

EARTHQUAKE LESSONS FROM CHINA

COPING AND REBUILDING STRATEGIES



EDITED BY

KEVIN Z. CHEN, QIANG ZHANG, AND CLAIRE HSU

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Earthquake Lessons from China

Coping and Rebuilding Strategies

Edited by Kevin Z. Chen, Qiang Zhang, and Claire Hsu

A Peer-Reviewed Publication

International Food Policy Research Institute
Washington, DC

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DOI: 10.2499/9780896298743

Library of Congress Cataloging-in-Publication Data

Earthquake lessons from China : coping and rebuilding strategies / edited by
Kevin Z. Chen, Qiang Zhang, and Claire Hsu.

pages cm

Includes bibliographical references and index.

ISBN 978-0-89629-874-3 (alk. paper)

1. Wenchuan Earthquake, China, 2008. 2. Earthquakes—China—
Wenchuan Xian (Sichuan Sheng) 3. Disaster relief—China—Wenchuan
Xian (Sichuan Sheng) 4. Emergency management—China—Wenchuan
Xian (Sichuan Sheng) I. Chen, Kevin Z., editor.

HV6002008.W46 E24 2016

363.34'9580951—dc23

2015034827

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Acronyms and Abbreviations

CAAC	Civil Aviation Administration of China
CASW	China Association of Social Workers
CBDM	Community-based disaster management
CCF	China Charity Federation
CCTV	China Central Television
CNR	China National Radio
CPC	Communist Party of China
CPERRF	Central Post-Wenchuan Earthquake Restoration and Reconstruction Fund
CWDF	China Women's Development Foundation
GONGO	government-organized nongovernmental organization
MLD	mean log deviation
NDRC	National Development and Reform Commission
NGO	nongovernmental organizations
PLA	People's Liberation Army
PRB	Population Reference Bureau
PRC	People's Republic of China
PTSD	post-traumatic stress disorder
RCSC	Red Cross Society of China
RMB	renminbi
SARFT	State Administration of Radio, Film, and Television

SARS	Severe Acute Respiratory Syndrome
SASAC	State-Owned Assets Supervision and Administration Commission
SMM	student maximum modulus
SOF	Sub-headquarter of Frontline
UNDP	United Nations Development Program

Foreword

The 2008 Wenchuan earthquake had a devastating physical and socioeconomic impact on China. The disaster led to the deaths and disappearances of nearly 90,000 people and economic losses of 845 billion yuan. It directly affected some 46 million people's lives overall.

Nevertheless, public, private, and nonprofit actors responded effectively and comprehensively to the earthquake. In *Earthquake Lessons from China*, the authors identify and discuss the crucial disaster management innovations that were put to use by China as it coped with the earthquake's aftermath.

The most important disaster management policy innovations included pair-wise aid, in which one donor province or city is assigned to a recipient area; increased NGO involvement in disaster response; living subsidies and other financial aid to affected households; and integrating poverty reduction policies into disaster management.

A common theme across all these innovations is diffusion. Disaster response efforts were diffused across a longer timescale than they had been in the past, going beyond immediate aid to those affected by the earthquake to also include measures to mitigate future earthquakes, long-term reconstruction, and poverty reduction. Disaster response was also diffused across the policy environment so as to include a greater number of agencies and actors. This diffusion may not only reshape China's response to disasters but also encourage greater decentralization in China's hierarchical social and governance structure.

Given the great deal of attention China's response to the 2008 earthquake has attracted internationally, lessons drawn from it can guide future disaster management not only in China but elsewhere as well. Openness to innovative approaches was critical to this response and will be vital to future natural

disaster responses. More diffuse approaches to disaster management can dramatically improve global resilience against natural disaster. For these reasons, this book and its findings should be valuable to policymakers and business and NGO leaders concerned with improving responses to natural disasters.

Shenggen Fan
Director General, IFPRI

Acknowledgments

The editors would like to express their appreciation to the IFPRI Innovation Fund and CGIAR Research Program on Policy, Institution, and Markets (PIM) for their support of the project. The editors are grateful to the Publication Review Committee and the two anonymous reviewers for their very helpful comments. The editors would also like to convey their deepest gratitude to the policymakers and experts who contributed to this report. We thank them for the time and energy they dedicated to sharing their experiences and insights on this pressing issue.

WENCHUAN EARTHQUAKE OVERVIEW

Kevin Z. Chen, Claire Hsu, and Qiang Zhang

Natural catastrophe has seemingly become a part of our daily lives as news that a natural disaster has taken place somewhere in the world has become all too commonplace. Earthquakes in particular inhabit a special position within the array of natural hazards against which humanity perseveres because they can result in some of the most devastating losses of life and property and critically disrupt and delay economic development. Especially worrisome is the rising trend seen since the 1970s in the number of earthquakes causing significant human and economic loss (Guha-Sapir and Vos 2011). Unfortunately, this worrisome trend is expected to continue as urbanization progresses and as global exposure (though not necessarily vulnerability) to disaster risk expands. As of 2009, the number of people living in cities exposed to earthquakes was approximately 370 million worldwide, a number that is expected to more than double by 2050 (Lall and Deichmann 2009).

China is no stranger to natural disaster, or to earthquakes in particular, because half of its territory consists of high-intensity earthquake regions (Yu et al. 2010). Although China already contends with a staggering variety and frequency of severe natural disasters, in part due to its rapid economic development in recent decades, continued development, along with the onset of global climate change (Zou and Yuan 2010), is expected to increase China's exposure and is considered to pose additional threats. Although China's exposure to natural disasters has increased because of its recent development and urbanization, disaster management has figured prominently in Chinese governance throughout its long history, perhaps most famously as a means of confirming or denying the emperor's Mandate of Heaven, or divine right to rule, which was perceived to have been withdrawn when natural disasters occurred.

Nonetheless, the physical and social impact of the Wenchuan earthquake was devastating. On May 12, 2008, the earthquake, which according to the China Seismological Bureau registered 8.0 on the Richter scale (CCTV 2008), shook the nation as the most severe earthquake, in terms

of sheer magnitude, to strike modern China since its founding in 1949. Its tremors resulted in the deaths and disappearances of nearly 90,000 people (Xinhua, 2009), more than 5,000 of whom were schoolchildren (Bai et al. 2009), and RMB 845 billion in direct economic losses (Xinhua 2008). Ultimately, the total disaster area covered 500,000 square kilometers with the quake's destruction extending, to a varying extent, across 10 provinces, autonomous regions, and direct-controlled municipalities: Sichuan, Gansu, Shaanxi, Chongqing, Yunnan, Hubei, Guizhou, Henan, Shanxi, and Hunan (China, Ministry of Civil Affairs, NCDR and UNDP 2009). The quake's tremors could be felt in neighboring countries and in cities as distant as Beijing—1,545 kilometers away (BBC 2008). Ultimately, the disaster affected more than 46 million people, and its social impacts ranged from homelessness to loss of livelihood to post-traumatic stress disorder and other trauma-related psychological disorders (China, Ministry of Civil Affairs, NCDR and UNDP 2009). However, the staggering scale of the damage and destruction of the quake was met with quick and aggressive responses by public, private, and nonprofit actors.

