoring the way of life people had before a natural disaster.

Public insurance, on the other hand, only applies to rural areas and has a maximum coverage of only about CNY 18,000. As with direct government subsidies, the purpose of public insurance is meeting basic needs, instead of helping people go back to the life they used to have. Furthermore, the premium of the public insurance system is heavily subsidized and not related to risk. This practice has been criticized for watering down economic incentives for proactive risk management and emergency response capacity building (Gurenko and Lester 2004; Heinz Center 2000; Yin, Kunreuther, and White 2011).

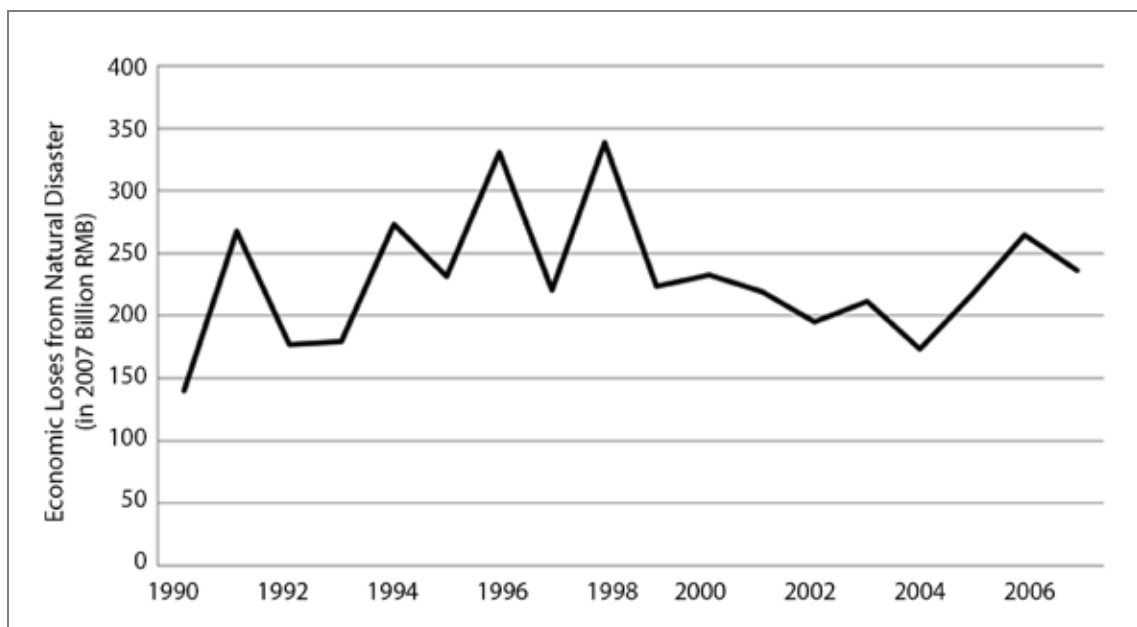
The limitations of the public approach create a space for private insurance. In this paper, we investigate how China's insurance industry (as suppliers) and Chinese people (as consumers) view natural disaster insurance. We conducted in-person interviews with insurance companies that are involved in the property insurance market in China. Insurance companies hesitate to offer insurance policy against natural disasters because of institutional barriers (e.g., natural disaster coverage is not considered a separate category, and existing accounting and tax regulations), low demand from consumers and the ambiguity associated with natural disaster.

Our analysis of the demand for insurance is based on a field survey, which includes a choice-experiment of insurance selection. We found that people have a low demand for insurance because of three major reasons: a) the perception of "*it won't happen to me*", b) budgetary constraint, and c) a deep distrust in the insurance industry. We found that people tend to avoid insurance offered by small-scale insurance companies and strongly favor government insurance. This suggests that the establishment of natural disaster insurance should be initiated by government in China. We also found that one's willingness to pay (WTP) for natural disaster insurance would significantly increase if one has high risk perception, and has experienced natural disasters.

Our analyses suggest that neither the public nor private approach present an adequate solution to the challenge of financing natural disaster losses in China. Government-business collaboration may provide a viable alternative. Based on our findings, we discuss the roles that government and the private sector should play in a collaborative system.

1.0 INTRODUCTION

China suffers a variety of natural disasters, which result in about CNY 200 billion economic losses every year (Figure 1). In recent years, with two major earthquakes in Sichuan province and Qinghai province, as well as the increasing frequency of droughts and floods as a result of climate change, China faces a critical challenge, that is, how to finance the increasing economic losses resulting from various natural disasters. In this report, we focus on climate-related disasters and explore the potential role of insurance addressing this challenge.



Source: Ministry of Civil Affairs (2012). Adjusted to 2007 CNY/RMB.

Figure 1. Economic losses from natural disasters

As a risk-spreading mechanism, insurance helps distribute the costs of climate-related events throughout society. Insurance should be a useful tool to enhance the adaptive capacity of households in dealing with extreme climate events. However, this potentially powerful tool is notably underdeveloped in low and middle-income developing countries. In these countries, less than 1% of total direct losses from natural disasters is insured, compared with 40-100% in industrial countries (Gurenko and Lester 2004; Linnerooth-Bayer and Mechler 2007; also see Table 1). In the U.S., about 50% of the economic losses are covered by the insurance industry after major hurricanes such as Allison in 2001 and Katrina in 2005. In contrast, after the 2007 snowstorm in China, payments from insurance companies only accounted for about 6.5% of the losses. Most of these payments were for automobile insurance (T. Wang 2008).

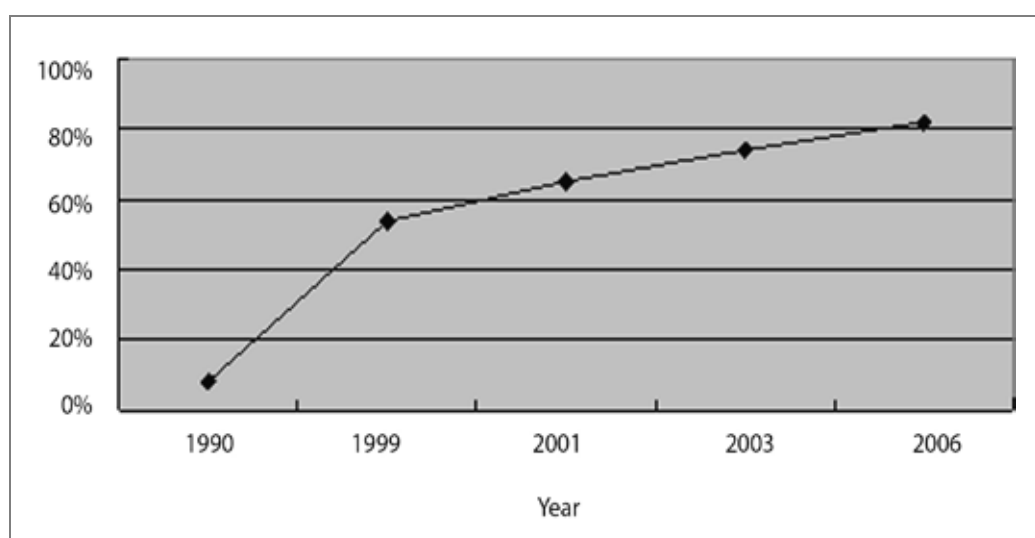
Table 1. Insured losses for several major natural disasters

Region	Disaster	Losses	Insured losses	Insured losses/losses
Chi-Chi, Taiwan	1999 Earthquake	USD 10 to12 Billion	USD 0.6 to 0.75 Billion	6% to 6.25%
Houston, Texas, USA.	2001 Tropical Storm Allison	USD 6 Billion	USD 3.5 Billion	58.3%
Louisiana and Mississippi, USA.	2005 Hurricane Katrina	USD 140 Billion	USD68.5 Billion	48.9%
South China	2007 Snowstorm	USD 7.7 Billion	USD 0.5 Billion	6.5%

Sources: Hays (2008); Chi-Chi Reconnaissance Team (2000); Burton and Hicks(2005); Wang, T. (2008) ; Insurance Information Institute (2008).

The damaging impacts of the absence of natural disaster insurance on the ability of households to adapt to extreme climate events cannot be fully appreciated without considering the underlying social context. Banuri et al. (1994), and Munasinghe (2000) argue that in developing countries, loss of social capital (e.g., the rules and arrangements which bind communities together) can significantly damage household adaptive capacity.

In China, the most significant social change is the movement towards privatization. Consider the example of housing privatization as an illustration of how this movement could have a significant impact on adaptive capacity in dealing with climate event losses. Before 1998, most residential houses in urban areas were built and maintained by work units (*danwei*), including government agencies, state-owned enterprises, or quasi-public organizations such as schools and hospitals. In 1998, the Chinese government initiated urban housing reform, allowing urban residents to actually own their dwellings for the first time since 1949. This reform quickly swept through the urban areas of China and the urban homeownership rate rose from 8% in 1990 to 82% in 2006 (Figure 2).



Source: (F. Wang 2008)

Figure 2. Homeownership in urban China, 1990-2006

The impact of housing privatization on household adaptive capacity in dealing with climate event losses is significant. Before the reform, central government, local governments and work units shared the costs of rebuilding and repairing damaged houses. (Various work units bore most of the costs as they were responsible for providing their employees housing.) Since the reform which allowed urban residents to own houses, residents have been shouldering all the costs of the damages to their homes. In a sense, before the reform, the public funds served to cushion individual households from the impact of natural disasters. The reform of housing privatization effectively removed this cushion. Unlike the insurance market of developed countries, the Chinese insurance market is still in its nascent stage. This has led to urgent calls for the establishment of an insurance-based approach to enhance adaptive capacity in dealing with climate change (Xie 2004; T. Wang 2008).

Insurance could be public or private. Pure public insurance has been criticized for watering down economic incentives to engage in proactive risk management and emergency response capacity building (Gurenko and Lester 2004; Heinz Center 2000; Yin, Kunreuther, and White 2011). On the other hand, a pure private insurance system might not work at all, especially as extreme climate events become more unpredictable both in probability and the extent of damages due to climate change. In China, the agriculture disaster insurance market sharply shrank after the People's Insurance Company of China left state ownership in 1994 (Shi et al. 2008). After Hurricane Katrina struck the United States in 2005, State Farm and Allstate refused to write policies in areas subject to frequent and potentially severe climate events in the United States (Jaffee, Kunreuther, and Kerjan 2008b).

Therefore, although it is clear that an insurance-based system is necessary for enhancing household adaptive capacity in dealing with extreme climate events, it is not clear how this system would be institutionally constructed and developed. This research aimed to explore strategies to develop an insurance-based system in China. The research proceeds with an examination of the decision processes, through extensive surveys and interviews, of three key interested parties: a) potential victims in risk-prone areas; b) insurers who sell insurance policy prior to an extreme climate event; and c) the government agencies who often provide victims with financial assistance after disasters.

This report proceeds as follows: Section 2 provides an overview of the strength and weakness of the public sector and private sector in financing natural disaster losses. Section 3 sketches out public mechanisms currently available in China to provide financial assistance for disaster recovery and examines whether there is a space for private insurance. Section 4 investigates the potential of developing a private natural disaster insurance system in China, from the perspective of insurance providers. On the supply side, this section investigates whether a private insurance option is currently available and how private insurance companies position themselves in developing and marketing insurance against natural disaster. Section 5 focuses on the demand side, and investigates potential victims' choice of insurance and how their choice varies with the design of insurance. Section 6 concludes the report with a summary of the key findings and discussion of future research.

2.0 PUBLIC AND PRIVATE APPROACHES FOR FINANCING NATURAL DISASTER LOSSES

2.1 Public Solutions

In theory, government can deal with natural calamities through two approaches: government offer insurance-like program on its own prior to a disaster and government provides disaster relief fund after a disaster.

The first approach does not work well for the following reasons. First, governments do not have expertise in developing and marketing insurance policy, assessing damages and processing claim. Second, because of lack of technical expertise and political reasons, governments tend to charge a flat-rate premium which may water down people's incentive in risk mitigation (Yin, Kunreuther, and White 2011). Third, government-operated insurance programs often include subsidies, which hinder the development of a private insurance market (Yin, Pfaff, and Kunreuther 2011).

Government disaster relief funds that are provided following a disaster may be counterproductive, as potential victims will not be likely to invest in protective measures (such as insurance) prior to a disaster if they expect disaster assistance from the government following a disaster. Furthermore, this approach faces budgetary restrictions. In East Asia, the shortage of both domestic and international funding has become a major bottleneck for disaster response and recovery (World Bank 2007).

This bottleneck raises a need for insurance. Insurance is in essence a mechanism that spreads risk across individuals and over time. Premiums collected from the years that have no natural disaster and individuals that do not suffer natural disaster in a year can be used to pay coverage to disaster victims. Therefore, the development of an insurance market could reduce dependence on domestic and international public funds.

