URBAN REAL PROPERTY LOSS RELIEF IN THE SCOPE OF DISASTER GOVERNANCE

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Abstract

Over the last ten years, natural disasters, such as earthquake, flood, typhoon, debris flow and landslide, have cost the tremendous loss of real properties in China. The losses include the loss of real property structures, facade damage of land and building, and loss of property rights due to land loss. The background of unprecedented urbanization which drives the increasing number of people living in urban areas involves the urban real properties in the hazard-prone district. Meanwhile, As the urban development raises the dwelling density, urban real properties are exposed to the vulnerable environment in the face of disasters. The reasons cause the loss of urban properties could be tremendous.

In the current state of affairs, the Chinese central government is the main organization that takes the responsibility of post-disaster loss relief. Neither disaster insurance nor private-public loss relief cooperation has grown maturely in tandem with the need of market taking over this responsibility from the central government. Therefore, there is a current debate on whether there is a need for private sector to take some responsibilities for an effective loss relief in China. At the same time, the focus of disaster management is mostly in the post-disaster phase, while in the pre-disaster phase, the importance of disaster governance is not fully understood.

The paper suggested an urgent need for urban real property loss relief study in the scope of disaster governance. To further develop the theory of loss relief governance, the paper defined the differences between loss relief management and loss relief governance and establishes the concept model of loss relief governance, and pointed out the importance of multi-level cooperation in building real property loss relief system in China.

For the purpose of exploring the current urban real property loss relief system in China, the research team conducted a review of regulations and obligations of governments, CIRC and PICC, and field investigations of CIRC and PICC. The finding is that the urban real property loss relief system in China has experienced two stages: mainly *ex-*

post funding from the central government and some coverage by insurance systems while government acts as the main source of finance.

The main contributions of the paper are as follows. Firstly, the paper proposed the importance of urban real property loss relief. Secondly, the paper analysed the difference between the loss relief management and loss relief governance and suggested a holistic urban real property loss relief system is within the scope of disaster governance. Thirdly, the paper proposed the loss relief process should go backward to urban planning phase and cover the whole process of urban development, involving pre-disaster, mid-disaster, and post-disaster phases. Lastly, the paper summarized the urban real property loss relief system in China and pointed out the current weakness and future research focuses.

Keywords: real property, natural disaster, loss relief, disaster governance, urban China

1. INTRODUCTION

In 2015, the Chinese urbanization rate was approximately 56.10%, involving more than 600 million residents living in urban China. Urban agglomeration and expansion regarding size, density as well as complexity cause the vast range of real property construction, accommodating people in urban areas (Yang, Tuladhar et al., 2015.). Due to urbanization, more people are exposed to potential disaster hazards than before. Meanwhile, as the urban density grows, the living density is intense in core cities, resulting in the surge of energy consumption. Furthermore, as the urban boundary expands, the urban area extends to the hazard-prone districts and disaster-prone urban fringe areas are involved in the urban range (UNISDR/UNESCAP, 2012; Tierney, 2012).

Nowadays, the most common natural disasters in urban areas (i.e., those being caused by atmospheric or tectonic disturbances) are storms, floods, drought, and earthquakes (Gallardo, 1984). China has become a country rather frequently affected by natural disasters. In recent years, Chinese cities frequently suffered such major disasters as the 2008 “5-12” Wenchuan earthquake, the 2012 Beijing "7-21" heavy rainfall, the 2013 "Fit" super typhoon, and the"4-20" Sichuan Lushan earthquake. The hits to cities have brought great loss not only economically but also socially, particularly resulting in tremendous loss of real properties, which exposed the problem that the existing urban natural disaster loss relief system is vulnerable. The restructure of disaster loss relief system in the domain of disaster governance is desperately needed (Raschky, 2008).

2. THE IMPORTANCE OF URBAN REAL PROPERTY LOSS RELIEF

Currently, there is insufficient research into the question of whether or not disaster loss in urban areas is lesser or greater than that incurred in rural areas. However, the

previous research focus of disaster relief was mainly in rural areas. The main reason is that recent great disasters happened in China concentrated in the countryside and city fringe. Taking China Wenchuan earthquake [1], for example, this massive earthquake with a magnitude 8 on the Richter scale happened in Wenchuan, Sichuan Province, resulting in hundreds of billions of property losses. The significant loss in the earthquake is up to 850 billion RMB, most of which was in rural towns and villages (Wang 2008) (Table 1).

Table 1: Summary of direct economic loss in Wenchuan earthquake

(Unit: 100 million RMB, about 15 million US Dollar)

Loss item	Sichuan	Gansu	Shannxi	Chongqing	Yunnan	Ningxia	Total
Countryside houses	**1,624.23**	230.54	145.27	38.96	12.40	0.83	2,126.90
City buildings	**74.67**	--	--	--	--	--	--
Indoor property	**307.52**	16.92	1.05	0.05	0.03	--	325.57
Outdoor property	**37.94**	0.53	1.04	--	--	--	39.51
Sum	**2,044.36**	247.99	147.36	39.01	12.43	0.83	2,491.98

Source: Impact of intensity and loss assessment following the great Wenchuan Earthquake (Yuan 2008)

However, the importance of urban real property loss relief should not be ignored. Accompanying with the rapid urbanization, urban real properties that symbolized as the modernized image of contemporary urban development are erected almost everywhere that urban boundary reaches. Whereas lacking prudent urban planning scheme, the expansion only considers absorbing the rural population into urban areas, acquiring rural land, eliminating the village and integrating the difference between the rural and urban recklessly (Afshar and Haghani, 2012). More urban areas involve hazard-prone districts in the process of rapid urbanization (Douglass, 2013). Meanwhile, “Rapid growth and population concentrations in megacities in less-developed countries render those urban regions even more vulnerable, particularly from the perspective of large-scale losses of lives, and also harder to govern effectively.” (Tierney, 2012).