In launching relief and rescue efforts, national and local authorities faced overwhelming obstacles such as the mountainous and remote terrain and the disrupted telecommunications and transportation infrastructure as well as a lack of readily available equipment and supplies. At the national level, the central government promptly enacted a number of organizational measures to initiate disaster response, including the same-day establishment of the State Council Earthquake Rescue and Relief Headquarters, commanded by Premier Wen Jiabao, who personally traveled to the disaster area that afternoon. The State Council Earthquake Rescue and Relief Headquarters in turn formed and oversaw nine subordinate working groups: (1) the Headquarters of the General Staff of the Chinese People's Liberation Army rescue and relief group, (2) the Ministry of Civil Affairs public livelihood support group, (3) the China Earthquake Administration earthquake monitoring group, (4) the Ministry of Health epidemic control group, (5) the Publicity Department of the CPC Central Committee publicity group, (6) the Ministry of Industry and Information Technology production restoration group, (7) the National Development and Reform Commission infrastructure assurance and post-disaster reconstruction group, (8) the Ministry of Water Resources water administration group, and (9) the Ministry of Public Security social security group. At the local and provincial levels, the Sichuan provincial government established the 512 earthquake relief command headquarters (which also formed and coordinated the efforts of various

working groups), while key disaster relief bodies were set up in some cities, autonomous prefectures, and counties (China, Ministry of Civil Affairs, NCDR and UNDP 2009).

The Chinese government also established the Regulations on Post-Wenchuan Earthquake Rehabilitation and Reconstruction on June 8, 2008 (China, State Council 2008a), to facilitate and hasten the country's "return to normalcy" (UNESCAP CDR 2008a). Building off of China's already comprehensive set of disaster laws and regulations (including the Law on Earthquake Preparedness and Disaster Reduction, the National Master Plan for Responding to Public Emergencies, five national thematic disaster response plans, and emergency response plans for 15 central government departments), the Regulations on Post-Wenchuan Earthquake Rehabilitation and Reconstruction outlined the following priorities, strategies, and measures:

- People-oriented actions to ensure a safer environment
- Scientifically sound and comprehensive planning
- Phase-by-phase implementation
- A joint-funding mechanism that combined self-reliance, government subsidies, and social donation assistance
- A survey to assess the losses and estimate the costs of rehabilitation and reconstruction
- A comprehensive assistance scheme that paired 19 provincial administrations with 19 counties in the earthquake zone

Following the establishment of the regulations, the government released the State Overall Plan for Post-Wenchuan Earthquake Restoration and Reconstruction (China, NDRC 2008). The plan allocated nearly RMB 1 trillion to the reconstruction of 51 seriously hit counties in Sichuan, Gansu, and Shaanxi. Because the affected region was characterized by great risk of secondary disasters, diverse levels of development, and the presence of world cultural and natural heritage sites and reserves, as well as of ethnic minority settlements, the plan grouped areas for reconstruction into three categories.

First, areas with lower disaster risk and greater carrying capacity were categorized as suitable for urbanization and industrialization. Second, areas with greater disaster risk and less carrying capacity were targeted for appropriate urban reconstruction and the development of select industries. Third, ecologically significant areas with low carrying capacity, great disaster risk, and

prohibitive construction costs and conditions were designated to accommodate small scattered populations and to shelter natural and cultural resources. The approach for the third category also involved relocation. In this way, the government sought to efficiently allocate its considerable though finite reconstruction resources.

World Bank officials commended “the speed and efficiency with which the Chinese government was able to mobilize government agencies, the private sector and the population at large” (Argueta-Bernal and Procee 2012). Other observers cited favorably the cooperative attitude toward foreign journalists and foreign aid (*The Economist* 2008). In addition to the government’s efforts, private companies donated record levels of aid to the rescue effort (Sarkis, Ni, and Zhu 2011). The tragedy also served as a watershed moment for China’s civil society, inspiring unprecedented numbers of Chinese citizens to volunteer their time and to donate their money (Shieh and Deng 2011; Teets 2009).

In the event of an earthquake, however, China’s hierarchical society and top-down governance structure (Zhang 2006) also faces a challenge in effectively delivering the massive aid and rebuilding the disaster areas, for multiple reasons. If some of the government buildings were to be damaged or if the civil service were to suffer casualties, the local government’s capacity, which would be a critical resource during such a time of crisis, would need to be rebuilt, a daunting task. Also, there exists widespread information asymmetry between the different levels of government. As there are large differences in needs across counties and villages, it is a great challenge, for the central government faces a challenge to quickly obtain accurate information about the degree of damage and the resources necessary for recovery in the various disaster areas.

Nevertheless, China’s disaster management efforts following the 2008 Wenchuan earthquake gained significant international recognition. Central to this achievement was China’s willingness to critically appraise existing disaster management strategies and to explore innovative approaches. This book explores key innovations in China’s response to the Wenchuan earthquake by presenting firsthand accounts of the policymakers who oversaw major paradigm shifts in disaster management strategies, as well as the research of leading experts.

History of China’s Disaster Management System

China’s disaster management system went through three distinct stages, identified by Zhang, Lu, and Zhang (2011).

Stage 1: Founding of People's Republic of China to SARS (1949 to 2003)

The first stage of modern China's disaster management system was characterized by the strong role of the central government: nearly all disaster management functions were performed via top-down political mobilization and centralized post-disaster command, and grassroots social organizational capacity was insufficient. Consequently, the central government emerged as the leading player in disaster relief, while the contribution of local governments and civil society was negligible. Moreover, in its approach to disaster management, the central government attached overwhelming importance to the direct economic damages and losses caused by natural disasters, while the social impacts were simply ignored.

A number of major legislative and policy developments took place during this first stage. At the end of 1949, a national disaster reduction and relief system was established by the Government Administration Council of the central people's government, centered around the Ministry of Internal Affairs (predecessor to the current Ministry of Civil Affairs). Later, in 1950, the Central Disaster Relief Commission was established to create a specialized office within the Ministry of Internal Affairs to oversee disaster management. Later, the disaster management system was redesigned so that the management of individual disasters was assigned to specific departments according to the type of disaster involved. For example, the Ministry of Water Resources was responsible for flood control, while the Seismological Bureau was responsible for coping with earthquakes.

In 1951 the Notice on Uniform Standards for Disaster Statistics was issued by the Central Manufacture Disaster Relief Commission. At the First National Civil Affairs Conference in 1950, it was proposed that China's disaster relief policy be defined as "pulling through by hard working, resource saving, mutual assistance, work relief and other necessary relief" (Li 2007). Improvement of the disaster management system, however, largely came to a halt during the Cultural Revolution. Unfortunately, during this period China suffered two of the greatest disasters of its modern period, the famine associated with the Great Leap Forward (1959–1961) and the Tangshan earthquake (1976).

The number of casualties caused by the famine is still being debated; estimates range from 10 to 30 million (Xia and Kang 2001; Cong 1989; Li 1998; Kane 1993; Li 2012). In order to explain the extensive loss of lives during the Great Leap Forward, President Liu Shaoqi (1959–1968) said, "*sanfentian-zai, qifenrenhuo*," which translates to "30 percent natural disaster, 70 percent

man-made disaster,” and points to the occurrence of a natural disaster (in this case drought) during a period of both policy incompetence and social chaos (Liu 1991). The Tangshan earthquake, which caused 242,419 deaths, highlighted a number of lessons. For example, although the city was located in a high-intensity disaster zone, it was designed to withstand earthquakes of only magnitude 6.0 on the Richter scale, far short of what the city needed to withstand the magnitude 8.0 earthquake that struck in 1976. Also, the emphasis during that time on ideological struggle rather than on the pursuit of scientific fact hampered China’s disaster management capacity (Xia and Kang 2001).

As a result of the reform and opening up in 1978, China’s rapid development led to increased exposure, both in terms of frequency and severity, to natural disasters, epidemics, and industrial accidents. The old system in which specific departments were paired with specific types of disasters quickly became overwhelmed, leading to disaster management coordination failures among the various sectors. In response, an interdepartmental deliberation and coordination mechanism was built as part of a larger overhaul of the organization of government departments.