2.2 Private Natural Disaster Insurance

It is widely acknowledged that a pure private natural disaster insurance system is hard to sustain, unlike other types of insurance. Freeman and Kunreuther (1997) discussed the concepts of insurability and marketability in relation to environmental risks. Only when the following conditions are met are insurers willing to provide coverage.

- Insurability Condition 1: The insurer has the ability to identify and, possibly, quantify the risk, that is, the amount of losses and the probability that the losses occur.
- Insurability Condition 2: The insurer has the ability to set premiums for each potential customer or class of customers. It requires some knowledge of the customer's risk in relation to others in the population so that problems of adverse selection and moral hazard are minimized.
- Marketability Condition: There exists a demand that is large enough to sustain the market.

While advances in risk modeling tools will make insurability condition 2 attainable, hindrances to marketability condition and insurability condition 1 are likely to continue, if not intensify.

The marketability condition hinges on the demand or Willingness to Pay (WTP) for natural disaster insurance. The demand for natural disaster insurance is known to be low for the following reasons: First, prior to a disaster, people tend to underestimate the chances of a disaster occurring. It is a common sentiment that *"this will never happen to me"* (Kunreuther and Pauly 2004; Kunreuther, Sanderson, and Vetschera 1985). Second, people consider natural disaster insurance to be a discretionary expense that should only be incurred if they have residual money after taking care of basic necessities (Kunreuther and Roth 1998). Third, people do not want to purchase insurance if they expect government to provide financial assistance following a disaster. Because of these reasons, people often consider purchasing insurance to be a bad investment. As a result, their WTP (demand) for insurance may not be high enough to sustain an insurance market. This rationale explains why in the U.S., many people do not purchase National Flood Insurance even though it is mandated (Tobin and Calfee 2005).

In addition to low WTP from the demand side, insurers tend to be reluctant to offer natural disaster insurance coverage or charge a much higher price if they do. The probability of natural disasters occurring is uncertain and damage resulting from natural disasters is difficult to estimate, posing a challenge to insurability condition 1. These conditions and the increasing effects of climate change prevent insurers from offering natural disaster insurance. For example, after Hurricane Katrina struck the U. S. in 2005, State Farm and Allstate have refused to write policies in areas subject to frequent and potentially severe climate events in the U. S. (Jaffee, Kunreuther, and Kerjan 2008a). When insurers do offer natural disaster insurance, the premium is likely to be high. Studies have repeatedly shown that when either the probability is ambiguous, losses are correlated, and/or the claim size is uncertain, actuaries and underwriters tend to charge a higher premium (Hogarth and Kunreuther 1989; Kunreuther, Hogarth, and Meszaros 1993).

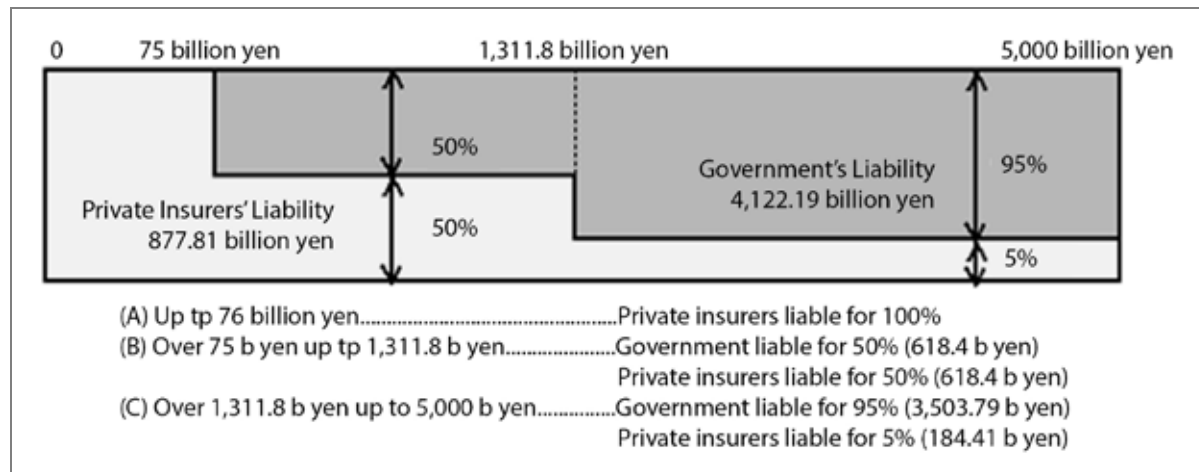
With a low WTP on the demand side, and a reluctance to offer natural disaster insurance and higher premiums on the supply side, the private insurance market for natural disasters may be hard to sustain.

2.3 Government and Business Collaboration

The challenges of purely public solutions and the weaknesses of a private natural disaster insurance system make it necessary to explore the potentials of a collaboration between government and private businesses. Many countries have already experimented with such collaborations. For example, Spain formed a public corporation, the Consorcio de Compensación de Seguros (CCS), that provides mandatory insurance for "extraordinary risks" such as natural disasters. This coverage is an add-on to property insurance policies that are marketed by the private sector. CCS pays claims if the loss is not covered by private insurance, if low-income families did not buy insurance, or if the insurance company becomes insolvent (Freeman and Scott 2005). Similar examples include the earthquake insurance programs in Japan, Turkey, Taiwan and California (Fan, Gu, and Ni 2011).

The Turkish Catastrophe Insurance Pool (TCIP) is a government-backed insurance program. It was established by the Turkish government with the assistance from the World Bank after the Marmara earthquake in 1999. TCIP is a compulsory insurance program. Policies are sold through insurance companies and their agencies, who issue policies on behalf of the TCIP. The Pool is protected via risk transfer into the international reinsurance market. TCIP premium tariff is determined by the Treasury Under-Secretariat based on three factors: construction type, location of the building according to earthquake intensity zone, and gross square area of the dwelling.

In Japan, earthquake insurance is part of fire insurance in general, and homeowners may purchase it on a voluntary basis. The basic rates are determined according to a building's age, location (four geographic zones throughout Japan), and type of structure (wooden and non-wooden). A 10% discount on the cost of the premium is applied to buildings constructed after June 1, 1981. The aggregate burden of earthquake insurance indemnity in Japan is shared among private insurers and the government. The Japanese government subsidizes the private insurance companies through a reinsurance scheme (Figure 3).



Source: Fan, Gu and Ni (2011)

Figure 3. Liability-sharing scheme between the government and private insurers in Japanese earthquake insurance

In these collaborative insurance systems, the primary role of government is to act as a backup to private insurers and therefore boost their willingness to offer insurance. Government may also mandate insurance as a solution to low demand of natural disaster insurance.

On the other hand, the involvement of insurance companies in the natural disaster insurance system has the following strengths: First, insurance companies could act as system operators because of their trained personnel, technical expertise and rich experience in insurance policy development, marketing, damage assessment, and claim processing. Second they can offer customized insurance policies to customers with different needs. Third their expertise in risk assessment allows them to offer risk-based premiums. These risk-based premiums give homeowners an estimate of the hazards they face and encourage them to engage in cost-effective mitigation measures to reduce their vulnerability to catastrophes.

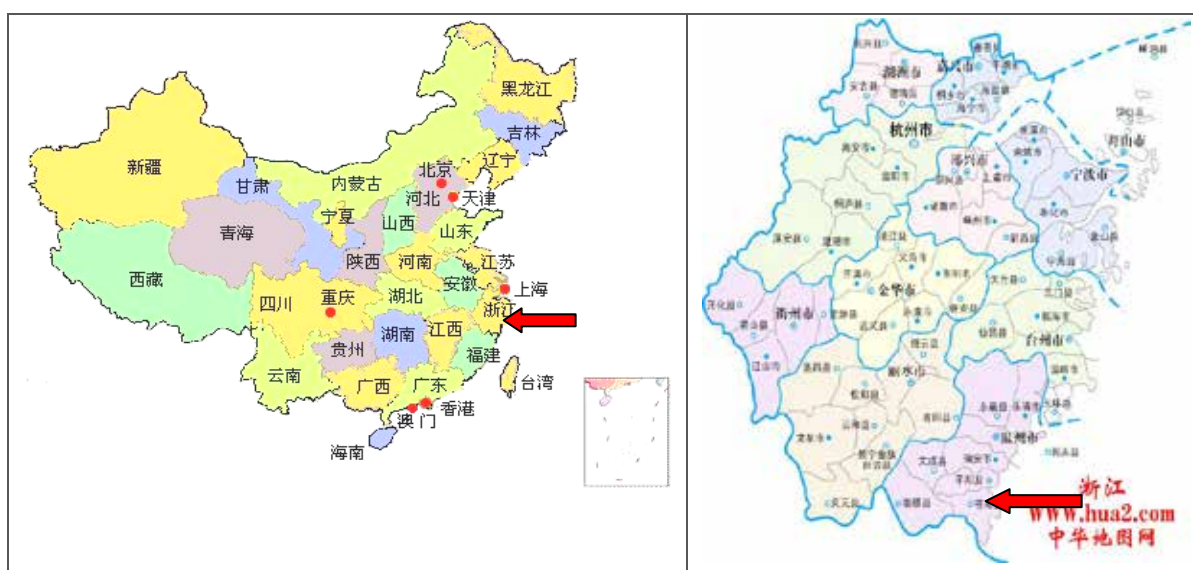
Kunrether and Michel-Kerjan (2009) emphasized “premiums reflecting risk” as the very first principle when constructing natural disaster insurance system¹. With risk-based pricing, risk-reducing efforts would be rewarded with premium discount, which would further create financial incentives for homeowners to adopt risk mitigation measures, such as building new houses in low-hazard zones; building with concrete and steel structures; bracing roof trusses; and installing straps or clips where the roof decking and roof supports meet in hurricane-prone area (Mills 2007). Yin, Kunreuther and White (2011) have shown empirical evidence that risk-based pricing does motivate more risk-reduction behaviors and therefore significantly lower risk.

¹ A major concern with risk-based premiums is the very high premiums for low income families with low-quality houses in high-hazard zones. Cases like these warrant government financial assistance. However, as Kunrether and Michel-Kerjan (2009) noted, financial assistance to low-income families should be given in a form of voucher instead of direct premium subsidy. Low-income families would still pay a premium reflecting the risk, and then be reimbursed an amount determined by their income and the insurance premium they are charged. The purpose is to preserve the function of premium as a signal of vulnerability to natural disaster and therefore the potential benefit of insurance in encouraging risk-reduction efforts. The amount of reimbursement will be reduced over time as low-income homeowners adjusted to the high premium.

3.0 PUBLIC APPROACHES FOR NATURAL DISASTER RECOVERY IN CHINA

The basis for this part came from three sources:

- FGDs with government officials directly involved in disaster response and recovery. The FGDs included representatives from local government units responsible for disaster relief and recovery, representatives from local non-profit organizations devoted to disaster relief and scholars involved in the process of developing and evaluating the public insurance system in Zhejiang province.
- A review of national, provincial and local policies, and related statistics.
- A field study in Cangnan County, Zhejiang Province (Figure 4).



Note: The arrow on the left indicates the location of Zhejiang province in China, while the arrow on the right indicates the location of Cangnan County in Zhejiang province.

Figure 4. Field study site: Cangnan County

Cangnan County was selected research site because it greatly suffered from typhoon ² in the last few years. From 2005 to 2009, ten typhoons struck Cangnan County, resulting with CNY 15.9 billion economic losses. Cangnan County has 1.28 million people and its GDP amounts to CNY 21.93 billion at the end of 2009. The GDP per capita is about CNY 17,133, slightly below the national GDP per capita which is around CNY 22,640.

3.1 Public Financial Assistance for Disaster Recovery

At present, government is the main source of financial assistance for victims of natural disasters. Financial assistance is often provided in the form of direct subsidies and low interest loans.

Direct subsidies given to victims whose dwellings are damaged aim to provide basic housing to victims who are not able to recover on their own. Local governments decide the amount of subsidy to be allocated. As of 2010, an average household in Cangnan County can receive a subsidy ranging from CNY 3,000-15,000 if the following conditions are met: (1) their home has collapsed, (2) their home was built legally and (3) they do not have financial resources to rebuild. The maximum level of subsidy, CNY 15,000, is sufficient to build a house with an area of 40 square meters. Households with damaged homes and no finances for repairs may receive a subsidy ranging from CNY 800-3,000.

² Having an average wind speed of 32.7m per second and above.

Low-interest loans, on the other hand, are only available for low-income households who wish to repair or rebuild their damaged dwellings. In Cangnan, government pays 50% of the interest for a loan up to CNY 20,000. In 2008, 487 eligible households borrowed CNY 9 million for repairing or rebuilding their dwellings, for which Cangnan County provided loan interest subsidy of CNY 613,680. Financial assistance through public channels has its weaknesses and strengths.

3.1.1 Limitations of a Disaster Recovery Fund

Data gathered from FGDs suggest that two challenges are evident for the approach of using public funds to achieve disaster recovery.

Public financial assistance for disaster recovery is insufficient.