At the same time, energy consumption in cities has speeded up due to the fast growth of cities, particularly in central business districts (or “CBDs”). Developed commercial centers, as well as residential agglomerations, assimilate energy-exhausted cities especially regarding water and minerals that mostly are extracted from underground. It results in uneven seismic activities. Furthermore, a large number of factories and automobiles emit carbon dioxide and harmful gasses, causing climate change regularly, which results in unpredictable rainfall and temperature anomaly. Natural

[1] Wenchuan earthquake is the worst earthquake event happened recently in China since the M7.8 Tangshan Earthquake in 1976 (Wang 2008)

disasters, such as earthquake, land subsidence, floods, intense heat and extreme cold weather, are becoming common meteorological activities. However, the seemingly common phenomenon hides huge disaster risk. Besides, the location of most economy-developed cities in coastal areas adds the additional challenges of sea rises and heightened vulnerability to extreme weather events. Once the disaster takes place, the loss will be innumerable. Urban real property loss relief deserves significant attention as the population consolidation leads to high dwelling density and the linkage effect of buildings to disasters is disastrous.

2.1. Population consolidation and dwelling density

It is a well-known fact that China is a populous country. Chinese cities constitute a significant percentage of the population and raise dwelling densities. According to "Demographia World Urban Areas 12th Annual Edition (2016)", the average population density in China is 5700 people per square kilometers among the investigated 224 cities which occupy 21.9% urban China with a total population 429 million.

Twenty-three (23) Chinese-region cities (including China: Taiwan and China: Hong Kong) rank in the Top 100 most populous cities globally (Table 2). Shanghai ranks the 8th with the estimated population 22,685,000, population density 5800 people per square kilometer and land area 5885 square kilometers.

Table 2: Population, land area, and population density

Rank	Geography	Urban Area	Population Estimate	Land Area		Population Density	
				Square Miles	Square Kilometers	Per Square Mile	Per Square Kilometer
8	China	Shanghai, SHG-JS-ZJ	22,685,000	1,500	3,885	15,100	5,800
11	China	Beijing, BJ-HEB	20,390,000	1,520	3,937	13,400	5,200
13	China	Guangzhou-Foshan, GD	18,760,000	1,475	3,820	12,700	4,900
25	China	Shenzhen, GD	12,240,000	675	1,748	18,100	7,000
28	China	Tianjin, TJ	11,260,000	775	2,007	14,500	5,600
31	China	Chengdu, SC	10,680,000	650	1,684	16,400	6,300
41	China：Taiwan	Taipei	8,500,000	440	1,140	19,300	7,500
42	China	Dongguan, GD	8,260,000	625	1,619	13,200	5,100
44	China	Wuhan, HUB	7,620,000	510	1,321	14,900	5,800
45	China	Hangzhou, ZJ	7,605,000	490	1,269	15,500	6,000
47	China	Chongqing, CQ	7,440,000	375	971	19,800	7,700
51	China: Hong Kong SAR	Hong Kong	7,280,000	110	285	66,200	25,600
52	China	Quanzhou, FJ	7,020,000	635	1,645	11,100	4,300

57	China	Nanjing, JS	6,380,000	515	1,334	12,400	4,800
61	China	Shenyang, LN	6,200,000	390	1,010	15,900	6,100
62	China	Xi'an, SAA	6,150,000	360	932	17,100	6,600
64	China	Qingdao, SD	5,970,000	615	1,593	9,700	3,700
70	China	Zhengzhou, HEN	5,755,000	500	1,295	11,500	4,400
74	China	Suzhou, JS	5,380,000	490	1,269	11,000	4,200
83	China	Harbin, HL	4,915,000	220	570	22,300	8,600
87	China	Xiamen, FJ	4,715,000	225	583	21,000	8,100
94	China	Dalian, LN	4,300,000	300	777	14,300	5,500
99	China	Fuzhou, FJ	4,080,000	170	440	24,000	9,300

Source: Demographia World Urban Areas 12th Annual Edition: 2016.04

For the purpose of analysis, two pictures are outlined for visual comparison among the top populated cities in China (Figure 1 & Figure 2). The population density has a positive correlation with the degree of population consolidation. In Figure 1, Shanghai ranks first with the total population of 22,685,000; Beijing ranks second and Guangzhou-Foshan ranks third. In Figure 2, Hong Kong has the densest degree of population consolidation with 25,600 people per square kilometer; Fuzhou ranks the second and Chongqing ranks the third.