Under this new mechanism, various organizations were established by the State Council, including the National Disaster Reduction Committee, State Flood Control and Drought Relief Headquarters, Prevention Headquarters, China’s National Nuclear Emergency Coordination Committee, and National Disaster Control and Relief Coordination Office, with many corresponding organs set up by governments at the provincial and lower levels as well. The organization of the local disaster relief organs generally reflected that of the central government’s, with the National Disaster Reduction Committee acting as a coordinating organization and the Ministry of Civil Affairs taking responsibility for disaster-relief work. This structure was maintained until 1994 (after the 10th National Civil Affairs Conference), when a level-to-level management system (*fengqiguanli*) of disaster relief was instituted by the central and local governments, under which governments were responsible for providing relief for their own jurisdictions.

Stage 2: SARS to Wenchuan Earthquake (2003 to 2008)

The second stage of modern China’s disaster management began in 2003, during the outbreak of severe acute respiratory syndrome (SARS), and came to a close in 2008 with the occurrence of the Wenchuan earthquake. After the onset of SARS, disaster management came to be viewed as fundamental to effective public governance, and the government took measures to build

an emergency management system focused on laying out plans, passing laws, establishing systems and mechanisms for emergency management, and completely replacing the traditional system that paired one department with one type of disaster.

Some major disaster management milestones were reached by the General Office of the State Council during this period. The Office set up a task force on proposing emergency plans (2003), drafted national-level emergency plans (2004), issued the national-level master plan and issued a policy to ask local governments to set up emergency management offices at each level of government and draft contingency plans (2005), issued a policy to ask enterprises to draft their own contingency plans (2006), and facilitated local governments' delivery of capacity building to communities (2007) (Hua 2007).

By the end of 2007, the effort to complete the new emergency management system—centered on the construction of plans, laws, systems, and mechanisms for emergency management—was nearly complete (Shan 2012). The effort included the preparation and issuance of the Master State Plan for Rapid Response to Public Emergencies and a comprehensive emergency plan system that encompassed that plan, the special state plans for responses to specific emergencies, departmental emergency plans, local emergency plans, and emergency plans for enterprises and public institutions (Shan and Zhou 2008). Additionally, the number of emergency management plans of all types and at all levels of government grew from 106 to 1.3 million, illustrating the growing importance of emergency management across all levels of government.

Provincial leading organs for emergency management were set up in all 31 provinces, autonomous regions, and municipalities, and special functional organs for emergency management were strengthened, including those for state flood control and drought relief, earthquake resistance and hazard mitigation, maritime search and rescue, forest fire prevention, disaster relief, and production safety.

Various emergency management mechanisms were constructed. These included emergency monitoring and early-warning mechanisms, communication mechanisms, emergency decisionmaking and coordinating mechanisms, responsibility and response mechanisms on a level-to-level basis, social-mobilization mechanisms, emergency resources allocation and requisition mechanisms, incentive structures, an integrated public security system, a comprehensive community management system, a new system to coordinate interactions between government and civil society, and international coordination mechanisms (Gao 2008).

Also, the Law of Response to Public Emergencies of the People's Republic of China, China's first basic law for emergency management, was passed by the Standing Committee of the National People's Congress on August 30, 2007, and was officially implemented on November 1, 2007 (China, National People's Congress Standing Committee 2007). This marked the legalization of emergency management. The law effectively established the legal system for emergency management (Mo and Xiao 2009). In addition, it introduced preparedness and prevention into the disaster management system (Qi 2007). Further, the law provided a horizontal linkage among the various ministries and encouraged the local governments to assume a more prominent role as first responders. Finally, the law formally extended the scope of disaster management planning to cover a wide array of sectors. This resulted in the promulgation of 35 laws, 37 administrative regulations, 55 departmental rules, and 111 regulatory documents for responding to public emergencies (China, Legislative Affairs Office of the State Council 2007).

Moreover, instead of relying heavily on functional and temporary organizations during this stage, the government created facilitating organizations designed to encourage different agencies to cross traditional bureaucratic boundaries and to cooperate. The government also leveraged both permanent and temporary organizations. As part of this transition away from the traditional response system to a diversified long-term and preventive system, the key role was gradually shifted from the state to the society.

As a result, disaster management was less restricted to state action and was gradually diffused throughout the rest of society, including township governments, communities, private enterprises and public institutions, social groups, and volunteer teams. The Master State Plan for Rapid Response to Public Emergencies stated that, under the leadership of the Central Committee of the CPC and the State Council, the emergency management system should be distributed under both vertical and horizontal management, with responsibilities taken on a level-to-level basis.

Except for government agencies, participation in the relief work was limited to government-organized nongovernmental organizations (GONGOs), such as the China Charity Federation (CCF), China Association of Social Workers (CASW), Red Cross Society of China (RCSC), and China Women's Development Foundation (CWDF). Grassroots organizations were largely unengaged, despite the participation of Friends of Facilitators in the relief work. Furthermore, volunteers and donations were not effectively leveraged because of the underdevelopment of organized channels extending beyond the existing system (Zhan 2008).

Stage 3: Wenchuan Earthquake to Present (2008 to Present)

The third and current stage of modern China's disaster management development began with the Wenchuan earthquake in 2008. Although the government was commended by a number of external observers (for example, *The Economist* 2008) for its response to the Wenchuan earthquake, the disaster revealed the need for additional collaborative mechanisms designed either to link the central government, local governments, and social departments together via laws and regulations or to realize the legalization of emergency management, the localization of decisionmaking processes, and the socialization of the disaster response structure. Major policy innovations of this period that continue in this tradition of diffusion, both in terms of time (Chapter 5) and policy space (Chapters 3 and 4), are the focus of this report.

Summary of Chapters

Given the current and future stakes involved, the urgency of addressing the common threat posed by natural disasters—especially by earthquakes—is starkly clear. However, those exposed to the threats posed by earthquakes are united not only by their vulnerability but also by their ability to learn from one another, transfer and adapt best practices, and collaborate on novel solutions. It is in this spirit that we present some of the most inspired recent innovations in disaster management born of China's experience during the 2008 Wenchuan earthquake.

In order to provide a comprehensive survey of China's disaster management innovations during and following the Wenchuan earthquake, this book spans the three main phases of China's disaster management policy—namely prevention and mitigation before the disaster, response and rescue immediately following the disaster, and reconstruction in the wake of the disaster—over the following several years.

In Chapter 2 the authors use a unique dataset to examine the effects of the 2008 Sichuan earthquake on the income and expenditure levels of rural households. They find that living subsidies were adequate to offset losses in annual income, but the mix of aid and bank loans were not sufficient to cover all reconstruction costs. In Chapter 3, the author presents his experience coordinating the pair-wise aid policy, describing the difficult conditions that led to its inception and the process of implementing the program as well as insights on its drawbacks and future development.

In Chapter 4, the author discusses the role for social innovation in disaster management by first reviewing the cross-sector collaborations that occurred during the response to the Wenchuan earthquake. He then discusses the challenges faced by the government during the response, the opportunities and innovative solutions involved, and the political considerations, such as the relationship between the central and local governments, involved.

In Chapter 5, the authors recount China's recent efforts at connecting disaster management to poverty reduction, the effectiveness of these efforts, and opportunities for better integrating these priorities. Chapter 6 presents conclusions, key findings and policy trends, and issues for further research.