It is clear from Table 2 that public disaster relief funding from all levels of government can only cover less than 3% of total economic losses in China (Table 2). In addition to this, government often prioritizes events with large-scale impacts and political importance. For climate events that do not catch public attention, public financial assistance from governments is lower.

Table 2. Government disaster relief expenses and economic losses from natural disasters in China

Year	Disaster relief (in billion CNY)	Economic losses from natural disasters (in billion CNY)	Disaster relief/ economic losses (%)
1990	1.33	61.6	2.16%
1991	2.09	121.5	1.72%
1992	1.13	85.4	1.32%
1993	1.49	99.3	1.50%
1994	1.80	187.6	0.96%
1995	2.35	186.3	1.26%
1996	3.08	288.2	1.07%
1997	2.87	197.5	1.45%
1998	4.12	300.7	1.37%
1999	3.56	196.2	1.81%
2000	4.75	204.5	2.32%
2001	4.10	194.2	2.11%
2002	5.55	171.7	3.23%
2003	5.29	188.4	2.81%
2004	4.00	160.2	2.50%
2005	4.31	204.2	2.11%
2006	4.94	252.8	1.95%
2007	6.56	236.3	2.78%
2008	30.38	1175.24	2.59%
2009	14.04	252.37	5.56%

Source: Ministry of Civil Affairs (2012).

Table 3 shows that disaster relief funding from government in Cangnan County covers less than 1% of total economic losses. This also applies to residential property losses. The 2009 typhoon Morakot led to residential property losses of CNY 166.39 million, while the government fund that was allocated to help victims rebuild or repair their dwellings only amounted to CNY 1.8 million, which is 1% of the total residential property loss.

Table 3. Government disaster relief expenses and economic losses from natural disasters in Cangnan County

	Economic losses from natural disaster (in million CNY)	Government disaster relief (in million CNY)	Disaster relief/ economic losses (%)
2005	2294	9.88	0.430689
2006	9124	97.59	1.069639
2007	1746	14.98	0.857961
2008	198.87	1.92	0.964147
2009	1282	1.3	0.101404

Source: Bureau of Civil Affairs, Cangnan County, Zhejiang Province

Table 4 shows the number of households whose dwellings collapsed or were damaged, and how many of them received government subsidy. It is clear that the entire CNY 1.8 million government subsidy went to households whose dwellings completely collapsed. Households with damaged dwellings received no funding and therefore had to bear all the losses on their own. Low-income families with collapsed dwellings were prioritized. All low-income households, except one, received government subsidy. About 31% of higher-income families with collapsed dwellings did not receive subsidies because they either had other places to live or were seen as wealthy enough to rebuild.

Table 4. Households with collapsed or damaged dwellings

		Number of households	Number of households that receive subsidy
Households with damaged dwellings		172	
Households with seriously damaged dwellings		117	
Households with collapsed dwellings	<i>Low income</i>	6	5
	<i>Others</i>	68	47

Source: Bureau of Civil Affairs, Cangnan County, Zhejiang Province

The practice in Cangnan County is a reflection of China's disaster relief philosophy – ensuring basic needs of disaster victims as stated in the 1999 *“Further Notice on the Use of Disaster Relief Fund”* published by the Ministry of Finance and Ministry of Civil Affairs (the 1999 Notice hereafter). Households that are viewed to have sufficient capacity for self-recovery are expected to bear all costs from natural disasters. In the survey conducted for this research, interviewees were asked: *“If your house is destroyed or seriously damaged in a typhoon, from whom do you think you will obtain funding for rebuilding or repairing your house?”* Majority (97%) said that they would primarily rely on their personal savings or borrow from relatives and friends.

Ensuring equity is difficult when a public approach of providing financial assistance for disaster recovery is used.

Although the 1999 notice clearly stated that disaster relief fund should not be equally allocated, equity or fairness is often a challenge in the use of public disaster relief fund. Even the terms “equity” and “fairness” are often unclear. During interviews with local residents and discussions with government officials in Cangnan County, questions on “fairness” and “equity” were frequently raised. (e.g., *“Is it fair to provide the same amount of assistance to a person whose three-stories house is blown away and a person whose house only lost one floor?”*; *“Is it fair to provide the same amount of assistance to low-income family and high-income family?”*)

After the 2008 Wenchuan earthquake, a local government tried to implement a “fair” subsidization system, in which government provided a 70-square meter apartment to all residents, regardless of the size and location of their original residence. This plan met fierce opposition from local residents and eventually failed (Feng 2008).

3.1.2 Advantages of a Disaster Recovery Fund

Public financial assistance for disaster recovery can be prioritized for low-income families and those who need financial help the most.

In the private insurance market, insurers charge premiums for coverage sold. Low-income families with high risk often cannot afford premiums and as a result cannot obtain payment from insurers for recovery. As public financial assistance is need-based, it can be used to help low-income families. This is what is emphasized in the 1999 notice and has been faithfully implemented through local governments.

It can be used as leverage to motivate risk-reduction efforts.

In Cangnan County and many other areas, public financial assistance is often used as a tool to enforce building code. After typhoon Sangmei almost wiped out 5% of the dwellings in Cangnan in 2006, Cangnan County established a system that rewards households who built typhoon-resistant structures. In 2006, households with newly-built dwellings that met all government building codes could receive CNY 1,500 from government. Over the years, this incentive has significantly increased and has been geared toward low-income families. In 2010, this incentive was raised to about CNY 22,000 for low-income families and CNY 11,000 for other families. This system provides incentive for residents to integrate mitigation into recovery efforts which should further reduce future risk of loss³.

3.2 Public Insurance

Since 2006, Zhejiang province has been implementing a public insurance system⁴. Some key features of this system are as follows:

- The system is operated by the Zhejiang Branch of People's Insurance Company of China Property and Casualty Company Limited (PICC P&C). PICC P&C is a leading P&C insurance company that provides a broad range of P&C insurance products for a wide variety of customers throughout China.
- The whole province is divided into two hazard zones: Tier 1 high-hazard zone, and Tier 2 low-hazard zone.
- Only rural residents are eligible to purchase this insurance product.
- The premium is heavily subsidized. For Tier 1 high-hazard zone, the premium is CNY 15 per year per family, with individual households paying CNY 5, provincial government paying CNY 4 and city and county government paying CNY 6. For Tier 2 low-hazard zone, the premium is CNY 10 per year per household, with individual households paying CNY 3, provincial government paying CNY 3 and city and county government paying CNY 4. Low-income households can participate in the insurance program at no cost. All premiums are paid by governments.
- The level of damage is classified into three types, level III being the most serious. The coverage is CNY 1,000 per room for level I damage, CNY 2,000 per room for level II damage and CNY 3,600 per room for level III damage. The maximum coverage is CNY 18,000 per family.
- The operation fee of PICC P&C is regulated. PICC P&C is allowed to keep 20% of the collected premium to pay for its operation expenses.

³ However, this use of public fund often conflicts with the goal of providing help to low-income families who are in need expeditiously. Low-income families who suffer a loss in an extreme climate event have difficulties in meeting all building codes in reconstruction and therefore are not able to obtain financial assistance.

It is worth noting that in extreme climate events such as typhoons, it is the low-income families who are most likely to suffer a great loss. In the 2009 typhoon Morakot, 95 families lost their houses and 42% of them were low-income families.

⁴ Fujian, its neighboring province, also suffers greatly from extreme climate events such as typhoons and has implemented a similar system.

This insurance system is designed as a government and business collaboration. First, government develops the system and regulates how the system works. For example, it sets up the level of premium, coverage as well as operation fee. Second, government boosts up the demand through heavy subsidy and other policy tools. For example, households who choose to participate will enjoy priority in obtaining public disaster relief provided by governments in addition to receiving insurance payment from PPIC P&C. Because of this and the fact that about two-thirds of the premium is paid by government, almost all households choose to participate although the participation is voluntary. According to Zheng (2009), about 10 million rural households participate in the public insurance system in Zhejiang Province by the end of June, 2008, raising the penetration rate to 98.61%.

The government collaborates with PPIC P&C because it does not have the personnel and expertise to implement the system. As a company that specializes in providing property insurance, PPIC P&C has rich experiences in loss assessment, claim processing and so on. In return, government has designated PPIC P&C as the sole company that can operate the public insurance system. Zheng (2009) reported the simple payout rate for the public insurance program is about 76.56% in 2007.

When considering whether such a public insurance is an adequate or effective mechanism for disaster recovery, several points should be highlighted. First, this type of insurance is only available to rural residents. When it is available, the maximum payment is only about CNY 18,000, which is only sufficient to build a dwelling of 50m². The purpose of this insurance system is to ensure that the victims' basic living needs are met, instead of to help victims go back to the life they used to have. This is again consistent with the spirit of the 1999 notice. Second, the premium is heavily subsidized. Almost two-thirds of the premium is paid using public funds. Low-income families can join the system at no cost. In some areas, premiums are not actually paid by individual families but by collective enterprises (Zheng 2009). Third, the premium is not related to risk. Premiums are different for each of the two hazard zones. But within each of the hazard zones, premium does not change according to building structure, material and risk mitigation measures in place.

When premiums are subsidized and not based on a risk-based pricing mechanism, two negative impacts may occur:

- When premiums are subsidized, there is no space for private insurance. Yin, Pfaff and Kunreuther (2011) documented the fact that private insurance for Underground Storage Tank (UST) cannot be sustained when states have a UST state fund program (which is a public insurance program) to pay for cleanup costs and third party compensations in case of a release.
- When premiums are not related to risk, people may take less care than they should and therefore become more vulnerable. Premiums are supposed to be a price signal that reflects the risk. Under a public insurance system, subsidy is given in a form of direct premium discount, which may send a signal that the risk is low, which may lower people's incentives to reduce risk (Kunreuther and Michel-Kerjan 2009). In addition to this, people would be less motivated to take risk mitigation measures since these efforts would not be rewarded with a decrease in the cost of premiums. Yin, Kunreuther and White (2011) found that the existence of a UST state fund program that charges participants with a flat rate leads UST owners to take less care in their operation, compared to private insurance that charges risk-based premiums.

3.3 Implication for Private Insurance Market

Regardless of the type of public financial assistance or public insurance, the usefulness of public approach is limited by the availability of public financial resources. The use of public funding largely follows the spirit described in the 1999 notice, that is, to ensure the basic need of victims who are not able to recover on their own. When public assistance is available, the assistance is only enough to ensure basic housing needs.

This observation has important implications for the private insurance market. The limitations of the public approach leave a space for private insurance. In the following section, we are turning to private insurance. Our key pursuits include 1) whether private insurance providers are willing to provide insurance policy against natural disaster and the reasons if not; 2) whether consumers are willing to buy insurance coverage against natural disaster and the reasons if not.

4.0 PRIVATE NATURAL DISASTER INSURANCE IN CHINA: SUPPLY SIDE ANALYSIS

At present, private insurance policy against extreme climate events exists in China. It is not a separate type of insurance, but is included in comprehensive residential property insurance. This type of insurance requires insurers to pay the insured for damages caused by extreme climate events.

However, interviews with private insurers suggest that they are often reluctant, and may even refuse, to provide such coverage. Discussions with private insurers, including representatives from TaiPing Property Insurance Company and People's Insurance Company of China Property and Casualty Company Limited (PICC P&C), and extensive literature review suggest that the following reasons are important.

4.1 Institutional Barriers

A number of institutional reasons that make insurers feel residential property damages uninsurable:

Existing comprehensive residential property insurance covers many kinds of residential property damages.

It is not specifically designed for damages caused by natural disaster. Private insurers view some damages are difficult, if not impossible, to insure against. For example, in suburban areas, it is difficult to insure against damages associated with lightning strike. It is very hard to tell whether an electronic device (e.g.: a computer) was damaged because of a lightning strike or careless use of power. This is a typical moral hazard issue (insurability condition 2). In urban areas, the primary uninsurable factor is water pipe burst. Insurers have a deep concern over the quality of residential apartments that were built in the last two decades. Once water pipe is burst, the damage would be high and hard to estimate. The uncertainty associated with the risk and damages caused by water pipe burst make insurers reluctant to provide residential property insurance in urban areas (insurability condition 1). It is worth noting that a natural disaster itself is not viewed as a risk that is fundamentally uninsurable. It is other factors within comprehensive residential property insurance that make insurers reluctant to provide coverage. This suggests that it might be a good idea to provide a separate and independent category of insurance – natural disaster insurance.

Existing accounting and taxation laws prevent establishment of a capital pool for natural disaster losses.

There are two key features of natural disaster losses. First, its occurrence has a very small probability but the losses are gigantic. Second, losses among individual households are highly correlated. In one disastrous event, many households will suffer great losses. This means that natural disaster insurance has to be designed as a mechanism that spreads the losses not only across space, but more importantly, over time. For the second purpose, insurance company needs to establish a capital pool that is reserved for natural disasters.