Figure 1: Total Population

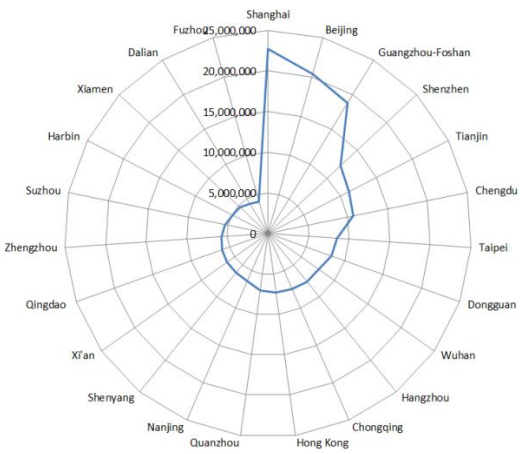
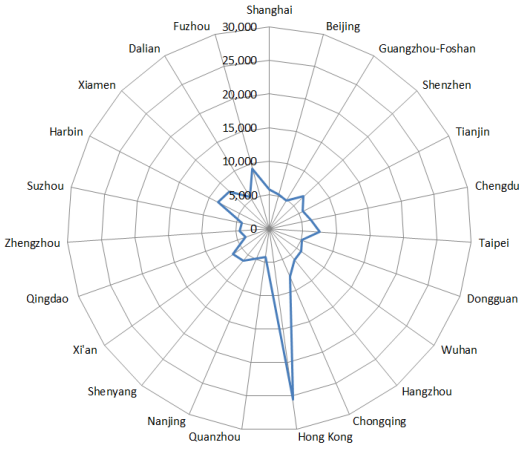


Figure 2: Population Density[2]



Population agglomeration promotes the real property consolidation while reducing the population flow rate. When a disaster happens, localized disasters will affect a large number of residents and real properties, and evacuation difficulties will cause worse damage to people and properties.

2.2. Linkage effects of buildings to disasters

Most Chinese citizens live in high-rise apartments, especially for city residents. Newly built buildings are made of concrete structures, particularly in economy-developed

[2] Population density represents the number of populaiton in per square kilometer.

regions. The concrete structure of buildings pays attention to the overall performance of buildings. The advantage is to enhance the ability of the building as a whole to fight against external attack. However, the disadvantage is that as the structure of apartments determines the correlations among upper-level and lower-level housing, a part of building's damage may cause the whole building's demolition. The linkage effect among separate apartments in one building is impressively significant in disaster loss relief analysis.

Taking earthquake, for example, the disaster damage to a building foundation results in the overall building collapse, causing tremendous loss to the whole building. Therefore, the linkage effect of building enlarges the property loss suffered from disasters. To minimize the loss, research in disaster loss relief should restructure the concept and rebuild the real property loss relief system in the domain of urban disaster governance.

Precisely, the first and foremost step of loss relief is in the pre-disaster phase. Prudent urban planning, strict building codes and regulations and thoroughly clear loss relief awareness are the most important matters in the pre-disaster phase. Multi-level organizations' cooperation is the secondary importance in mid-disaster. Moreover, in post-disaster phase, reasonably government subsidy and insurance compensation are the third importance. The pre-disaster loss relief preparedness and multi-level involvement are vital to the success of real property loss relief.

The current understanding of disaster loss relief emphasizes the importance of loss recovery and real property reconstruction after the disaster. Moreover, theoretically, loss relief is under the domain of disaster management. It is necessary to discuss the difference between loss relief management and loss relief governance.

3. REAL PROPERTY LOSS RELIEF GOVERNANCE

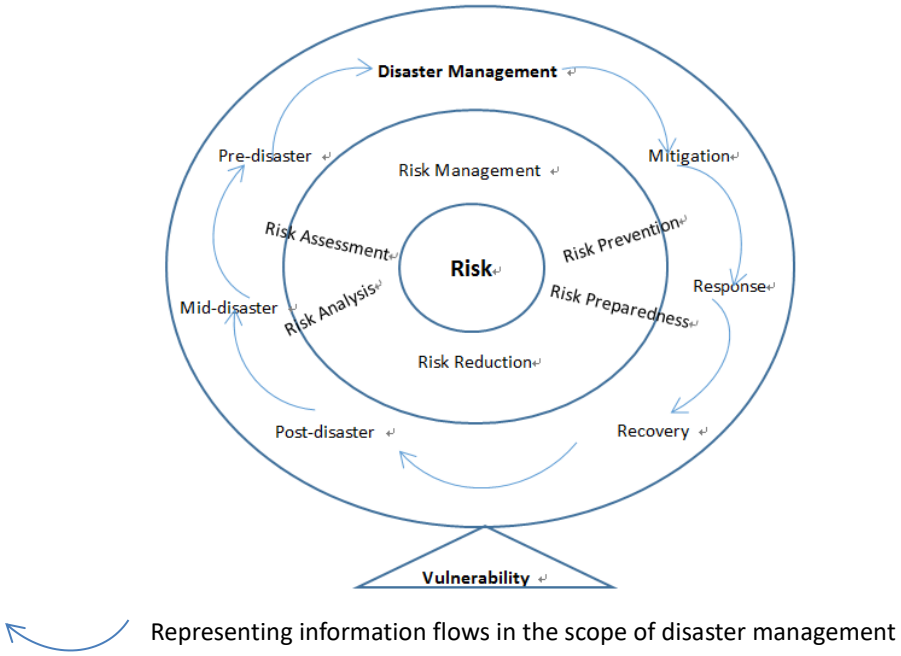
3.1. Loss Relief Management versus Loss Relief Governance

Traditionally, loss relief is regarded as post-disaster loss alleviation and loss management, and loss relief management is in the domain of disaster management (Hur 2012). In common, "disaster governmental process and risk reduction are the main focuses in disaster management as opposed to the concept of governance. The risk was defined as the possibility (probability) of loss, and consequently economic risks as the possibility of the loss of property or loss of function of buildings, utilities, *etc*." (Kárnik, 1984). The factors entering into the estimation of risk are value, vulnerability, and hazard. The elements at risk are any objects or activities exposed to certain dangers.