THE EFFECT OF THE WENCHUAN EARTHQUAKE AND GOVERNMENT AID ON RURAL HOUSEHOLDS

Shuaizhang Feng, Jingliang Lu, Patrick Nolen, and Lei Wang

The 2008 Wenchuan earthquake caused extensive damage in the rural areas of Sichuan. Natural disasters such as the Wenchuan earthquake disrupt social and economic systems in a variety of ways, and as shown by Kahn (2005) and Stromberg (2007), when it comes to natural disasters, the poorer the country, the more people die. Besides loss of life, though, natural disasters can lead to losses in income and declines in consumption for households that may in turn reduce the accumulation of human capital and long-term economic growth (Baez and Sontos 2008). These changes in income, consumption, and the returns to education could exacerbate inequality in rural areas or lead to an increase in poverty.

Developing countries are more likely to face these long-term effects because, compared to developed countries, they are less able to withstand the initial shocks. With inadequate infrastructure, second-rate healthcare facilities, and weak economies, the rural areas of developing countries are particularly vulnerable to the adverse effects of natural disasters, and they are consequently more likely to suffer from a severe negative shock than are urban areas (van den Berg 2010). Therefore, when a natural disaster strikes, relief agencies must target aid appropriately and deliver it quickly to rural areas. In response to the Wenchuan earthquake, the Chinese government provided living allowances and reconstruction aid to rural households. This chapter examines the impact government aid had on income and consumption of rural households and the role it played in mitigating the potential negative effects (as identified above) of the Wenchuan earthquake. We find that the government aid kept consumption from falling dramatically despite a large drop in income and that, at least temporarily, it reduced inequality.

The earthquake, with its epicenter in Wenchuan, Sichuan, registered 8.0 on the Richter scale and was one of the most damaging ever in terms of property value; the total economic loss from the earthquake is estimated to be RMB 845 billion (US\$132 billion). It left nearly 88,000 people dead (including those still listed as missing) and directly affected 46 million people.

Skyscrapers shook in Shanghai, more than 1,600 kilometers away.¹ The severity of the earthquake led to worldwide media attention and a swift response by the Chinese government.

The Chinese government provided immediate humanitarian aid to households and communities that were affected by the earthquake. It furnished grain, rations of edible oils, and other necessities worth nearly US\$50 per month per family for at least three (and usually six) months after the earthquake. It also provided aid for housing reconstruction, based on a formula involving household size and pre-earthquake income. The response, both in terms of its size and the openness with which the aid was allocated, provides a unique opportunity to look at the effect of government aid in China.

Besides giving aid to households, the government also rebuilt critical infrastructure. The Wenchuan Earthquake Restoration and Reconstruction Plan was publicized by the State Council in September 2008, four months after the earthquake, and promised that RMB 1 trillion (US\$157 billion) would be spent on rebuilding affected areas. By May 2011 the reconstruction was almost complete: 95 percent of the 41,130 national reconstruction projects were finished, and RMB 885 billion (US\$138 billion) had been spent. The government had helped to build 1.9 million homes in rural areas, 288,300 homes in urban areas, 3,839 schools, and 2,169 of various types of healthcare and rehabilitation facilities. It had also supplied funding for more than 5,000 key infrastructure projects (Jiang and Yang 2011).

The majority of the jurisdictions affected by the earthquake were rural, and consequently most of the recovery aid went to rural households and to build rural infrastructure. More than 10 percent of the RMB 1 trillion (US\$157 billion) promised was distributed in the seven months after the earthquake: RMB 40 billion in direct aid, RMB 40 billion for reconstruction, and RMB 24 billion for low-interest loans to farmers so they could rebuild their homes. The speed of aid disbursement and the focus on rural areas allow us to examine key questions about government's aid and the role of the aid in helping rural households recover. The study uses a unique dataset collected from primary sources. The dataset consists of a household survey conducted in August 2007, 9 months before the earthquake, and a follow-up survey conducted in August 2009, 15 months after the earthquake.

Few studies have been conducted on the effect of government aid in the recovery process following a large natural disaster. This study helps fill a gap in the literature in general, and it appraises the effectiveness of government aid

1 For a discussion of the damage and costs of the earthquake, see *New York Times* 2009.

in China, a developing country, in particular. This study aims to answer two questions: (1) What effect did the earthquake have on rural households? (2) Did government aid adequately address the needs of rural households affected by the earthquake?

The study focuses on income and expenditure of rural households to examine the effects of the earthquake and the role of government aid. It finds that household income did decrease after the earthquake but that government aid kept consumption from falling dramatically. But even though the living subsidies were effective in maintaining consumption, the aid for home reconstruction was inadequate: government grants and loans met less than 60 percent of the needs of rural households.

The next section reviews the related literature. The chapter then introduces the household survey data and provides the main empirical results. The last section concludes with policy recommendations.

Literature Review

A large literature focuses on the income and consumption patterns of rural households in China. Recent studies suggest that nonfarm work and human capital play a large role in determining the level, growth, and distribution of household income. Nonfarm work refers to people running their own businesses or working for family enterprises or doing other work for wages. Off-farm work not only raises household income and consumption but also loosens the liquidity constraint—that is, the limitation on saving or borrowing money—many rural households face, and it allows them to invest in agricultural production, leading to a decrease in rural poverty (Taylor, Rozelle, and de Brauw 2003; Zhu and Luo 2006, 2008; de Brauw and Giles 2008). Human capital also plays a similar role in reducing poverty and increasing income. Chen and Xing (2004) find that education improves the chances that a rural worker becomes involved in nonfarm work. They estimate that the returns to one year of education are 5–7 percent. Other studies find that education increases the likelihood that a rural worker will be employed in a high-wage sector. For instance, de Brauw and Rozelle (2008) estimate that, for off-farm workers, the average return to one additional year of education is 6.4 percent, and Zhou, Xu, and Xia (2010) estimate the average annual return to vocational education is 9 percent.

The role of nonfarm work and human capital in increasing household income provides potential channels by which policymakers could reduce poverty and decrease income inequality. Policies such as increasing access to

education in rural areas, strengthening infrastructure, or removing restrictions on a farmer's ability to engage in nonfarm activities could decrease income inequality and poverty in rural areas. However, when we consider household well-being, income is only one part of the picture. This is especially true in China, where rural households receive substantial amounts of government subsidies. Thus, we must also consider what affects household consumption and expenditure.

Recent research on rural household consumption provides some insights into what could stimulate expenditure. For instance, decreasing household uncertainty regarding income and relaxing the liquidity constraint could both help stimulate consumption. Several studies show that uncertainty, precautionary savings, and life-cycle patterns are key factors in explaining household consumption (Zhou 2005; Zang and Pei 2007).

Giles and Yoo (2007) find that with the expansion of migrant networks, rural households have an additional means of coping with unexpected shocks and consequently decrease their precautionary savings. Ai and Wang (2010) find that when rural households have access to nonfarm work, they can offset adverse income shocks and smooth consumption by working off-farm more. Thus, the permanent income hypothesis explains consumption well when farmers have access to off-farm work or other ways of relaxing their liquidity constraint.² These findings all suggest that if rural households faced less income uncertainty or had more access to credit, they would be less prone to put aside precautionary savings and would thus increase their consumption.

When natural disasters occur, households can suffer large losses in assets and income. Recent literature has shown that these types of effects can lead to a decrease in household consumption. Van den Berg and Burger (2008) examine the reactions of rural households in Nicaragua to Hurricane Mitch and find that all households decreased their consumption in response to the loss of assets. However, only poorer households cut their consumption because of transitory income losses, suggesting that the poorer households were liquidity constrained. Despite the difference in the effects on consumption, van den Berg (2010) finds that poorer households were no less likely to move into or out of poverty because of the hurricane.

Although no study has looked at how the Sichuan earthquake affected household income and expenditure, some studies have examined the effect of the earthquake on corporate donations (Shan, Gan, and Zheng 2008) and

2 The permanent income hypothesis supposes that a person's consumption at a given point is determined by his or her lifetime expected income, that is, the person's "permanent income."