With existing accounting regulations and taxation policies, private insurance companies have no incentive to create such a capital pool. First, private insurance companies are prohibited from setting aside funds for losses that have not occurred before taxation. Second, if a company wants to set aside a certain amount of money for future losses, it has to draw the amount from its after-tax income. In theory, capital reserve for future losses should be included as a cost, and therefore should be deducted from taxable revenues. Existing regulations make this impossible and therefore provide little incentive for private insurers to establish such a capital pool (Chen 2010).

4.2 Barriers from the Demand Side

Two barriers from the demand side make private insurance companies reluctant to offer insurance coverage against natural disasters.

First, the demand for natural disaster insurance appears to be low, as consumers have no interest in buying natural disaster insurance. With a low demand, private insurance companies have to charge a higher fee to cover its operation costs, which in turn further dampens the demand. This is exactly what Freeman and Kunreuther (1997) have highlighted in marketability condition. Section 5.4 provides an in-depth analysis of why consumers do not want to buy natural disaster insurance.

One example highlights the struggles private insurance companies face due to low demand. As a form of mandatory insurance, households may be required to purchase residential property insurance when applying for mortgage loan. Such a requirement exists in China. If one borrows from banks when buying a house, one is often required by banks to buy insurance against incidents that could cause the loss of the dwelling including natural disasters. However, private insurers have no interest in marketing this type of coverage, mainly because it is common for homeowners to terminate their insurance policies as soon as they have paid off their mortgages. Normally, the premium is paid over a period of time while banks often collect a lump-sum commission when selling the insurance policy. When the insured cease the insurance policy before the commission is collected, this means a pure loss to insurance company. This behavior suggests that consumers have low interest in buying insurance to protect private property, further reducing insurers' inclination to offer such coverage.

The second barrier is selected demand, or the problem of adverse selection. This means that people interested in buying insurance to protect private property tend to be those with high risk. Such an information asymmetry presents a violation to insurability condition 2 and prevents private insurers from offering natural disaster insurance. In practice, insurers often refuse to sell such policies to individual households and only provide such coverage when a residential community collectively buys comprehensive residential property insurance. When adverse selection is very serious, one solution is to make the purchase of natural disaster insurance mandatory, as in the cases of the U.S. National Flood Insurance Program and the Turkish Catastrophe Insurance Pool.

4.3 The Nature of Natural Disaster

Although the nature of natural disasters was not emphasized in the interviews with private insurance companies, this has been widely discussed in literature as a challenge to the establishment of a natural disaster insurance system. Natural disasters are hard to predict and when they occur, the extent of damage is highly uncertain and losses among different household units are correlated. As discussed in section 2, these conditions cause insurers to ask for a high premium, which may lead the insurance market to fail.

Today, extreme climate events (both the probability that it occurs and the losses that it causes) have become more unpredictable because of climate change. This may have a further chilling effect on the supply of insurance as it presents a violation to insurability condition 1. For example, after Hurricane Katrina, in February 2007, State Farm, the largest homeowner insurer in Mississippi, stopped selling new policies on homes and small businesses there. Allstate, another giant residential insurance provider, announced it would restrict new homeowners' policies in New Jersey, Connecticut, Delaware and New York City, refusing to write policies in areas subject to hurricanes (Jaffee, Kunreuther, and Kerjan 2008b). This suggests that a more innovative approach is needed to sustain insurance mechanisms so that people at risk are appropriately protected.

5.0 PRIVATE NATURAL DISASTER INSURANCE IN CHINA: DEMAND SIDE ANALYSIS

This section discusses consumers' choice of natural disaster insurance and how this choice varies with the design of insurance. The approach of choice experiment is used.

5.1 Research Site and Sampling

Cangnan County in Zhejiang Province was selected as the site for this research because it is frequently hit by typhoons. From 2005 to 2009 an average of two major typhoons struck Cangnan County every year. In 2006, Typhoon SangMei wiped out 5% of all dwellings in Cangnan. The most recent typhoon, Typhoon Morakot, flooded the county again in 2009, causing CNY 16 billion direct economic losses.

This study focuses on Lingxi Town in Cangnan County for two reasons. First, FGDs indicate that Lingxi has characteristics representative of the whole county. Second, Lingxi is the most accessible town in Cangnan County. Conducting interviews in other towns would have been both expensive and time-consuming.

Two-stage cluster sampling was used to select the sample for this research, as it is more feasible and cost-effective than selecting a random sample of the whole population. The two-stage cluster sampling was conducted as follows: First, a list of all 136 residential committees in Lingxi Town, Cangnan County, was obtained from the Bureau of Civil Affairs. Using random sampling procedure in STATA, 50 residential committees⁵ were randomly selected. Next, ten households were selected from each residential committee. The interviewers were instructed to walk around the neighborhood, identify the major dwelling types (based on the quality of the dwellings) and then select ten households proportionately from each type of dwelling.

Although the sampling procedure used in this study was not a random sampling procedure in a strictly statistical sense, it was the most feasible approach for this research. In the pilot test, it was found that the most local residential committees refused to provide a full list of households in its jurisdiction, making random sampling impossible.

As the penetration rate for property insurance is around 1% in China, the researcher felt that most interviewees might not be familiar with how insurance works. To cope with this, the research team used face-to-face interviews to allow the interviewers to ask more complex questions and solicit more information, and clarify questions depending on interviewees' familiarity with insurance.

Interviewers were hired through a local nonprofit organization called "*1+1 emergency response center*". In the pilot test, the research team hired undergraduate and graduate students from Shanghai University of Finance and Economics as interviewers. One challenge was the interviewers' limited understanding of local dialects. Most interviewees could not speak standard Mandarin. Eventually, the research team sought help from local volunteers and hired them as interviewers instead. Interviewers were trained to use the research instrument to ensure that they had a good understanding of the questionnaire.

In addition to questions related to interviewees' dwellings (including types of dwelling, area of dwellings, time of moving in, access to other disaster relief and so on) and demographic information such as experience with insurance, income, gender and so on, survey questions were developed to achieve the following two key tasks: soliciting interviewees' perception of risk that his/her dwellings is destroyed or seriously damaged by a typhoon, and his/her willingness-to-pay (WTP) for natural disaster insurance.

⁵ As the extension of the formal hierarchical administrative system in China, residential committee (RC) is the governance entity that is closest to urban residents. RCs' responsibilities include publicizing the constitution, laws and government policies; mediating civil disputes; helping maintain social order and security; assisting local governments in implementing policies of public sanitation, birth control, social welfare and youth education; and providing community services to residents.

5.2 Survey Questions for Risk Perception

Survey questions were designed to investigate respondents' perception of natural disaster risks. Both central tendencies and uncertainties of the perceptions are examined. This is important because: a) perception of risk is an important determinant for people's choice of insurance; and b) low perceived risk might be one of the reasons that lead to failure of insurance market.

The design of this part is modeled after RFF's series of studies on WTP for Mortality Risk Reductions (Alberini et al. 2006; Krupnick 2007). The survey started with exercises in interpreting probabilities and then presented questions to test interviewee's understanding of risk and probability. After the interviewees gained a reasonable understanding of risk and probability, they were asked the risk perception questions to determine the central tendencies and uncertainties of perception, respectively. The survey process and questionnaire is presented in the Appendix.

5.3 Survey Questions for Willingness to Pay

A choice experiment approach was used to determine potential victims' choice of insurance and examine how the choice varies with various attributes of insurance policy. Choice experiment approach⁶ was initially reported by the marketing and transport literature (Louviere and Woodworth 1983; Louviere 1988; Louviere 1992), and then applied to environmental studies (Hanley et al. 1998; Hanley, Wright, and Adamowicz 1998; Adamowicz, Louviere, and Williams 1994; Adamowicz et al. 1998; Boxall et al. 1996). Louviere and Timmermans (1990) outlined eight key steps in Choice Experiment Analysis:

- Identification of salient attributes;
- Specification of attribute levels;
- Selection of an appropriate method for combining attribute levels into descriptions of choice alternatives
- Choice of an experimental design to place the choice alternatives into sets in which stated preference or choice responses are observed
- Choice of a good (meaning realistic and within the limits of human processing capabilities) way to present the choice alternatives to individuals so that one can observe their stated preferences or choices
- Choice of a procedure to measure individuals' stated preferences or choices for a particular problem context
- Choice of method for estimating utility functions;
- Choice of an approach to map utilities into overt choices.

We first used the following attributes and their associated levels to define insurance policies: Coverage (CNY 30,000, CNY 60,000, CNY 100,000, CNY 150,000); Deductible (CNY 3,000, CNY 5,000, CNY 8,000); Contract term (one year, three years, five years); Service provider (Government-run nonprofit insurance entity; Top-ten private insurance companies; Other private insurance companies); Time required for processing claim (one month; three months); and Premium (determined by the coverage and rate ratio 1%; 1.2%; 1.4%; 1.6%; 1.8%; and 2%).

Choice experiments using these attributes and its associated levels were designed, and a pilot test was conducted in July 2010. Based on comments from researchers with experience using stated preference methods and results from the pilot test, the choice experiment was further refined.

In the final choice experiment, the following attributes were used:

1. **Service provider.** It was evident from the FGD, and was later confirmed in the pilot study, that the Chinese have a deep distrust in the insurance company. It was suggested that people may exhibit a different level of trust to different service providers (i.e.: government insurance;

⁶ It is also called choice-based conjoint analysis, choice modeling or stated choice method (Aizaki and Nishimura 2008).

commercial insurance companies backed by government; large-scale commercial insurance companies; and small-scale commercial insurance companies.) The performance of Chinese government in several major natural disasters including WenChuan earthquake and YuShu earthquake has led people to believe that government is a reliable source of help in major natural disasters.

2. **Term of insurance contract.** The inclusion of this attribute is a response to the new surge of interest in long term insurance (Kunreuther and Michel-Kerjan 2010). Theoretically, it can be argued that long-term insurance contracts can be coupled with long-term home improvement loans that would give homeowners incentives to adopt cost-effective mitigation measures and provide them with stable financial protection over time. In spite of its theoretical strengths, it is not clear how consumers would respond to long-term insurance: whether people prefer long-term insurance over short-term insurance or vice versa (Klimaszewski-Blettner, Kunreuther, and Michel-Kerjan 2010). On one hand, consumers may prefer the stability long-term insurance offers: insurers cannot rescind the policy at free will and premiums will stay unchanged over the contract period. On the other hand, consumers may value the option of reconsidering whether to continue buying insurance next year. In China, according to the regulations, residential property insurance can be offered at one year, three-year and five-year terms. These three levels were used in the analysis of this research.
3. **Deductibles.** Deductibles are the amount of expenses that must be paid out of one's pocket before an insurer will cover any expenses. It is set at three levels: CNY 3,000, CNY 5,000 and CNY 8,000.
4. **Premium.** Premium is the price one pays each year for having insurance policy. Since premium hinges upon coverage, this study uses another attribute that is widely used by private insurers to determine premium - the ratio of premium over coverage. In China, this ratio is determined more through experience than actuarial evaluation. Private insurers suggest that in regions like Cangnan County, 2% is reasonable for sustaining an insurance policy against natural disaster. Currently, the public insurance system uses a ratio that is around 0.83%, out of which only about one third (0.28%), is paid by individuals out of their own pockets. At this ratio, it has been reported that the penetration rate has reached 98.61% (Zheng 2009). Given these considerations, this study uses 0.2%; 0.6%; 1%; 1.4%; 1.8%; and 2.2% as the levels of the ratio of premium over coverage.

With these attributes and their associated levels, the procedure introduced in Kuhfeld (2010) was used to construct the choice sets used in this study. The Macro %*mktruns* suggests that a 100% Efficient Design can be made with the Mktex Macro at a size of 144. This study used %*mkttex* to create 144 choice sets. Each choice set includes two alternative insurance policies and plus an option of “do not buy the listed two insurance policies” (see Table 5 for one example).

Table 5. Example of choice set

Attributes	Do not buy the listed two insurance policies	Insurance policy I	Insurance policy II
Service Provider	-----	Top-Ten Commercial Insurance Company	Commercial Insurance Company backed up by Government
Term of Contract	-----	5 years	1 years
Deductible	-----	CNY 8,000	CNY 8,000
Premium	0	CNY 6 /year for every CNY 10,000 coverage	CNY 2/year for every CNY 10,000 coverage
Your Choice			

5.4 Findings

The survey was launched at the end of March 2011. As of the end of May 2011, 341 valid questionnaires were accomplished, a success rate of more than 68%. This success rate is comparable to other similar surveys in China. Each interviewee was asked four sets of choice questions.

About 61% of the interviewees are male (Table 6). Since the survey was primarily conducted in rural areas, the respondents generally did not have a high level of education. Only about 7.9% of the respondents received education from a college or a higher educational institution. Distribution of income was included in Table 6. The majority of households have an annual income ranging from CNY 10,000 to CNY 70,000. About 9% of the respondents reported an annual household income below CNY 10,000, while 5% above CNY 120,000. It is worth noting that 37.65% of the interviewees reported that they had never bought any type of insurance. Most of those who have insurance experience bought medical insurance or automobile insurance. Only 14 households reported that they had bought residential property insurance before.