The core concept of disaster management is the risk. The concept model of disaster management encompasses risk management (RM), risk assessment and risk analysis (RA), risk reduction (RR), risk preparedness and risk prevention (RP) (Figure 3) (Jametti and von Ungern-Sternberg, 2010; Lin Moe and Pathranarakul, 2006). The risk

period covers pre-disaster (*ex-ante*) phase as well as post-disaster (*ex-post*) phase (Linnerooth-Bayer, Warner et al., 2009). The main focus of loss relief management is risk reduction and response capacity, as well as minimizing the environmental vulnerability in the disaster administrative process (Weichselgartner, 2001).

Figure 3: Loss relief management: core and process



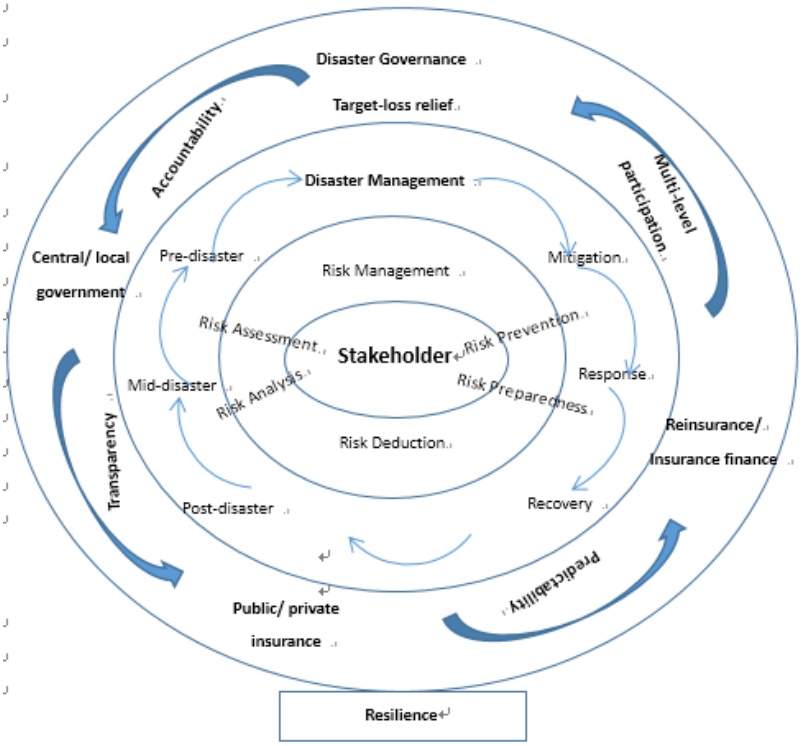
3.2. Loss Relief Governance: Multi-level Governance

Governance means “the process of decision-making and the process by which decisions are implemented (or not implemented)” (Kezar and Eckel, 2004; UNESCAP, 2009). Distributed governance power diverts from traditional centralized government power. It lies in public institutions (government), private organizations (industry associations and other non-governmental organizations), or both public and private sectors, requiring balance and decentralization. Meanwhile, governance theory advocates the interaction in the governmental process, encouraging the participation through mutual dialogue, coordination, and cooperation. The goal is to establish common objectives, achieve maximum utilization of various resources, and ultimately reach a win-win management pattern through both top-down and bottom-up vertical management (Xi-dong, 2005; Yang, Tuladhar et al., 2015).

Temporarily, disaster governance is not yet a widely used term in the literature. Nevertheless, the basic understanding of disaster governance is widely accepted. Comparing to disaster management, “disaster governance is a more inclusive concept in that disaster management, and risk-reduction activities take place in the context of and are enabled (or thwarted) by both societal and disaster-specific governance frameworks.” Disaster governance is often a form of “collaborative governance or activities that bring together multiple organizations to solve problems that extend beyond the purview of any single organization” (Tierney, 2012).

The governance process determines the first and foremost emphasis is the stakeholders' participation. In this paper, stakeholders include counterparts who bear risks either in pre-disaster or post-disaster phase, particularly urban residents. Good disaster governance should focus at least four factors, accountability, transparency, participation and predictability (UNESCAP, 2009; Ahrens and Rudolph, 2006). Different from urban governance, disaster governance emphasizes accountability and allocations of accountability among multi-level participants. The accountability should be well allocated between governments and insurance companies. To enhance the accountability, multi-level organizations' participation and information transparency are rather important. The main purpose of disaster governance is minimizing the loss caused by disasters, and therefore predictability is the key factor in the governmental process (Figure 4). The main difference between loss relief management and loss relief governance lies in the degree of multi-level organizations' participation and public involvement. As for real property loss relief, public input is critical in all aspects of disaster risk planning from central to local governments and community levels. It is important to decentralize policies and customize them according to local needs and priorities (Douglass, 2013; Tierney, 2012). Moreover, multi-level involvement provides an impetus for regional collaboration as multi-level governance separates authority from local contexts (Maldonado, Maitland et al., 2010; Ahrens and Rudolph, 2006; Haghani and Oh 1996).