China's stock market (Shan 2011). One study, Sun et al. (2010a), does investigate the earthquake's effect on the determinants of household income. The study examines the similarities and differences of the determinants of household income by estimating household income equations before and after the earthquake. However, the survey sampled only 319 rural households and relied on recall data for pre-earthquake income. Recall error is likely to be correlated with one's experience of the earthquake, and thus it biases all results. No work has been done to look at the role of government aid in recovery.

Data and Empirical Results

Data

Our analysis uses data from the Sichuan rural household and migration survey. The survey was conducted in County M. County M was one of the hardest-hit areas in the earthquake. First, we randomly chose two towns from all towns in County M: Town S and Town X. Then, we randomly chose three villages in each town. Last, we surveyed all the households in each village. The survey was conducted in two waves, in August 2007 and August 2009. The survey was funded by Shanghai University of Economics and Finance and the University of Essex; the collection of survey data was overseen by researchers from both universities. Town S and Town X both suffered heavy damage from the Sichuan earthquake. Town X is roughly 30 kilometers closer to the epicenter of the earthquake than Town S, so Town X suffered much more loss of life and property than did Town S.

The 2007 survey covers 787 households, and the 2009 survey covers 780 households; 683 households can be matched across the two waves. The questionnaire gathered basic demographic information (age, sex, education level, etc.); information on the acreage of land owned, farming activities, ownership of livestock, individual business activities, off-farm work, and household income and assets; and information on cash consumption. The expenditure data focuses on the month before each survey wave. The 2009 questionnaire also gathered information regarding damage and loss caused by the earthquake and the type and amount of government aid received.

Table 2.1 presents the summary statistics for household heads. The vast majority of household heads are male; on average they are 51 years old and had five years of schooling in 2007. Table 2.1 also shows the summary statistics for household heads from the matched sample. The results are similar to those from the whole sample. Our empirical analysis below uses the whole sample

TABLE 2.1 Summary statistics for household heads, Town S and Town X, 2007 and 2009

Characteristics	Whole Sample						Matched Sample					
	Town S			Town X			All			Town S		
	2007	2009		2007	2009		2007	2009		2007	2009	
Age	51.42	53.04		51.22	52.82		51.32	52.93		51.88	53.60	
Sex (female = 1)	0.06	0.07		0.11	0.13		0.09	0.10		0.06	0.07	
Schooling (years)	5.55	5.66		5.06	5.17		5.29	5.41		5.57	5.63	
Household size	2.99	2.95		2.93	2.86		2.96	2.91		2.99	2.99	
Observations	370	382		417	398		787	780		320	320	
										363	363	
										683	683	

Source: Authors' compilation.

for two years. For robustness check, we have also analyzed the matched data; the results are robust. Because of space limitations, we do not report those results below.

Empirical Results: Household Income

We divided the net annual income of the household (August 2006 to July 2007 and August 2008 to July 2009) into five sources: crop income, live-stock income, individual business income, off-farm wage income, and other income. Table 2.2 presents summary statistics for income variables by years and towns. Figure 2.1 depicts income composition.³

Table 2.2 demonstrates that the level of household income in both towns declined after the earthquake. The average household income declined by 16 percent in Town S and 13 percent in Town X while per capita income decreased by 17 percent in Town S and 12 percent in Town X. The change in income levels varied dramatically by the income source: the average household livestock income declined sharply, by 52 percent in Town S and 44 percent in Town X; off-farm income declined only slightly in both towns; the average individual business income rose significantly, by 192 percent in Town S and 134 percent in Town X. The dramatic rise in business income is due in part to business opportunities associated with the reconstruction after the earthquake.

Figure 2.1 depicts the changes in the composition of household income between 2007 and 2009. The share of livestock income fell significantly, the share of individual business income rose sharply, and the share of off-farm wage income also increased to some extent. This simple comparison shows the changes in importance of different categories of household income: households began to rely more on individual businesses and off-farm work when livestock raising suffered serious earthquake damage. Crop income remained about the same, both in level and proportion. The earthquake did not affect the off-farm household income, although some off-farm work was interrupted temporarily by the earthquake. Off-farm income was the main household income source before and after the earthquake.

Empirical Results: Government Aid

Earthquake-stricken households received two types of aid from the Chinese government: a living allowance, and a mix of subsidies and loans for home reconstruction. With respect to the living allowance, the Ministry of Civil

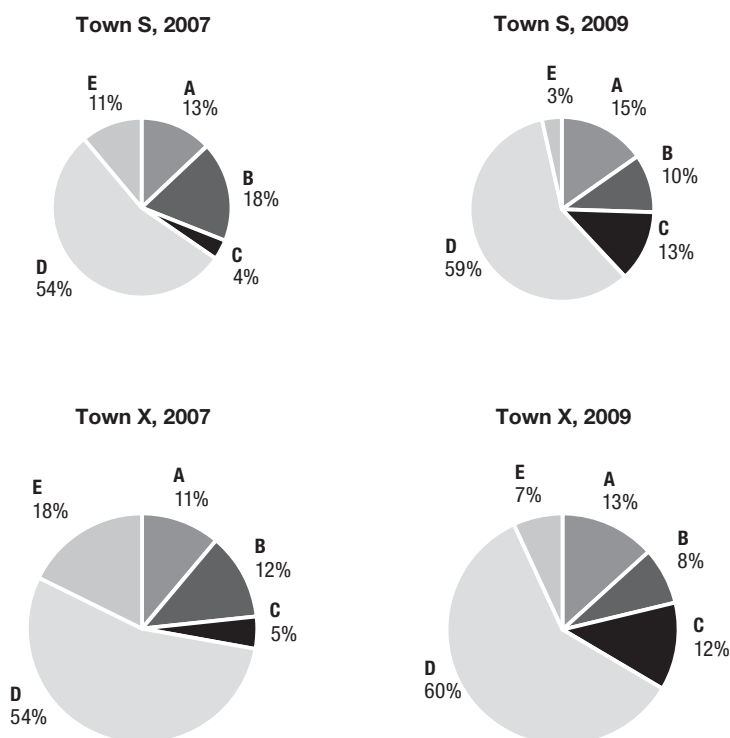
3 All income variables are expressed in year 2007 RMB.

TABLE 2.2 Summary statistics for household income, Town S and Town X, 2007 and 2009, RMB

Average annual household income characteristics	Town S			Town X			All	
	2007	2009	Change	2007	2009	Change	2007	2009
Household income	15,543 (17,819)	13,076 (12,856)	-16%	12,712 (14,742)	11,028 (14,106)	-13%	14,043 (16,312)	12,031 (13,539)
Income per capita	5,290 (6,748)	4,401 (4,227)	-17%	4,261 (5,396)	3,737 (4,560)	-12%	4,744 (6,087)	4,062 (4,410)
Crop income	2,013 (1,557)	1,994 (1,262)	-1%	1,411 (1,300)	1,460 (1,032)	3%	1,694 (1,457)	1,722 (1,180)
Livestock income	2,798 (11,308)	1,339 (5,061)	-52%	1,548 (6,640)	875 (2,079)	-44%	2,136 (9,152)	1,102 (3,845)
Individual business income	561 (2,376)	1,636 (6,811)	192%	574 (3,408)	1,345 (10,226)	134%	568 (2,966)	1,487 (8,718)
Off-farm wage income	8,430 (11,066)	7,641 (10,017)	-9%	6,917 (9,280)	6,549 (9,063)	-5%	7,628 (10,181)	7,084 (9,551)
Other income	1,723 (6,311)	455 (2,234)	-74%	2,249 (7,445)	758 (3,162)	-66%	2,002 (6,936)	609 (2,749)
Observations	370	382		417	398		787	780

Source: Author's compilation.