Table 6. Socio-demographic information

Education	
Elementary School and Below	30.26%
Middle School	33.55%
High School	28.29%
Professional College	6.58%
University and Above	1.32%
Gender	
Male	61.23%
Female	38.77%
Age	
Mean	35
Median	35
Standard Deviation	14
Annual Income	
Below CNY 10,000	8.93%
CNY 10,000-30,000	33.04%
CNY 30,000-50,000	24.55%
CNY 50,000-70,000	15.18%
CNY 70,000-90,000	8.04%
CNY 90,000-120,000	5.36%
CNY 120,000-150,000	0.89%
More than CNY 150,000	4.02%
Insurance Experience	
Yes	62.35%
No	37.65%

5.4.1 Low Demand for Insurance

The first unexpected but interesting finding was that about 44% of the interviewees refused to even consider buying natural disaster insurance, no matter how the insurance policy is structured.

After making a brief introduction to how natural disaster/typhoon insurance works, the interviewers asked the interviewees the following question: *“Based on this introduction of insurance and your knowledge/experience with insurance, would you consider purchasing typhoon insurance to protect you from property losses resulting from typhoon?”*

About 44% of the interviewees said that they would not consider purchasing insurance in any event (Figure 5). This suggests that nearly half of interviewees would not consider natural disaster insurance no matter how it is constructed.

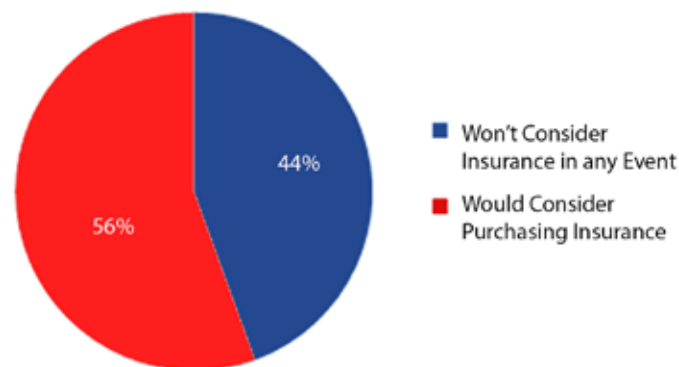


Figure 5. Refusal to purchase insurance

Interviewees who chose the answer of “No, I won’t consider purchasing insurance in any event” were asked the follow-up question below to determine their reasons for not wanting to buy insurance.

What is the major reason for you not to purchase insurance?

- a) I do not think my dwelling will be damaged by a typhoon;
- b) Our budget is already tight. I cannot afford typhoon insurance;
- c) I do not believe in insurance at all, and will not buy any insurance policy.
- d) Government will provide financial assistance following a disaster anyway;
- e) I have other ways to cover losses or damage to my dwelling.
- f) Others (Please Specify) _____

As demonstrated in Figure 6, the leading reason for not purchasing insurance is that people do not feel that their house would be destroyed or seriously damaged in a typhoon. This is consistent with Kunreuther and Pauly’s (2004) observation that the mentality of “low probability” or “*this will never happen to me*” is a major reason for low demand for natural disaster insurance. Another major reason for refusal to insurance is that people consider natural disaster insurance to be a discretionary expense that should only be incurred if they have residual money after taking care of necessities of life, as suggested by Kunreuther and Roth (1998).

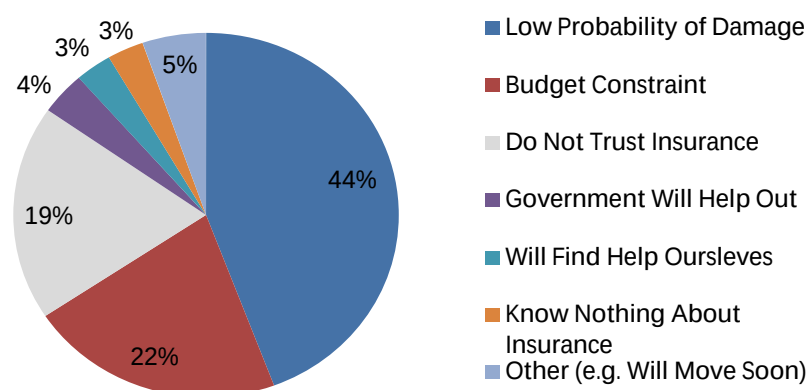


Figure 6. Reasons for not purchasing insurance

A third leading reason for refusal of insurance is that 19% of the interviewees indicated that they do not believe in insurance at all. Interviews suggest that the malpractice of insurance industry has resulted with hostile mentality against insurance among general consumers. During the conduct of this research, some interviewers felt hostility from respondents. Some respondents mistakenly thought that the research team members were insurance agents, and tried to kick them out of their houses. One respondent complained that insurance is all about *“friend cheating friend, relative cheating relative”*.

The following quotes illustrate this sentiment among respondents:

I am not going to buy any insurance policy. A couple of years ago, I bought agricultural insurance, which is supposed to provide coverage on my crops. After a typhoon, I made a claim. But the insurance company refuses to give me any money. They said that I made some mistakes in filling out the application form. I still do not understand what mistakes I had made, but I do know that all farmers in my neighborhood did not get any payment from the insurance company.

I have a friend who used to be a construction worker and participated in the construction of the subway system in Hangzhou. He was injured in an accident. After the accident, he had a very difficult and struggling time in obtaining payment from insurance company although he does have insurance coverage.

A logistic analysis was conducted to determine which factors predict respondents' decision on whether or not to purchase insurance (Table 7). The dependent variable is a dichotomous variable which is equal to 1 if the respondent said that *“Yes. I may consider purchasing insurance”* and 0 if the respondent said that *“No. I won't consider purchasing insurance in any event”*. The explanatory variables include the following:

- **Experience with Insurance:** This is a dummy variable which is equal to 1 if a respondent has purchased any kind of insurance. In our sample, about 62% of the respondents have such experiences. The most popular commercial insurance is auto and life insurance.
- **Risk Perception:** This is a categorical variable that is created based on a respondent's estimate of the chance that his/her house would be seriously damaged by a typhoon in the next ten years. An estimate that is above 10% inclusively is interpreted that the interviewee views the chance of damage as high. An estimate that is below 1% inclusively is interpreted that the interviewee views the chance of damage as low. The estimate that falls in between is interpreted as medium.
- **Catastrophic Experience:** This variable is a dummy variable which is equal to 1 if an interviewee indicated that their dwellings were destroyed or seriously damaged in a typhoon in the last five years and 0 otherwise.
- **Information Provision:** This is a dummy variable which is equal to 1 if questionnaire B is used and 0 if questionnaire A. As shown in the Appendix, in questionnaire B, each respondent will be presented with some historical information about typhoon before they make responses to questions related to insurance purchase.
- **Gender** is included as a control variable. Gender is a dummy variable with 1 indicating female and 0 for male.
- **Education and age** are continuous variables. They are included in the regression analyses as control variables.
- **Probability Knowledge** is a dummy variable which is equal to 1 if the interviewee answers the probability test question correctly at the first time of being asked of the question and 0 otherwise.

Table 7. Logistic analysis of respondents' willingness to consider insurance

Variables	Insurance Decision
Perceived Medium Risk	0.40
	(0.85)
Perceived High Risk	0.63
	(1.79) †
Catastrophic Experience	0.49
	(1.15)
Insurance Experience	0.62
	(1.84) †
Information Provision	0.06
	(0.20)
Education	0.18
	(0.97)
Gender	0.10
	(0.32)
Age	-0.03
	(2.12)*
Probability Knowledge	-0.73
	(1.25)
Constant	-0.60
	(0.56)
Observations	194
Absolute value of z statistics in parentheses	
** significant at 1%; * significant at 5%; † significant at 10%	

The most interesting finding is that people who have “*experience with insurance*” are significantly more likely to purchase insurance. In the early development of China’s insurance market, malpractice was indeed a very common phenomenon. However, over the last three decades, this insurance market has become more and more disciplined. People who have personal experiences with insurance do not feel resistant to this financial instrument.

Figure 6 indicates that even if it is not listed by the researcher as a reason for “*won’t consider purchasing insurance in any event*”, “*I know nothing about insurance*” is indicated by 3% of the interviewees to be the major reason for not considering insurance. This suggests that as people become more familiar with the concept of insurance and gain more personal experience, they may be more open to natural disaster insurance. So the question is that how this process can be speeded up.

As expected, people who feel that there is a high likelihood that their houses would be seriously damaged by a typhoon in the next ten years are more likely to purchase insurance. This suggests that adverse selection might be a concern in developing this particular type of insurance market. The coefficient for “Information Provision” is not significantly different from zero. This suggests that reminding the respondents that their county has a history of being hit by typhoons does not have a significant impact on their decision to purchase natural disaster insurance. This may be due to the fact that people have a fairly accurate perception about the frequency of typhoon in their county as discussed below.

When it comes to control variables, the only one that demonstrates significant explanatory power is age. It has a negative coefficient, which shows that younger respondents are more likely to accept the idea of insurance.

5.4.2 Risk Perception

When it comes to risk perception, two features stand out. First, people are generally optimistic. Overall, interviewees' perception about the number of typhoon occurred each year in Cangnan County is fairly consistent with the historical record (that is, two typhoons each year in the last five years.) Figure 7 shows that 59% of the respondents indicated that the frequency of typhoons in Cangnan County would be twice a year or more, and 86% of them indicated that it would be once a year or more.

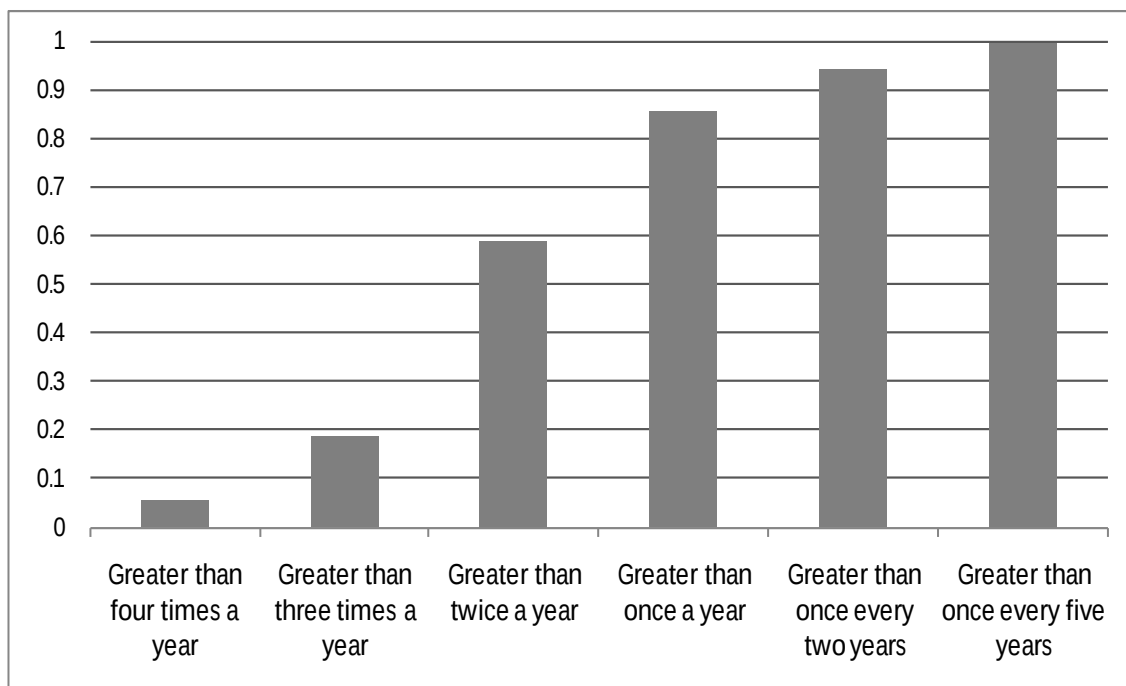


Figure 7. Perceived frequency of future typhoons

It is interesting to note that although respondents knew that typhoon frequently hit Cangnan County, a significant number did not believe that their houses would be damaged. Figure 8 shows that 53% of the interviewees indicated that the likelihood that their houses are seriously damaged in a typhoon in the next ten years was smaller than or equal to 5%. Thirty-eight percent (38%) of the respondents believed that this likelihood is zero or 1%. As mentioned earlier, this mentality of “low probability” or “*this will never happen to me*” is a major reason for low demand for natural disaster insurance (Kunreuther and Pauly 2004; Kunreuther, Sanderson, and Vetschera 1985). This is confirmed in our survey. Among those who refuse to consider insurance, 44% indicated that the reason of refusal is that the likelihood of their houses being damaged by a typhoon is very small (Figure 8).

Second, another feature of risk perception is that people hold very different views regarding the likelihood of their houses being damaged by a typhoon in the next ten years. Figure 8 shows that 38% of the interviewees feel that this likelihood is less than 1%, and that 16% of them say that the likelihood can be at least as high as 50%. This raises the question of adverse selection and how natural insurance should be structured to mitigate adverse selection.