Figure 4: Loss relief governance: core and process

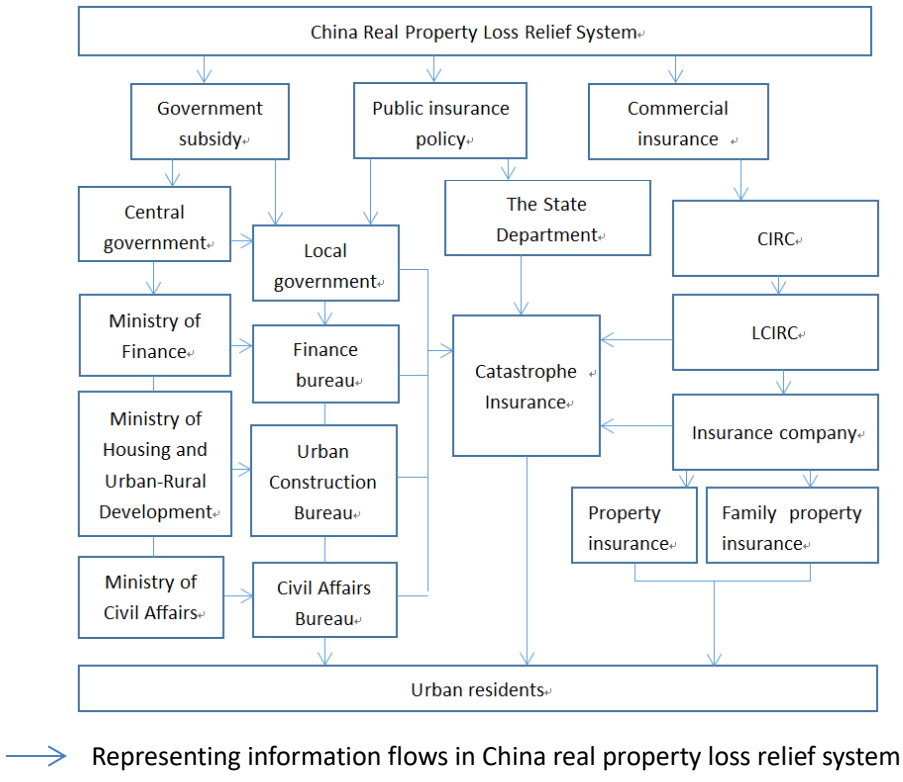


Real property loss relief governance evolves through four stages mostly on the foundation of economic development in one country[3]. China as a country stands at "Stage 2: Mainly *ex-post* funding from the central government" and is evolving to "Stage 3: Some coverage by insurance systems; government is still the main funding source" regarding real property loss relief governance.

4. URBAN REAL PROPERTY LOSS RELIEF SYSTEM IN CHINA

China real property loss relief system is a government-oriented system, which includes three vertical lines that are headed by government subsidy, public insurance policy and commercial insurance (Figure 5). Government-oriented real property loss relief system against disasters is, of course, stronger as insurance markets have limited capacity to diversified catastrophic risks. Government reinsurance is also an effective option covering significant losses caused by major catastrophe (Lewis and Murdock, 1996). In the system, financial solvency is a key support factor to the success of the real property loss relief. Targeted large disasters are designed to under cover of governmental subsidy and public insurance policy, whereas, small disasters are under relief by commercial insurance.

Figure 5: China real property loss relief system



[3] "Stage 1: Very limited funding from central government; heavy reliance on donors; Stage 2: Mainly ex-post funding from the central government; Stage 3: Some coverage by insurance systems; government is still the main funding source; Stage 4: Significant (re)insurance penetration; government supplements by allocating catastrophic risk capital" (Michel-Kerjan, Zelenko et al. 2011).

4.1. Methodology

The research adopted desk research and interviews with China Insurance Regulatory Commission (CIRC), insurance companies and citizens. Desk research was for gathering soft documents from official websites of governments, ministries, CIRC and insurance companies. The desk work also reviewed published regulations and official obligations from the Ministry of Finance, the Ministry of Housing and Urban-rural Development, and the Ministry of Civil Affairs, and local finance bureau, urban construction bureau and civil affairs bureau, and CIRC and local CIRC. To investigate the practical implementation of real property loss relief, the research team conducted interviews with CIRC, Property Insurance Company China (PICC) and individual citizens. During the interviews, the team collected first-hand information of current real property loss relief system in China.

4.2. Government Subsidy

Government subsidy is from top-level government, central government, through the Ministries subordinated to the central government and impact on the local government and its subordinated local bureaus and finally reaches urban residents (Melo Zurita, Cook et al., 2015). The central government is responsible for the national disaster loss relief regulations and decisions. Its subordinate ministries, such as the Ministry of Finance, the Ministry of Civil Affairs, and the Ministry of Housing and Urban-Rural Development are the direct organs taking responsibility for urban real property loss relief regulations and decisions. Moreover, they convey the regulations to local governments. Similar to the central governmental process, local governments are in charge of local loss relief implementation with the subordinated departments, the civil affairs bureau, urban construction bureau, and finance bureau.

The government subsidy was the most common way for the enormous disaster loss relief although it was an uncertain governmental relief method comparing to commercial insurances (Raschky, Schwarze et al., 2013). The 850 billion loss of Wenchuan earthquake was mostly covered by the government relief and charitable donations. Although the local financial capacity is vital to the successful implementation of local loss relief, as the high state financial payment and local finance expenditure, local governments bear the burden of the fiscal deficit. Meanwhile, due to the limitied capacity of reinsurance, the subsidy mechanism is rather weak in the current institutional environment (Shi, 2012).

4.3. Commercial Property Insurance

Commercial property insurance is a market mechanism for real property loss relief. It is deemed as an effective way of governance (Ericson, Doyle et al. 2003). In China, the implementation of commercial property insurance is through China Insurance Regulation Commission (CIRC), Local China Insurance Regulatory Commission (LCIRC), local insurance companies to individual insurers. CIRC is one of the State Council agencies, which is particularly responsible for the supervision of insurance industries. The subordinated department of property and casualty insurance

undertakes the monitoring obligations of property insurance companies and reinsurance companies. The main function is formulating regulations and property insurance actuarial system, monitoring the insurance company's asset quality and solvency, inspecting and regulating market behavior, and protecting insurers' rights.