Note: Standard deviations in parentheses.

FIGURE 2.1 Household income composition, Town S and Town X, 2007 and 2009

A = Crop income; B = Livestock income; C = Individual business income; D = Off-farm wage income; E = Other income.

Source: Authors' compilation.

Affairs, the Ministry of Finance, and the State Administration of Grain joined together to provide each individual in the earthquake-stricken areas with RMB 300 (US\$47) per month and to provide households with rations and edible oils in the first three months after the earthquake. After the first three months had passed, the State Council continued to provide needy individuals RMB 200 (US\$31) per month for an additional three months. The living allowance was larger for areas and households that were most severely affected by the earthquake.

With respect to subsidies and loans for home reconstruction, Sichuan Provincial People's Government provided reconstruction subsidies to rural households whose homes had collapsed or been damaged in the earthquake.

TABLE 2.3 Summary statistics for income losses and government aid, Town S and Town X, 2007 to 2009

Income loss/government aid	Town S	Town X
Crop income (RMB)	-359 (407)	-512 (478)
Livestock income (RMB)	-370 (2,714)	-606 (2,175)
Individual business income (RMB)	-1,196 (7,557)	-603 (3,123)
Off-farm wage income (RMB)	-2,052 (4,054)	-3,166 (5,657)
Crop yield (½ kilogram)	-479 (545)	-723 (666)
Housing rebuilding cost (RMB)	64,345 (50,982)	65,927 (67,464)
Housing loan (RMB)	12,153 (10,129)	14,418 (10,961)
Government living allowance (RMB)	3,391 (2,688)	3,734 (3,966)
Expected housing subsidy (RMB)	3,551 (3,480)	3,742 (3,057)
Final housing subsidy received (RMB)	17,550 (14,748)	19,133 (13,291)
Observations	382	398

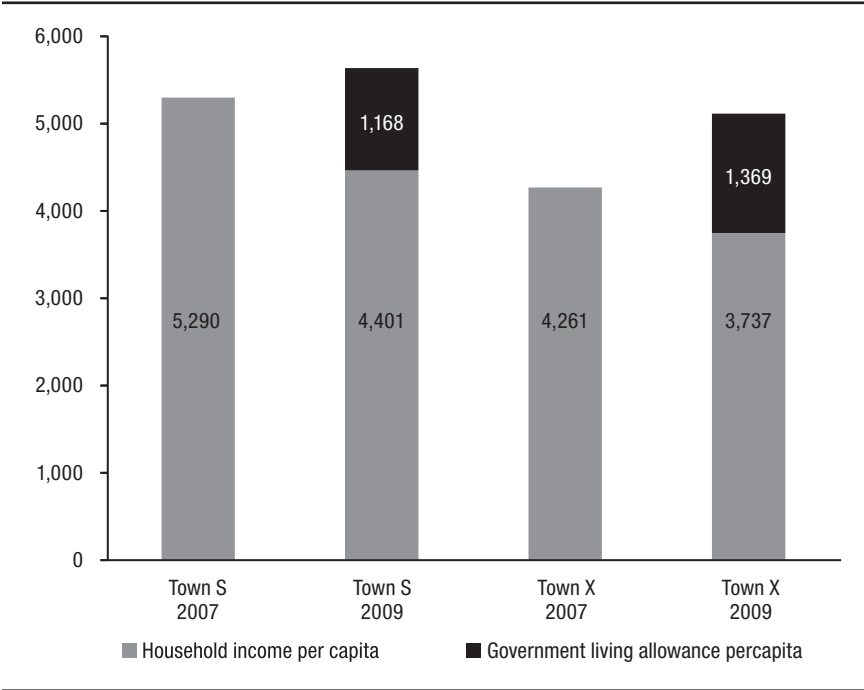
Source: Authors' compilation.

Notes: Standard deviations in parentheses; all in 2007 RMB.

On average, each household received RMB 20,000 (US\$3,100). Subsidies for reconstruction were distributed based on household income and size: for households with one to three people, RMB 16,000 was provided; for households with four or five people, RMB 19,000; for households with six or more people, RMB 22,000. If households were deemed to have a greater need than what their entitled subsidies would provide, they received an additional RMB 4,000. If households had to build their own transitional places to live, they received RMB 2,000 for construction.

Table 2.3 provides summary statistics, based on data gathered directly from households, for the types of loss caused by the earthquake and the government aid received by households. On average, households in Town X had

FIGURE 2.2 Household income per capita and government living allowance per capita, Town S and Town X, 2007 and 2009, RMB



Source: Authors' compilation.

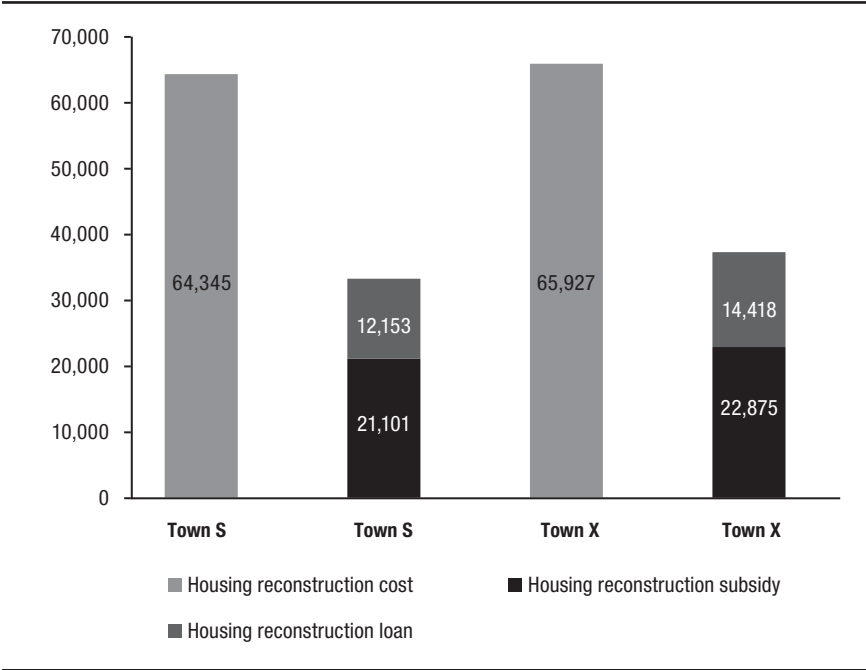
Note: The government provided no living allowance in 2007; household income per capita is determined by calculating income per capita for each household and then determining the average of all households at the town level.

greater losses of income from all income sources, except for business income, than those in Town S. Not surprisingly, households in Town X received more aid than those in Town S. These summary statistics are consistent with Town X being closer to the epicenter of the earthquake.

Figure 2.2 illustrates the role government aid played in helping households recover after the earthquake. The figure shows per capita income before and after the earthquake and the living allowance provided by the government. Income per capita in Town X was lower than that in Town S for both years. Income per capita decreased from RMB 5,290 to RMB 4,401, or 17 percent, in Town S, compared to RMB 4,261 to RMB 3,737, or 12 percent, in Town X from 2007 to 2009. The living allowance for individuals in Town X was higher than that for individuals in Town S.

To examine the role of reconstruction aid on recovery, we calculated the average cost of repairing or rebuilding a home and compared it to the average

FIGURE 2.3 Average housing reconstruction costs, subsidies, and loans, Town S and Town X, 2009, RMB



Source: Authors' compilation.