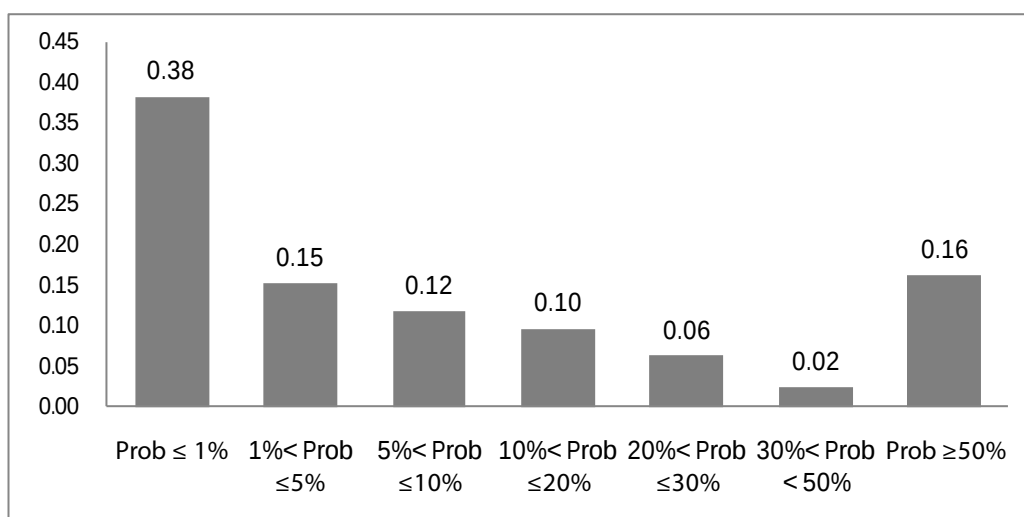


Figure 8. Perceived likelihood of serious damage to homes in the next decade

5.4.3 Choice of Insurance and its Determinants

Conditional logistic model was used to examine how potential victims' choice of insurance varies as a function of various attributes of insurance policy and his/her risk perception. This model is based on a random utility theory where a respondent's utility is divided into a systematic component and a random component. It has been widely used to analyze data from choice experiments.

The regression analysis excludes observations from respondents who indicate that they will not consider insurance no matter how it is structured⁷.

The following insurance design variables are included in the regression analysis (Table 8) to explain respondent's choice of insurance.

- The variables "Three Year Term" and "Five year term" are dummy variables that indicate the insurance contract is on three-year term and five-year term respectively. The omitted category is insurance policy in "One Year Term".
- The variables "Government", "Commercial Insurance Backed up by Government" and "Large-scale Commercial Insurance Company" are dummy variables that indicate the insurance providers are Government, Commercial Insurance Backed up by Government and Large-scale Commercial Insurance Company respectively. The omitted category is Small-scale Commercial Insurance Company.
- Deductible is a continuous variable. As described in Section 5.3, it takes on values of CNY 3,000, CNY 5,000, and CNY 8,000;
- Premium is also a continuous variable. As described in Section 5.3, it takes on values of CNY 2 per CNY 10,000 of coverage, CNY 6 per CNY 10,000 of coverage, CNY 10 per CNY 10,000 of coverage, CNY 14 per CNY 10,000 of coverage, CNY 18 per CNY 10,000 of coverage, CNY 22 per CNY 10,000 of coverage.
- Finally, ASC is an alternative specific constant for choice of insurance. Creating two ASCs for each of the insurance policy does not change the results in any significant manner, which is a nice signal for balanced design.

⁷ This might overstate people's willingness to pay for insurance because the choice experiment only includes those with a likely higher demand. It must be noted that respondents often lost patience when interviewers insisted on asking choice questions after they indicated that they would not buy insurance in any event. Readers might want to keep in mind that this estimate only reflects the WTP of the interviewees who are willing to consider insurance.

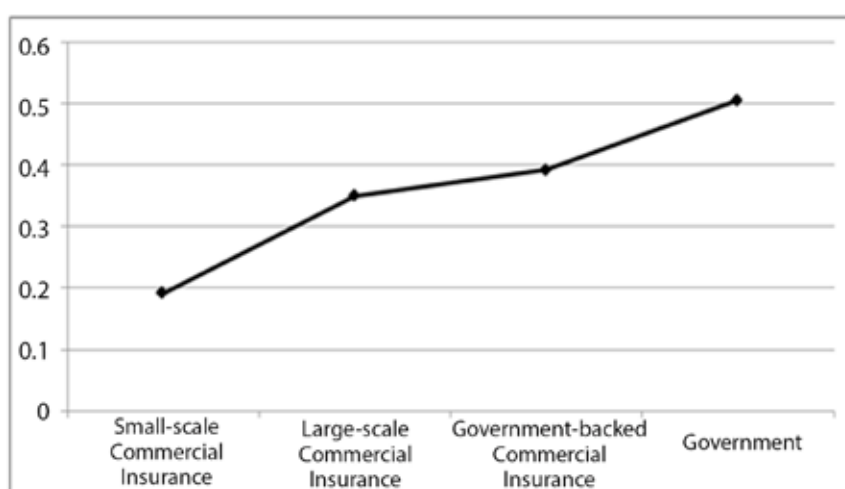
Table 8. Conditional logistic analysis of insurance choice

Variables	(1) Choice	(2) Choice	(3) Choice
ASC	-0.15 (0.65)	-0.27 (0.81)	-0.90 (1.76) †
Government	1.40 (8.58)**	1.46 (8.03)**	1.62 (7.53)**
Commercial Insurance Backed up by Government	0.95 (5.82)**	1.00 (5.54)**	1.17 (5.48)**
Large-scale Commercial Insurance Company	0.66 (3.96)**	0.82 (4.48)**	1.02 (4.67)**
Three Year Term	0.14 (1.04)	0.19 (1.31)	0.18 (1.04)
Five Year Term	0.08 (0.62)	0.11 (0.78)	0.25 (1.49)
Deductible	-0.07 (2.73)**	-0.08 (2.70)**	-0.09 (2.60)**
Premium	-0.04 (4.37)**	-0.10 (4.20)**	-0.04 (1.01)
Perceived Medium Risk * Premium		0.03 (1.95) †	0.05 (2.28) *
Perceived High Risk * Premium		0.03 (2.45)*	0.02 (1.34)
Catastrophic Experience * Premium		0.05 (3.31)**	0.03 (1.45)
Gender * Premium		0.02 (1.75)	0.00 (0.17)
Age * Premium		0.00 (0.63)	-0.00 (0.83)
ASC * Probability Knowledge		0.23 (0.94)	0.06 (0.19)
Premium*Income			-0.00 (0.06)
ASC*Income			0.29 (2.83)**
Observations	2568	2124	1536
Absolute value of z statistics in parentheses ** significant at 1% ; * significant at 5%; † significant at 10%			

Three regression analyses were conducted. The first included only insurance design variables. The second analysis added the interaction between premium and risk perception, interaction between premium and Catastrophic Experience, interaction between premium and gender, as well as interaction between premium and age, so that the moderating effects of risk perception, Catastrophic Experience, gender and age could be examined. Interaction between ASC and Probability Knowledge was also included to capture the impact of the respondents' ability of processing probability information. The third regression analysis included an interaction term between premium and income and an interaction term between ASC and income to examine the income effect. Unfortunately, a significant portion of the respondents declined to disclose their income even though it was presented as income ranges. Including income in the regression would have caused significant loss of information. Because the major results from all three regressions are similar, this study relies on the second model in following discussions.

5.4.3.1 Insurance Providers

Compared to small-scale commercial insurance company, other insurance providers including government, commercial insurance backed up by government and large-scale commercial insurance company seem more attractive. The order of preference from the most preferred to the least preferred is as follows: government, commercial insurance backed up by government, large-scale commercial insurance company and small-scale commercial insurance company. Figure 9 shows that for males at mean age with no Catastrophic Experience and Low Risk Perception, the probability of purchasing an insurance policy with deductible of CNY 5,000 and premium at CNY 10 per CNY 10,000 coverage is 19.15% if the insurance policy is provided by a small-scale commercial insurance company. In contrast, the probability of insurance purchase would increase to 34.98%, 39.17% and 50.50% respectively if the insurance is offered by a large-scale commercial insurance company, a commercial company backed by government and government. It should be noted that when interpreting these results, one must bear in mind that this analysis is confined to the respondents who are willing to consider purchasing insurance.



Note: Calculated for a Male at Mean Age with no Catastrophic Experience and Low Risk Perception and an Insurance Policy with Deductible of CNY 5,000 and Premium at CNY 10 per CNY 10,000 coverage.

Figure 9. Probability of insurance purchase with different insurance providers

Table 9 shows how the MWTP of males at mean age changes with different types of insurance providers, his risk perception and catastrophic experience. It suggests that a resident whose dwelling had not been seriously damaged in the last five years and whose risk perception is high is willing to pay CNY 9.56 more for each CNY 10,000 coverage if insurance is offered by large-scale instead of small-scale commercial insurance company, CNY 11.76 more for commercial insurance backed up by government, and CNY 17.18 more for government.

Table 9. Marginal willingness-to-pay under various scenarios

Types of Insurance Providers	Catastrophic Experience=1			Catastrophic Experience=0		
	Low Risk Perception	Medium Risk Perception	High Risk Perception	Low Risk Perception	Medium Risk Perception	High Risk Perception
Government	22.46	41.71	41.71	12.70	17.18	17.18
Government-backed Commercial Insurance	15.38	28.57	28.57	8.70	11.76	11.76
Large-scale Commercial Insurance	12.62	23.43	23.43	7.13	9.65	9.65
Deductible	-1.20	-2.23	-2.23	-0.68	-0.92	-0.92

As mentioned earlier, distrust in insurance companies is a great hindrance to the demand for natural disaster / typhoon insurance. This distrust seems to affect small-scale commercial insurance companies more since they are often viewed as the source of malpractice. In addition to this, people may have doubts on whether small-scale insurance companies have the capacity to offer insurance for great damage caused by natural disasters.

In contrast, respondents strongly prefer government as the natural disaster insurance provider. This is not only true compared to small-scale commercial insurance companies, but also compared to commercial insurance companies backed up by government, and large-scale commercial insurance companies. The difference between the coefficients of government and commercial insurance backed up by government is statistically significant. So is the difference between the coefficients of government and large-scale commercial insurance companies.

China is a country where government plays significant roles in every aspect of social-economic life. Although complain about governments exists, people always go to government for all kinds of troubling issues. It is not a surprise that when it comes to natural disaster insurance, people naturally think about government. It is likely that this is reinforced by two recent trends: First, governments have played a magnificent role in recent natural disaster events such as Wenchuan and Yushu earthquake. After these two earthquakes, all levels of governments provide significant funds for disaster recovery including rebuilding cities and dwellings. Second, Chinese government is making efforts to establish social security and medical health insurance system throughout the country. People tend to think that natural disaster insurance should also be offered by government, just like social security or medical health insurance.

This suggests that the establishment of natural disaster insurance cannot be initiated by the private sector alone in China, especially when people have little knowledge about insurance and people do not trust the insurance industry. Government has to do its part.

5.4.3.2 Length of Insurance Contract

The length of the insurance contract does not appear to have a significant impact on the demand for natural disaster insurance. It has been argued that long-term insurance contracts can be coupled with long-term home improvement loans that would incentivize homeowners to adopt cost-effective mitigation measures and provide them with stable financial protection over time. In spite of these theoretical appeals (Kunreuther and Michel-Kerjan 2010), consumers do not seem to like long term insurance policies more than short term ones.

This may be due to two possible yet opposite impacts from offering long-term insurance. On one hand, consumers may like the stability long-term insurance offers: insurers cannot rescind the policy at free will and premiums will stay unchanged over the contract period. On the other hand, consumers may prefer short-term insurance because they value the option of reconsidering whether to continue buying insurance next year.

The good news is that people's likelihood to purchase insurance would not be significantly reduced if long-term instead of short-term insurance were offered. In fact, the coefficients have a positive sign. This suggests that consumers would not be resistant to the idea of long-term insurance.

5.4.3.3 Deductible

Higher deductible dampens the willingness to purchase insurance. Apparently, the damages from small-to-mid-scale typhoon are often small. Higher deductible means that the insured can get payment only when damages are large. Table 9 suggests that a resident whose dwelling had not been seriously damaged in the last five years and whose risk perception is low is willing to pay CNY 0.68 more for each CNY 10,000 coverage when the deductible was reduced by CNY 1,000. The WTP would significantly increase when his/her dwelling had been seriously damaged in the last five years.