Since losses are highly correlated geographically as well as insurance companies have regional risk resistance awareness, first insurance companies frequently seek product design, rate control, and reinsurance to manage their exposure to natural disaster losses(Lewis and Murdock, 1996; Kárnik, 1984). Therefore, regarding insurance product design, insurance company maintains its profit through the following rules of product design (Kárnik, 1984):

"*(a) The insured event has to occur with a certain regularity, in a given period;*

(b) The sustained damage must be measurable; it must be possible to calculate the probability of occurrence and the degree of harm;

(c) The risks must be spread geographically;

(d) The amount of damage must be limited. "

There are considerable difficulties in bringing financial mechanisms designed for frequent small losses to efficiently and profitably relate to rare catastrophic losses as the significant risk is hard to transfer (Lewis and Murdock, 1996).

Property insurance products consist of two types, which are basic insurance and comprehensive insurance (Kunreuther, 1968). In China, the most influential property insurance company, PICC, provides similar insurance products to residents. The research team investigates the PICC with interviews. The interviews are with the chief manager of Property Insurance and Reinsurance Department. During the interviews, the research team finds that PICC engages two main products that are property insurance and family property insurance. Property insurance includes basic insurance clause, comprehend insurance clause and complete insurance clause with diverting insurance rate (Table 3). Family property insurance includes basic insurance clause plus additional clauses and comprehensive insurance provisions. Generally speaking, the insurance clauses advise the insurers to choose among the three clauses and different insurance rate, which differentiate the insurance objects and liabilities by package prices (Table 4).

Table 3: Property insurance clauses

Property insurance clauses_PICC_2009 Edition			
Basic insurance clause	Insurance liability	Clause 5	During the period of insurance, the insurer shall be liable for compensation by the contract, for the loss of the insured subject to the following reasons: (a) fire; (b) explosion; (c) lightning; (d) flying objects and other aerial objects falling.
	Liability exemption	Clause 7.4	Earthquake, tsunami and its secondary disasters
		Clause 7.8	Storm, flood, storm, tornado, hail, typhoons, hurricanes, snow, ice, dust storm, sudden landslide, collapse, debris flow, sudden ground subsidence
Comprehend insurance clause	Insurance liability	Clause 5	During the period of insurance, the insurer shall be liable for compensation by the contract, for the loss of the insured subject to the following reasons: (a) fire and explosion; (b) lightning, heavy rain, flood, storm, tornado, hail, typhoon, hurricane, snow, ice, sudden landslide, collapse, debris flow, suddenly the ground subsidence of; (c) flying objects and other aerial objects falling.
	Liability exemption	Clause 8.5	Earthquake, tsunami and its secondary disasters
Complete insurance clause	Insurance liability	Clause 5	In the period of insurance, as a result of natural disasters or accidents causing direct damage or loss of the insured object (hereinafter referred to as "loss"), the insurer shall be liable for compensation by the contract.
	Liability exemption	Clause 7.4	Earthquake, tsunami and its secondary disasters

Table 4: Family property insurance clauses

Family property insurance clauses_PICC_2009 Edition			
Basic insurance clause	Insurance liability	Clause 4	In the period of insurance, the insurer shall be liable for compensation by the contract for the loss of the insured subject to the following reasons: (a) fire; (b) lightning; (c) explosion; (d) the falling of flying objects and other air operated objects, not of the collapse of the other buildings and the fixed objects that are used by the insured.
	Liability exemption	Clause 7.2	All losses caused by the earthquake and its secondary disasters;
		Clause 7.8	Storm, flood, storm, tornado, hail, typhoon, hurricane, snow, ice, dust storms, sudden landslide, collapse, debris flow, sudden ground subsidence
Additional clauses	Insurance liability	FJ01.	Tornado, storm, heavy rain, snow, and ice additional insurance clauses
Comprehensive insurance provisions	Insurance liability	Clause 5	In the period of insurance, the insurer shall be liable for compensation by the contract for the loss of the insured subject to the following reasons: (a) fire, explosion; (b) lightning, typhoon, tornado, storm, flood, snow, hail, ice, landslide, collapse, debris flow, and sudden ground subsidence; (c) the falling of flying objects and other air operated objects, not of the collapse of the other buildings and the fixed objects that are used by the insured.
	Liability exemption	Clause 7	(a) nuclear radiation, nuclear explosion; (b) earthquake, tsunami and secondary disasters.

In the investigation, the research finds that the insurance companies cannot bear the massive disaster risk. The insurance product is designed to bear property loss caused by property stealing and other housing regular low risk. Market mechanism has limited capacity to protect real property from disaster loss, not even mentioning loss relief, which is the market failure aspect of insurance relief. “Market failure in natural disaster insurance is widely recognized. Most natural disaster insurance schemes include various degrees of public-sector participation” (Jametti and von Ungern-Sternberg, 2010). Moreover, the prevalence of commercial disaster insurance is affected by the income level of one country (Tierney, 2012). In China, the real property commercial insurance market is not mature enough as citizens’ insurance awareness is considerably low and insurance companies have difficulties in expanding marketing

channels, which leads to even worse results. Thus, it is not surprising that Wenchuan earthquake insurance compensation is under 0.2% after the disaster.