Note: Housing reconstruction subsidy includes both the subsidy expected and that received.

subsidy received by each household (Figure 2.3). The average cost of repairing or rebuilding residents' homes was larger in Town X at RMB 65,927 than in Town S at RMB 64,345. The government subsidy for reconstruction, on average, accounted for only RMB 21,101, or 32.8 percent, of the total average cost of repairing or rebuilding in Town S, and RMB 22,875, or 34.7 percent, of those costs in Town X. The combination of this reconstruction subsidy and loans for home reconstruction (the latter offered by government-assigned banks at a low interest rate) accounted for, on average, only RMB 33,254, or 52 percent, of the costs of repairing or rebuilding in Town S and RMB 37,293, or 57 percent, of the costs in Town X. These figures show that the housing damage was greater in Town X and that the government housing reconstruction subsidies together with housing loans could not fully compensate for all the repairing or rebuilding costs.

Empirical Results: Household Consumption

Consumption is an important indicator of household welfare, and with the large amount of subsidies that rural households in China receive, analyzing consumption might provide a slightly different story about the effects of the earthquake compared to the income regressions. This section analyzes the change in household consumption after the earthquake and the impact of the government living allowance on consumption.

The data collected consist of detailed household cash expenditure information for the months prior to the surveys (July 2007 and July 2009). We divide household expenditures, aside from the expenditure on housing maintenance, into five categories: food, clothing, health and education, transportation and public utilities, and other expenditures.⁴ Table 2.4 presents summary statistics for expenditures (in 2007 RMB). Figure 2.4 depicts the composition of consumption.

Table 2.4 shows that expenditure per capita rose after the earthquake by 22 percent in Town S and 35 percent in Town X. Considering that households in Town X, on average, received a larger living allowance, we hypothesize that the higher increase in consumption in Town X is related to the living allowance; we examine this in the regression analysis below. Food expenditure increased by 48 percent in Town S and by 46 percent in Town X. Figure 2.4 suggests that the proportion of expenditure on food and the proportion of expenditure on transportation and public utilities increased; the proportion of expenditure on clothing decreased. These results suggest that the direct and indirect effects of the earthquake might have changed the structure of households' consumption.

Previous empirical studies on rural household consumption have used different specifications for the consumption equation. Different specifications were used because of the different theoretical hypotheses that underlay the empirical models (that is, absolute income hypothesis, relative income hypothesis, and life cycles/permanent income hypothesis). Our goal is not to test a specific theoretical hypothesis but to investigate the possible determinants of household consumption and the effect of the living allowance on consumption. Therefore, we will use a reduced-form consumption regression equation:

$$\ln(exp)_i = \hat{a}_0 + \hat{a}_1 \ln(inc)_i + \hat{a}_2 kid_6_num_i + \hat{a}_3 kid_14_num_i + \hat{a}_4 old_65_num_i + \hat{a}_5 educ_i + \hat{a}_6 town_x_i + \hat{a}_7 \quad (1)$$

4 Because of the earthquake, expenditures on housing maintenance rose sharply in 2009, making comparisons before and after the earthquake unproductive.

TABLE 2.4 Summary statistics for household expenditure, Town S and Town X, 2007 and 2009, RMB

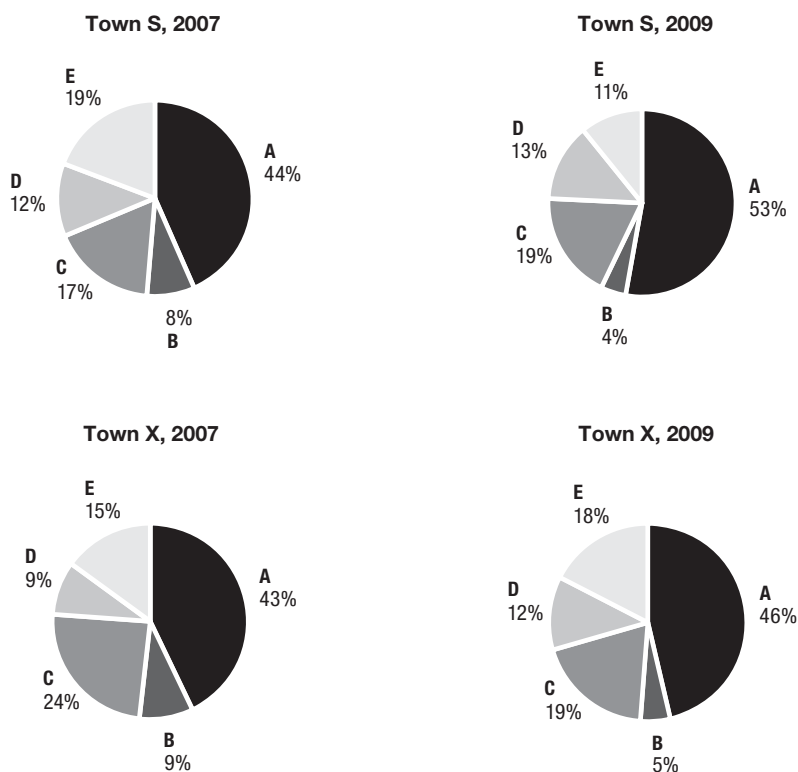
Average annual expenditure	Town S			Town X			All		
	2007	2009	Change	2007	2009	Change	2007	2009	Change
Household expenditure	1,090	1,295	19%	1,048	1,472	40%	1,067	1,385	30%
	(1,104)	(1,398)		(1,236)	(1,344)		(1,175)	(1,373)	
Household expenditure per capita	379	462	22%	393	532	35%	387	498	29%
	(350)	(416)		(577)	(457)		(484)	(438)	
Food expenditure per capita	165	244	48%	169	247	46%	167	245	47%
	(130)	(237)		(146)	(163)		(138)	(202)	
Clothing expenditure per capita	30	20	−33%	35	26	−26%	33	23	−30%
	(69)	(54)		(74)	(55)		(71)	(55)	
Health and education expenditures per capita	66	86	30%	96	103	7%	82	95	16%
	(164)	(189)		(492)	(274)		(376)	(236)	
Transportation and public utilities expenditures per capita	46	62	35%	35	64	83%	40	63	58%
	(114)	(209)		(58)	(89)		(89)	(160)	
Other expenditures per capita	73	50	−32%	59	93	58%	65	72	11%
	(168)	(100)		(82)	(271)		(130)	(207)	
Observations	370	382		417	398		787	780	

Source: Authors' compilation.

Notes: Standard deviations in parentheses; household expenditure excludes housing maintenance expenditure; because of rounding, totals might not exactly equal sums of numbers in table.

The dependent variable in equation (1) is the natural logarithm of household income. The independent variables include the natural logarithm of household income, the number of children under the age of 6, the number of children ages 6–14, the number of persons above the age of 65, the median number of schooling years for laborers, and a dummy variable for Town X.

Table 2.5 presents variable definitions and summary statistics. In the regression we also include the natural logarithm of the 2009 living allowance so we can examine its effect on consumption. Since the living allowance was exogenous and temporary (lasting no longer than six months), we regard it as a different type of income, that is, different from the household income listed above it. Table 2.6 presents estimation results.

FIGURE 2.4 Composition of household consumption, Town S and Town X, 2007 and 2009

A = Food; B = Clothing; C = Health and education; D = Transportation and public utilities; E = Other.

Source: Authors' compilation.