5.4.3.4 Risk Perception and Catastrophic Experience

As expected, the coefficient of premium is negative and statistically significant. This evidences that people's willingness to purchase insurance decreases as premium increases. Table 8 shows that the interaction term between premium and risk perception is positive and significant. So is the interaction term between premium and Catastrophic Experience. This suggests that people who had catastrophic experiences and feel they are at high risk are more likely to tolerate premium increase. In other words, they are willing to pay more to obtain coverage. As clearly demonstrated in Table 9, people are willing to pay more to purchase insurance when their dwelling had been seriously damaged in the last five years and when their risk perception is high.

For example, a resident whose dwelling had not been seriously damaged in the last five years and whose risk perception is low is willing to pay CNY 7.13 more for each CNY 10,000 coverage if insurance is offered by large-scale instead of small-scale commercial insurance company. In contrast, he/she would be willing to pay CNY 12.62 more if his/her dwelling had been seriously damaged in the last five years and CNY 9.65 more if his/her risk perception is high (Table 9).

Note that the coefficient estimate for the interaction term between premium and medium risk perception is almost the same as that for the interaction term between premium and high risk perception, which means that people with median and high risk perception does not differ significantly in terms of their WTP for insurance. However, we notice that the standard error is smaller for the interaction term between premium and high risk perception compared to the interaction term between premium and medium risk perception, which means the impact of high risk perception is more pronounced.

5.4.3.5 Personal Characteristics

The interaction terms between premium and age and between premium and gender have coefficients that are not different from zero. This suggests that these two variables are not significant factors that shift consumers' WTP for natural disaster insurance. Regression 3 shows that the interaction term between ASC and income has a statistically significant coefficient, which suggests that people with high income are more likely to buy insurance.

5.4.3.6 Link to the Supply Side

Interviews with private insurers suggest that in regions like Cangnan County, CNY 20 per CNY 10,000 coverage is reasonable for sustaining an insurance policy against natural disaster. Currently, the public insurance system uses a rate that is around CNY 8.3 per CNY 10,000, among which only about CNY 2.8 is paid by individuals out of their own pockets. The probability for a male resident at the mean age of 35 to purchase an insurance policy with deductible of CNY 5,000 was calculated at these three levels of premium from a commercial insurance company that is backed up by government. Assuming that this resident has no catastrophic experience and low risk perception, at a premium of CNY 2.8 per CNY 10,000 coverage, the probability for him to buy insurance is about 56.95%. This percentage would decrease to 43.29% and 19.15% if the premium is set at CNY 8.3 and CNY 20 per CNY 10,000 coverage respectively. This shows that a natural disaster insurance program has to include significant public subsidy if it aims to cover a large portion of households.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This research first examined the existing public system of disaster relief and recovery, including both direct government subsidy and public insurance systems through extensive documentary research, focus group discussions and face-to-face interviews. It was found that the usefulness of direct government subsidy is limited by the availability of public financial resources. Direct government subsidy is largely reserved for those who do not have capability for self-relief and recovery. This is similar to public insurance, which only applies to rural areas and provides a maximum coverage of only about CNY 18,000. Both approaches provide assistance sufficient to ensure only basic housing needs. Furthermore, the premium of the public insurance system is heavily subsidized and not related to risk. This practice has been criticized for watering down economic incentives for proactive risk management and emergency response capacity building (Gurenko and Lester 2004; Heinz Center 2000; Yin, Kunreuther, and White 2011).

The limitations of public approaches leave a space for private insurance. This study investigated how China's insurance industry (as suppliers) and Chinese people (as consumers) view natural disaster insurance. After a literature study and a series of face-to-face interviews with insurers involved in the Chinese property insurance market, it was found that insurance companies hesitate to offer insurance policy against natural disaster because of institutional barriers, low demand from consumers and the ambiguity and uncertainties associated with natural disasters.

A field survey, which includes a choice-experiment of insurance selection, was used to gather data for the demand side analysis. From the data generated from the survey, it was found that people have a low demand for insurance because of three major reasons: (1) the perception of *"it won't happen to me"*; (2) budgetary constraints; and (3) a deep distrust of the insurance industry. It was also found that people tend to avoid insurance offered by small-scale insurance companies and strongly favor insurance provided by government. This suggests that the establishment of natural disaster insurance should be initiated by government in China. It was also found that a person's WTP for natural disaster insurance would significantly increase if he/she had a catastrophic experience before and his/her risk perception was high.

The results of this study suggest that neither public nor private approach presents an adequate solution to the challenge of financing natural disaster losses in China. Instead, government-business collaboration may provide a valuable alternative.

In such a collaborative system, insurance companies should be given the flexibility to assess risk-based premium so that the function of premium as a signal of vulnerability to natural disaster is maintained (Kunreuther and Michel-Kerjan 2009). Insurance companies should be responsible for loss assessment and claim processing. The participation of private sector is necessary because governments do not have expertise in providing insurance services, and are often hindered from charging risk-based premium because of political reasons.

This study clearly shows that private sector alone cannot sustain a natural disaster insurance system. On one hand, consumers' WTP is rather limited if government is not a part of the system. On the other hand, insurers have no incentives to offer natural disaster insurance for reasons that we have discussed in absence of policy supports from governments. This study suggests that government at least should play the following roles in developing a natural disaster insurance system with private sectors. On the demand side:

- Government should help boost the demand for natural disaster insurance. Low demand for insurance is a major obstacle. This study shows that the participation of government itself could significantly increase the demand for natural disaster insurance. In addition, measures are available for governments to use in order to increase demand.

For example, in the United States, the Flood Disaster Protection Act of 1973 made the purchase of flood insurance mandatory for the protection of property within Special Flood Hazard Areas (SFHAs). In China, households who choose to participate in public insurance system will have priority in obtaining public disaster relief provided by governments, which considerably increase the participation rate of the public insurance system.

- Government should provide subsidies to help low-income families or small business located in disaster-prone areas. Section 2 suggests that when constructing natural disaster insurance, insurance companies

should be given the flexibility to assess risk-based premiums. However, a major concern with risk-based premium is that low income families, who often own low-quality house, in high-hazard zones may face very high premium that they cannot afford. If so, they will be left unprotected. In this case, government financial assistance is warranted. In China, subsidy is provided in the form of premium deduction and is given to everyone equally.

However, as discussed in section 3.2, this will weaken people's incentive for self-protection. Kunreuther and Michel-Kerjan (2009) pointed out that it is important to keep in mind that financial assistance to low-income families should be given in a form of vouchers instead of direct premium subsidy. This means that low-income families would still pay an insurance premium that reflects its risk, and then be reimbursed by the government with an amount that would be determined by their income and the insurance premium they are charged. This will preserve the function of the premium as a signal of vulnerability to natural disaster and the potential benefit of insurance in encouraging risk-reduction efforts.

- Government should educate the public and improve awareness about climate change risk. This study suggests that the mentality of “low probability” or “*this will never happen to me*” is a major reason for low demand for natural disaster insurance. Therefore, improving awareness about climate risk among the general public through various educational efforts should be useful to increase demand for natural disaster insurance.

On the supply side, it is recommended that government play the following roles:

- Remove institutional barriers, such as certain accounting and taxation rules, to the development of natural disaster insurance. Our study suggests that the existence of institutional barriers (e.g., some accounting and taxation rules) is an important reason for insurers not to provide natural disaster insurance. No one but the government can remove these institutional barriers.
- Provide financial backup for private sectors. Extreme low-probability and high-consequence events such as the Wenchuan earthquake may lead to losses far beyond insurers' capacity. Government may want to provide catastrophe reinsurance contracts to private insurers in order to protect against catastrophic losses (Doherty, Kleindorfer, and Kunreuther 1990; Lewis and Murdock 1996; Litan 2005). Scholars (Doherty, Kleindorfer, and Kunreuther 1990; Gurenko and Lester 2004; Lewis and Murdock 1996; Litan 2005) also suggest a multi-layered insurance program in which governments help finance the losses beyond the insurance and reinsurance industry. As climate changes, insurers find it increasingly hard to predict the frequency and severity of natural disasters. Therefore, governments should make the effort to improve knowledge about climate change so that private insurers can set risk-based premiums appropriately (Mills 2007).

In sum, it is clear from this study that government-business collaboration is needed to establish a natural disaster insurance system. This research should provide a good starting point to develop institutions for a government and business collaborative natural disaster insurance system.

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APPENDIX

Questionnaire

INTRODUCTION

Hello, I'm a researcher from the Shanghai Jiao Tong University. We are conducting research on how to improve community's capacity to recover from extreme climate events such as a typhoon. As climate change is in progress, extreme climate events such as typhoon will become more common and more frequent. Such extreme climate events often result in significant damages to personal property and disrupt people's life. It is crucial to have a system to minimize such damages and help community improve its capacity of recovery. Our research aims to determine how you protect yourself financially from the losses brought about by extreme climate events.

Your opinions are very important for this research. Rest assured that your name will remain completely confidential. This interview will take 20-30 minutes.

Thank you for your cooperation.

Part I: Risk Perception

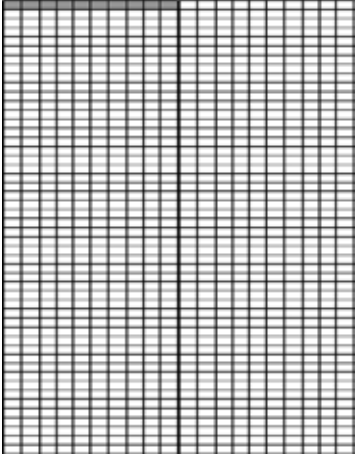
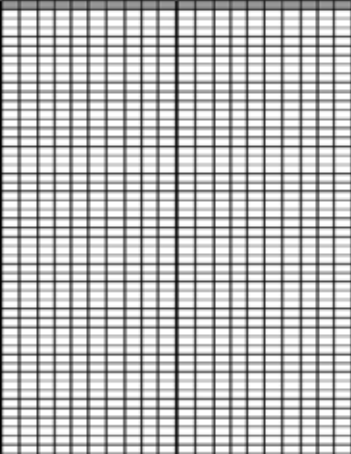
Every day, we face many events that, however uncertain, have a chance of occurring. In theory, CHANCE can be predicted. For example, if we throw a dice, the chance to get a two points  is "1 out of 6".



1. Suppose you are given the choice of living in one of two communities that are identical except for the risk that your house is seriously damaged by a typhoon in the next ten years.

In community **A**, there is a 10 in 1,000 chance that your house will be seriously damaged by a typhoon in the next ten years (See the number of gray squares in the left grid). In community **B**, there is a 20 in 1,000 chance that your house will be seriously damaged by a typhoon in the next ten years. (See the number of gray squares in the right grid)

Which community would you choose to live in? *Please select one response only.*

 Community A (Continue with Q 2)	 Community B (Continue with Q1b)
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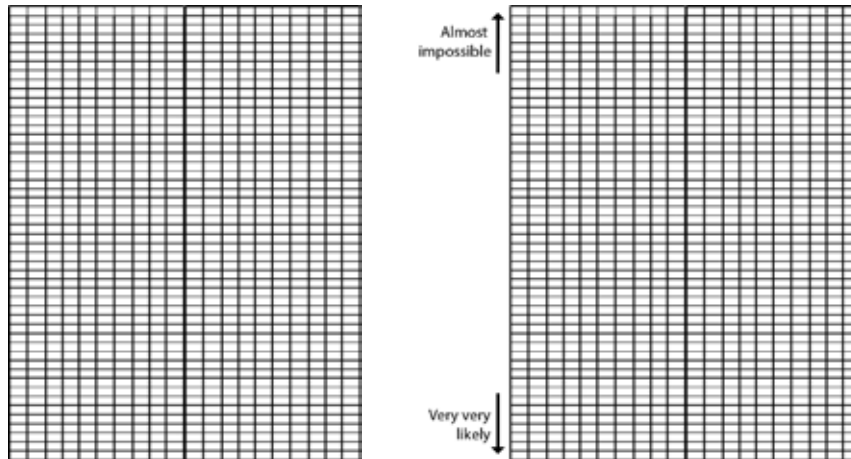
Note for interviewer:
Explain why community A is the right choice if they get the answer wrong twice.

Record the times they got the answer wrong.

1b. In community **A**, there is a 10 in 1,000 chance that your house will be seriously damaged by a typhoon within the next ten years. In community **B**, there is a 20 in 1,000 chance that your house will be seriously damaged by a typhoon within the next ten years. This means there is a greater chance that your house will be seriously damaged if you choose to live in Community B, compared to Community A. Would you still choose Community B?

2. Please think about the chance that your house would be seriously damaged by a typhoon in the next ten years and make the best estimate. Please indicate how many squares in the grid should be marked as red. One square stands for a chance of “1 out of 1000”.

3. Please think about the chance that your house would be seriously damaged by a typhoon in the next ten years. Please make your low guess and high guess respectively, and indicate how many squares in the grid should be marked as red accordingly. One square stands for a chance of “1 out of 1000”.



NOTE: If the interviewees do not understand probability and the left grid above does not help, we used the right grid above. This grid has a vertical line at the left with “almost impossible” at one end and “very very likely” at the other end. The interviewees were asked to tick on the line to indicate the likelihood that their house would be destroyed or seriously damaged in a typhoon in the next ten years.