In all, the loss relief is insufficient to rely solely on commercial insurance. In fact, when catastrophic disasters occur, the majority of commercial insurance risk has transferred to the central government and local government.

4.4. Public Insurance Policy: A Governance Framework

The governmental process focuses on loss management through official channels. The main purpose is to assure the real property loss can be compensated after disasters through government payments by humanitarian considerations and insurance companies by insurance contracts (Van Asseldonk, Meuwissen et al., 2002). However, as for catastrophic disasters, it is out of the consideration that the shocking loss is over the finance capacity of local governments. Moreover, as the low insurance awareness, limited insurance companies' propaganda, and insufficient cooperation with multi-level organizations, the real property loss relief is almost an impossible task for local governments (Jaffee and Russell, 2006). As mentioned above, in Wenchuan earthquake, the responsibility of real property loss relief was undertaken by the central government mostly at last. The disaster risk was not allocated fairly in the social system. Moreover, such case should not be a model for future relief-system reconstruction.

The research team conducted interviews with the real property insurance company PICC and the Department of Property and Casualty Insurance, CIRC to investigate public-private multi-level cooperation regarding real property loss relief system. The multi-level cooperation includes the cornerstone insurance policy, the loss relief pilots of catastrophe insurance, and the establishment of catastrophe insurance loss relief. It symbolizes China has moved from the stage 2 to stage 3 regarding real property loss relief system.

4.4.1. Cornerstone insurance policy

The cornerstone in real property loss relief is the introduction of policy "Several Opinions on Accelerating the Development of Modern Insurance Services" on 13 Aug 2014. The policy proposed 2020 development goals of insurance industries. "By 2020, insurance depth (premium income divided by gross domestic product) would reach 5%, the insurance density (premium income divided by total population) reached 3500 RMB per person, enabling real property insurance as the social 'stabilizer' and 'booster.'" Meanwhile, it emphasized the need for corporating insurance into the disaster prevention and rescue system; particularly, it decided the establishment of catastrophe insurance system. This policy outlined the blueprint of the route of insurance industries by 2020 and promoted the necessity of incorporating private insurance companies into governmental loss relief system.

4.4.2. Catastrophe insurance: loss relief pilots

From 2013 to 2015, pilot cities such as Shenzhen and Ningbo took the first step to catastrophe public insurance loss relief using public government insurance. The

government of Shenzhen made active exploration in this area. By the end of 2013, the Shenzhen municipal government passed through the "Shenzhen catastrophe insurance pilot scheme," according to natural disaster's frequency and unique geological characteristics. The scheme included 15 risks such as typhoons, landslides, floods, nuclear security, *etc*. All of Shenzhen residents were involved in the program protection. Every year, the government invested 36 million RMB in buying such a loss-resistant protection (Table 5).

Similarly, Ningbo, according to the geological location and natural disasters, included flood, debris flow, typhoon, landslide, *etc*. in the catastrophe scheme. The Ningbo government funded 57 million RMB for the city's 1000 million residents (including foreigners) to purchase sum-up 700 million catastrophe insurance. The insurance compensation including 300 million RMB due to typhoons, rainstorms and floods and other natural disasters and secondary disasters, 300 million RMB due to household's property loss, 100 million RMB due to the sudden major public safety incidents fulfilled in the year 2014 (Table 5).

Table 5: Catastrophe insurance pilot cities

City/ Province	Pilot time	Insurance objects	Government payment per year
Shenzhen	Dec 2013	Typhoon, debris flows, floods and nuclear power security, *etc*.	36 million RMB
Ningbo	Nov 2014	Flood, debris flow, typhoon, landslide, *etc*.	57 million RMB

4.4.3. Establishment of public catastrophe insurance

The CIRC issued the "Establishment of Urban-Rural Residential Earthquake Insurance System Implementation Plan" on 11 May 2016. It was the symbolism of the official implementation of the catastrophe insurance system

The earthquake catastrophe insurance is introduced as a breakthrough in the development of urban and rural residential earthquake catastrophe insurance products, symbolizing the establishment of Chinese residential earthquake insurance community. Adhere to the "government promotion, market operation and residents' livelihood security" principle; the catastrophe insurance establishes solid public-insurance foundations using well-deigned mode selection, solvency, fund collection, liability limitation and pricing model.

<u>Mode selection</u>

The Implementation plan clarifies that the government is the main driver to promote market operation. The government implementation scheme promotes the refinement effect for the design of the system, legislation and policy support; and the determination

of market operation, the insurance market, especially residential earthquake community is responsible for the specific operation, which is called “government-community combination mode.”

Solvency

The implementation plan establishes the rule of risk sharing and grading burden by risk layering techniques that allocates disaster risks among five-layer dispersion mechanism. The mechanism involves insurers, insurance companies, reinsurance companies, earthquake catastrophe insurance special reserve, government financial support.

Fund collection

The implementation plan is a "voluntary" plus "positive incentives" mode, that is, to encourage local public finance for the implementation of premium subsidies, and to give tax incentives to insurance companies and insurers, which merges advantages of compulsory insurance and voluntary insurance (Michel-Kerjan, Zelenko et al. 2011).

Liability limitation

The implementation plan clearly defines liability limitation in an earthquake. Under the fixed value premise, actual losses and liability are cured into three gears to ensure clear and straightforward operation. Basic insurance coverage 20,000 RMB and 50,000 RMB together with the maximum sum 1 million RMB are covered under the public insurance policy. When the insurance sum spills over 1 million, the loss relief can be resolved through the commercial insurance. The actual amount limits explicitly define quasi-public goods from the private product.