4. Compared to the past, how frequently have typhoons hit your community in the last three years?
(1) more frequently; (2) about the same; (3) less frequently; (4) hard to say

5. Compared to the current frequency of typhoons, how frequently do you think typhoons will hit your community in the future?
(1) more frequently; (2) about the same; (3) less frequently; (4) hard to say

6. Please encircle how frequently you think typhoons will hit your county in the next ten years. Choose only one answer.

1 every 5 years	1 every 4 years	1 every 3 years	1 every 2 years	1 in each year	2 in each year	3 in each year	4 in each year	5 in each year
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7. Please encircle one LOW GUESS and one HIGH GUESS on how frequently you think typhoons will hit your county in the next ten years.

1 every 5 years	1 every 4 years	1 every 3 years	1 every 2 years	1 in each year	2 in each year	3 in each year	4 in each year	5 in each year
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Part II: Choice Experiment

In this section, we are going to ask several questions regarding insurance. This is a research that is conducted for academic purpose only. We do not have any connection with commercial insurance company. Nor do we have any intention to sell any type of insurance to you. Please trust us and answer the following questions based on what you really think.

1. What types of insurance have you purchased in the last three years? Please circle all types that you have purchased.

- a. auto insurance
- b. life insurance
- c. medical insurance
- d. residential property insurance (**proceed to Q1c**)
- e. others (please specify)

1b. What is the first year you purchased any of the insurance policies you mentioned in Q1? ____

98 Don't know 99 Refused

1c. What is the coverage and premium for your residential property insurance?

Coverage: ____ Premium: ____ 98 Don't know 99 Refused

2. What is the market value for your house/apartments? ____CNY 98 Don't know 99 Refused

[If Questionnaire A, Continue with Q3 directly]

[If Questionnaire B, before continuing with Q3, please state the following: "CangNan suffered greatly from typhoon. From 2006 to 2009, two major typhoons struck CangNan on average. In 2009, we had Typhoon Morakot. In 2006, Typhoon SangMei struck, wiping off 5% of the dwellings in CangNan. That is, out of every 20 families, one had a collapsed or seriously damaged dwelling after Typhoon Sangmei."]

If you purchased an insurance policy against typhoon, insurance companies will cover your property loss after a typhoon strikes. Here is a brief description of how insurance works. The following terms are important for assessing an insurance policy.

- Coverage: the maximum payment you can get from insurance company in one event.
- Deductible: It is the amount of expenses that must be paid out of pocket before an insurer will cover any expenses. For example, one insurance provides coverage of CNY 100,000 and set the deductible at 5,000CNY.
 - If your loss in a typhoon is CNY 130,000. The expenses that are covered by insurance company would be CNY 95,000;
 - If your loss in a typhoon is CNY 80,000. The expenses that are covered by insurance company would be CNY 75,000;
 - If your loss in a typhoon is CNY 3,000. The expenses that are covered by insurance company would be zero.
- Premium. Of course, you need to pay a certain amount of money to get insurance coverage, which is called premium. Premium varies across insurance companies.

3. Based on this introduction of insurance and your knowledge/experience with insurance, would you consider purchasing typhoon insurance to protect you from property losses resulting from typhoons?

(1) No. I won't consider purchasing insurance in any event. **(proceed to Q 3.1)**

(2) Yes. I may consider purchasing insurance. **(proceed to Q 3.2)**

3.1 What is your main reason for not buying insurance?

- a) I do not think my dwelling will be damaged by a typhoon;
- b) Our budget is already tight. I cannot afford typhoon insurance;
- c) I do not believe in insurance at all, and will not buy any insurance policy.
- d) Government will provide financial assistance following a disaster anyway;
- e) I have other ways to cover losses or damage to my dwelling.
- f) Others (Please Specify) _____

3.2 We would like you to compare two hypothetical insurance policies and the option of "*do not purchase the two listed insurance policy*". You will be presented with four (4) choice sets, each of which is composed of two hypothetical insurance policies and the option of "*do not purchase the two listed insurance policy*". The two listed insurance policies are different on the following dimensions:

- Service provider: Government; Commercial insurance company backed by government; Top-ten commercial insurance companies; Small commercial insurance companies.
- Term of insurance contract: One year; Three years and Five years.
- Deductible: CNY 3000, CNY 5,000, CNY 8,000
- Premium: Price you pay each year for every "CNY 10,000" coverage.

Note for Interviewer: Before presenting the first choice set, you should say this “Cheap Talk Script” in your own language. [Cheap Talk Script] The experience from previous similar surveys is that people often respond in one way but act differently. It is particularly common that one states a higher willingness to pay than what one actually is willing to pay for in real life. We believe this is due to the fact that one does not really consider how big an impact an extra cost actually has to the family budget. It is easy to be generous when one presently does not really face a real choice between no insurance and a specific insurance policy.

Note for Interviewer: Before presenting the second choice set, you should say this “Independence Reminder” in your own language. Please treat each of these four sets independently, that is, for each set, imagine that the two hypothetical options presented to you are the only ones available.

Example:

Attributes	Do Not Like the Listed Insurance Policy	Insurance Policy I	Insurance Policy II
Service Provider	-----	Top-Ten Commercial Insurance Company	Commercial Insurance Company backed up by Government
Term of Contract	-----	5 years	1 year
Deductible	-----	CNY 8,000	CNY 8,000
Premium	0	CNY 6 /year for every CNY 10,000 coverage	CNY 2 /year for every CNY 10,000 coverage
Your Choice			

3.3 If either of the listed insurance policies is selected, ask “could you indicate a coverage level you desire”?

Part III: Risk Prevention and Disaster Recovery

1. Does your family have a kit that provides stuff you may need urgently should a typhoon strikes, for example, flashlight, bottled water etc?

(1) Yes (2) No

2. During typhoon season, how often do you check the house and brace windows and doors?

(1) Very frequently (2) Sometimes (3) Occasionally (4) Never

3. Has your house ever been destroyed or seriously damaged in a typhoon in the last five years?

(1) Yes (**proceed to Q3.1 and Q3.2**) (2) No

3.1 Where did you get the money to rebuild or repair your house?

(1) Personal savings (2) Loan from relatives and friends (3) Bank loan
(4) Government subsidy (5) Others (please specify) _____

3.2 Have you ever received government subsidy for rebuilding/repairing your house?

(1) Yes (**proceed with Q3.3 and Q 3.4**) (2) No

3.3 What is the amount of government subsidy? _____

3.4 Does government provide technical support to ensure the quality of your new house when you rebuild or repair your house? (1) Yes (2) No

4. If your house is destroyed or seriously damaged in a typhoon, from whom do you think you will obtain funding for rebuilding or repairing your house?

- (1) Personal savings
- (2) Loan from relatives and friends
- (3) Bank loan
- (4) Government subsidy
- (5) Others (please specify) _____

5. Do you have rural public property insurance?

- (1) Yes (**proceed to Q5.1, 5.2, 5.3**)
- (2) No (**proceed to Q 5.4**)

5.1 How much do you pay out of your pocket?

5.2 Do you know what the highest payment you may get in an event of property losses is?

5.3 How do you feel about the current highest payment?

- (1) Too low; (2) Too high; (3) About right

5.4 Why have you not participated in rural public property insurance?

- (1) I have never heard of it.
- (2) I do not trust insurance at all.
- (3) The premium we pay is too high. _____
- (4) I do not think my dwelling will be damaged by a natural disaster or fire.
- (5) Others. Please specify. _____

6. Have you received any education or training on what you should do to reduce losses from typhoon or how you should act should a typhoon strike?

- (1) Yes (**proceed to Q6.1**)
- (2) No

6.1 Who do you receive such an education or training from?

- (1) Government
- (2) Others (please specify) _____

7. Have you received typhoon warnings from local government in the past?

- (1) Every time
- (2) Very often
- (3) Occasionally
- (4) Never

8. Through what channels do you receive typhoon warning?

- (1) Radio
- (2) TV
- (3) Cell phone message
- (4) In-person notification from governmental staff
- (5) Others (please specify)

9. In the past few years, when you receive typhoon warning from government and are asked to evacuate, what would you do?

- (1) Follow instruction and evacuate right away
- (2) Wait and see
- (3) Do not evacuate because our house is strong enough

10. Is there a typhoon shelter close to your home?

- (1) Yes (**proceed to Q10.1**)
- (2) No
- (3) Don't know

10.1 How long does it take for your whole family to arrive at the typhoon shelter? ____ hrs

11. To your knowledge, is there any flood control installation in your area?

- (1) Yes. It works every time a typhoon strikes;
- (2) Yes. It works sometimes. It does not help when there is a large/very strong typhoon;
- (3) Yes. It does not help at all when a typhoon strikes;
- (4) No.

12. In the last few years, how quickly does rescue crew arrive at areas that suffer greatly from typhoon?

- (1) Within several hours
- (2) Within a day;
- (3) Within two days;
- (4) Three days or more

13. In the last few years, have you ever participated in rescue activities when a typhoon strikes?

- (1) Every time
- (2) Often
- (3) Occasionally
- (4) Never

14. Are you willing to participate in rescue activities as a volunteer in the future when a typhoon strikes?
 (1) Surely will participate; (2) Will participate
 (3) Depending on the situation (4) No
15. In the last few years, did government provide life necessities such as food and clothes to you after a typhoon?
 (1) Beyond basic needs (2) Satisfy basic needs
 (3) Some but not enough (4) Did not provide
16. In the last few years, how soon will the local transportation and telecommunication come back to normal?
 (1) Within several hours (2) Within one to two days
 (3) Within three to four days (4) Five days or more
17. To your knowledge, do you know if local government has set up a disaster response plan?
 (1) Yes **(proceed to Q17.1)** (2) No (3) Don't know
- 17.1 Do you think that it is complete?
 (1) Very complete (2) Complete (3) Incomplete (4) Very incomplete.
18. To what extent do you think that local government's natural disaster management has effectively reduced casualties in a typhoon?
 (1) Significantly (2) Slightly (3) No impact.
19. To what extent do you think that local government's natural disaster management has effectively reduced economic losses in a typhoon?
 (1) Significantly (2) Slightly (3) No impact.
20. Overall, how do you feel about local government's performance in disaster response?
 (1) Very satisfied (2) Satisfied (3) Neutral
 (4) Unsatisfied (5) Very unsatisfied
21. Based on local government's performance in the last disaster response after a typhoon, how has your trust/confidence in local government changed?
 (1) Significantly improved (2) Improved (3) No Change
 (4) Reduced (5) Significantly reduced

Part IV: Demographic Information

1. In which year were you born? [Record Year Here 19____] 98 Don't know 99 Refused to answer
2. What is the highest level of formal education you completed? (READ CODES 1- 5)
 (1) Less than elementary school (2) Middle school graduate
 (3) High school graduate (4) Some college or associate degree
 (5) College graduate and above
 98 Don't know 99 Refused to answer
3. What is your occupation? (1) Record Occupation Here _____ (2) Retired
 If retired, ask the respondent's occupation before retirement and fill in here _____
 98 Don't know 99 Refused to answer
4. What was your total annual family income in 2009? (READ CODES 1 - 7)
 (1) Under CNY 30,000 (2) CNY 30,000 but less than CNY 50,000
 (3) CNY 50,000 but less than CNY 70,000 (4) CNY 70,000 but less than CNY 90,000
 (5) CNY 90,000 but less than CNY 120,000 (6) CNY 120,000 but less than CNY 150,000
 (7) CNY 150,000 or more
 98 Don't know 99 Refused to answer

5. How many people live in this dwelling? [Record Here _____]
98 Don't know 99 Refused to answer

6. Among the family members you mentioned in Q5, how many of them are below the age of 16?
[Record Here _____] 98 Don't know 99 Refused to answer

7. Which of the followings best describes your living-place?
(1) A one-family house detached from any other house
(2) A one-family house attached to one or more houses
(3) An apartment- building with less than five floors
(4) An apartment- building with six to ten floors
(5) An apartment- building with more than ten floors

Q7: Record by
observation.

8. Approximately when was your dwelling first built?
(1) 2000 or later – Specify year _____ (2) 1990 to 1999
(3) 1980 to 1989 (4) 1970 to 1979
(5) 1960 or earlier
98 Don't know 99 Refused to answer

9. When did your family move into this dwelling? [Record Year Here _____]
98 Don't know 99 Refused to answer

10. What is the floor area of this dwelling? [Record Here _____ in Square Meter]
98 Don't know 99 Refused to answer

11. Is this dwelling _____?
(1) Owned by you or someone in this household with a loan? Include home equity loans.
(2) Owned by you or someone in this household free and clear (without a loan)?

12. The building materials of your dwellings:
(1) Steel (2) Steel and Concrete
(3) Brick and Concrete (4) Brick and Wood (5) Others

13. Gender: (1) Male (2) Female

14. Address: _____

Q13 and Q 14:
Record by
observation.

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