Pricing model

The pricing model is designed to the level of regional risks, building construction types, and urban-rural differences in differentiated insurance rates. The important setting-up threshold in the plan is that buildings should meet the requirements of the national building quality (including seismic fortification standards). The principle means the insurance object should be the buildings with national construction quality requirements (including seismic fortification criterion) and indoor ancillary facilities. Moreover, the main insurance liability covers devastating earthquake vibration caused by the tsunami, fire, explosion, subsidence, landslides, and landslides secondary disasters.

China real property loss relief has experienced from government subsidy, commercial insurance to policy-driven public insurance, which fully reflects the transition trend from disaster management to disaster governance. The current system highlights the multi-level involvement in the process of loss relief including government instruction and regulation as well as private insurance companies’ cooperation. Although the market mechanism functions weakly, NGOs and individual residents hopefully participate actively in the future. China has moved a vital step forward towards a more inclusive and coordinated real property loss relief system.

5. DISCUSSION

Researchers' attention in real property loss relief was mainly in rural areas. Nevertheless, the paper suggests urban disaster and its damage to urban real properties cannot be ignored because urban consolidation causes high property density. And the linkage effects of buildings to disasters are dangerous. With the background of rapid urbanization, the research on urban real property loss relief is a vital research topic in the current environment.

Beyond the analysis of section 3 and 4, the paper finds out on the topic of urban real property loss relief; there are some other practical issues vital to the implementation. Firstly, holistic governance concept is influential to the success of real property loss relief system. Holistic governance should cover pre-disaster, mid-disaster, and post-disaster phases, emphasizing the coordination of urban planning, urban construction, and urban development stages. It is critical to identify urban hazards before urban planning, reasonably plan urban districts, firmly abide by building construction codes and sustainably enhance urban security regarding energy consumption, emergency infrastructure, and evacuation facilities (Lodree Jr and Taskin, 2008).

Secondly, as disaster governance's core concept is the stakeholder, it is vital to enhance stakeholders' awareness of loss prevention and self-relief methods. Extensive evidence shows that residents in hazard-prone areas have not sufficient awareness to conduct loss prevention measures voluntarily (Kunreuther, 2006), particularly in developing countries (Linnerooth-Bayer, Warner et al., 2009). During the interviews, the research team finds out except for officers in CIRC and managers in insurance companies, most of the citizens have no idea that property insurance is a necessary way for real property loss relief. It is urgent to develop channels for insurance propaganda and enhance people's insurance awareness (Wang, Liao et al., 2012).

Thirdly, regional loss estimation methods are not clear. Basing on real property loss degree the estimation includes extreme-loss estimation, medium-loss estimation, and low-loss estimation. In general, extreme-loss estimation goes to the government through government subsidy; medium-loss estimation goes to insurance companies and reinsurance companies; the low-loss estimation goes to insurance companies and individuals. Official earthquake damage estimation instruction is mostly for individual buildings. As for regional earthquake loss, researchers propose isoseismal map method (Yuan, 2008) while for other common disasters, regional loss estimation method is not well developed (Downton and Pielke, 2005). The low and medium loss estimation follows market price or the replacement cost of damaged parts, which is prevalently used in the market. Meanwhile, direct loss and indirect loss relief are well defined in the research. Terminologically, the direct loss reflects damage to plant, equipment, and infrastructure plus loss of income as a direct result of damage. The indirect loss is any loss other than direct loss (Cochrane, 2004). For individuals, indirect loss includes income loss expect for the direct real property loss. Whereas for regional

and national levels, indirect losses become more significant. It includes regional and national facilities damage, infrastructures damage, an indirect loss for inter-industry and postponed impacts, rebuilding assistance, unemployment compensation, survivor benefit payments, tourism offset and so on so forth. The indirect loss could be more harmful to the whole economic system than the direct loss. Therefore, mentioning real property loss relief, it is necessary to take not only the direct loss but also the indirect loss into account.

Last but not least, the most influential disaster to urban areas, the flood, is not well researched. The urban disaster frequency study suggests that floods are the most influential natural disasters in urban areas[4] (Gallardo, 1984). However, no matter private insurances or government public insurance has not established the solid floods loss relief system.

6. CONCLUSION

The rapid urban transition involves people and real properties in disaster hazards in core cities and hazard-prone areas due to urban consolidation as well as urban boundary expansion. The importance of urban disaster and its damage to urban real properties should be highlighted in disaster researches.

There is a significant difference between loss relief management and loss relief governance, which causes divert key research processes and focuses. Loss relief management is in the domain of disaster management which underlines risks as the core concept; while loss relief governance is in the scope of disaster governance which emphasizes stakeholders as the core focus. It is necessary to build real property loss relief system under the framework of disaster governance that consists of four key factors accountability, transparency, participation and predictability, paying attention to multi-level organizations' cooperation.

The research team conducted regulation revisions and field investigations and found out real property loss relief system in China has experienced two stages that are mainly *ex-post* funding from the central government and some coverage by insurance systems while government as the main source of finance. Currently, China real property loss relief system includes government subsidy, commercial insurance, and public insurance policy, implementing the multi-level cooperation although market mechanism still relatively weak.

The research team will continue the research in urban real property loss relief in the four specific fields discussed in section 5, which are urban hazard identification, insurance channel development, insurance awareness cultivation, regional loss estimation, and flood loss-relief system development specifically in the future.

[4] Floods 52 %, earthquakes 17 %, hurricanes 15 %, drought 7%, volcanic eruptions 3%, others 6% (Gallardo, 1984).

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