Table 2.6 demonstrates that household consumption was highly correlated with household income in both years. The living allowance was also highly correlated with household consumption in 2009, and its estimated elasticity was nearly four times larger than that of household income; holding all else equal, a 1 percent increase in the living allowance led to a 0.207 percent increase in household consumption. This suggests that the living allowance from the government played an important role in stabilizing household consumption after the earthquake. On average, households with more children under the age of 6 and children ages 6–14 consumed more; households having more people above the age of 65 consumed less. The coefficient on the number of children ages 6–14 is close to zero and is not significant in 2009. One

TABLE 2.5 Variables and summary statistics for consumption regressions, Town S and Town X combined, 2007 and 2009

Variables	Definition	Mean (2007)	Mean (2009)
ln(exp)	log of household consumption (RMB)	6.62 (0.89)	6.95 (0.77)
ln(inc)	log of household income (RMB)	8.73 (1.81)	8.65 (1.68)
ln(aid)	log of living allowance (RMB)	n.a.	8.04 (0.53)
kid_6_num	number of children under age 6	0.10 (0.30)	0.07 (0.27)
kid_14_num	number of children ages 6–14	0.21 (0.41)	0.18 (0.39)
old_65_num	number of people above age 65	0.30 (0.58)	0.35 (0.63)
educ	median of laborers' schooling years	5.70 (3.13)	5.87 (3.11)
town_x	regional dummy for Town X	0.53 (0.50)	0.50 (0.50)
Observations		785	758

Source: Authors' compilation.

Notes: Standard deviations in parentheses; laborer refers to people ages 15–64; n.a. = not applicable.

possible explanation is that the earthquake interrupted education for children; another is that the government education subsidies crowded out expenditure on children's education. The coefficient in 2009 on the Town X dummy is 0.136 and is significant in 2009; the 2007 coefficient is not significant, however. Table 2.4 shows that the regional consumption differential after the earthquake can be attributed to the significant increase in “other expenditures” for Town X, which may be directly related to the expenditure on earthquake relief.

Empirical Results: Economic Inequality

The decline in household income because of the earthquake could have caused greater economic inequality: if poorer households were less prepared for the earthquake, lived in homes that were more likely to be damaged, or worked in sectors that were more likely to face downturns (such as agriculture), then economic inequality could have increased because of the damage caused by the earthquake. The analysis below shows that, despite the likelihood of greater inequality, income inequality actually did not increase after the earthquake. If we look at the Lorenz curves (a common graphical way of representing income distribution) and a cardinal comparison based on a number of commonly used inequality indexes, we find no change in income inequality.

Cardinal indexes of inequality differ in their sensitivities to income differences at different ranges of the income distribution: an index might be sensitive to income differences among higher incomes, lower incomes, or those

TABLE 2.6 Regression results for household consumption, Town S and Town X combined, 2007 and 2009

Dependent Variable: $\ln(\exp)$			
Independent variables	Definition	2007	2009
$\ln(\text{inc})$	log of household income (RMB)	0.066*** (0.021)	0.053** (0.022)
$\ln(\text{aid})$	log of living allowance (RMB)	n.a. n.a.	0.207*** (0.058)
kid_6_num	number of children under age 6	0.198** (0.082)	0.232** (0.116)
kid_14_num	number of children ages 6–14	0.236*** (0.072)	–0.020 (0.070)
old_65_num	number of people over age 65	–0.157*** (0.056)	–0.212*** (0.051)
educ	median of laborers' schooling years	0.042*** (0.011)	0.036*** (0.009)
town_x	regional dummy for Town X	–0.019 (0.061)	0.136*** (0.052)
constant		5.788*** (0.195)	4.657*** (0.471)
Observations		785	758
R^2		0.099	0.164

Source: Authors' compilation.

Notes: Robust standard errors in parentheses; n.a. = not applicable; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; $\ln(\exp)$ = log of household consumption (RMB); laborer refers to people ages 15–64.

somewhere in between (Atkinson 1970). For this reason, we use multiple inequality indexes in a systematic way to get a robust picture of the change in income inequality.

We focus on the following indexes when examining income inequality: the mean log deviation (MLD), the Theil index, half the coefficient of variation squared ($CV^2/2$), and the Gini coefficient. The first three indexes belong to the one parameter generalized entropy class of measures, $GE(\alpha)$, and each corresponds to a specific parameter: $\alpha = 0, 1$, or 2 respectively. These measures range from being sensitive to income differences at the bottom of the distribution (MLD) to being sensitive to those at the top ($CV^2/2$); the Theil index is sensitive to differences between the middle and the top of the distribution. The commonly used Gini coefficient is an inequality index sensitive to differences

toward the middle of the distribution, although not as close to the middle as the Theil index. We computed distribution-free variance estimates for the inequality indexes according to formulas provided by Biewen and Jenkins (2006) for GE indexes, and by Kovačević and Binder (1997) for the Gini index.

The standard procedure for ranking Lorenz curves is to simply compare ordinates. According to Foster (1985), if there is statistically significant Lorenz dominance, then there is a unanimous ordering of income distributions according to all standard inequality indexes. With this in mind, we checked whether our estimates of inequality trends were robust to the choice of the inequality measure by employing Lorenz dominance analysis; we checked whether or not Lorenz curves of income distributions for pairs of years crossed. Although the form of the stochastic process generating income or consumption is not a priori known in statistical analysis of inequality, one can use asymptotically distribution-free statistical procedures such as those developed by Beach and Davidson (1983). We define L^i as the i^{th} Lorenz ordinate (cumulative income share) $i = 1, 2, \dots, k-1$, where the k^{th} ordinate is equal to 1. For the $k-1^{\text{th}}$ pair-wise comparison between years 2007 and 2009, each test statistic T_i is $T_i = (\hat{L}_i^{2009} - \hat{L}_i^{2007}) / \sqrt{\hat{V}_i^{2009} + \hat{V}_i^{2007}}$, where \hat{L}_i is the estimate of the Lorenz ordinate and \hat{V}_i is the estimate of its variance.

Our hypothesis testing uses the multiple comparison union intersection method of Bishop, Formby, and Smith (1991). Following standard practice in the literature, the income shares were computed at the 19 vingtiles. Tests are based on a 5 percent significance level and take account of the fact that each dominance test is based on 19 simultaneous tests. To draw inferences about the Lorenz curves based on the $k-1^{\text{th}}$ sub-hypotheses, we follow Beach and Richmond (1985) and test the T_i as a student maximum modulus variate. The critical value is therefore obtained from the student maximum modulus (SMM) distribution: $\text{SMM}(19, \infty) = 3.01$.

To partially order the Lorenz curves, statistical tests must distinguish between four possible outcomes. First, there may be no statistically significant difference between any pair of Lorenz ordinates, which means we must rank year 2007 and year 2009 as equivalent in terms of inequality (that is, equality is taken as the null hypothesis): this occurs when $|T_i| \leq 3.01$ for all i . Second, if there are positive and statistically significant differences in ordinates and no negative and statistically significant differences, then 2009 Lorenz dominates 2007: inequality is lower according to all standard inequality indexes ($T_i > 3.01$ for some i and $|T_j| \leq 3.01$ for $j \neq i$). Third, if there are negative and statistically significant differences in ordinates and no positive and statistically significant differences, then 2007 Lorenz dominates 2009 ($T_i < -3.01$ and $|T_j| \leq$

3.01 for $j \neq i$). Fourth, if there are negative and positive differences that are statistically significant, then the Lorenz curves cross and a unanimous inequality ranking cannot be derived ($T_i > 3.01$ for some i and $T_j < 3.01$ for some $j \neq i$).

Table 2.7 suggests that, according to the point estimates of the ordinates (cumulative income share or cumulative consumption share), the Lorenz curves of both income and consumption moved slightly inward between 2007 and 2009, which indicates greater equality. The inward shift is even greater when we include the government living allowance as part of household income in 2009 (2009G). However, all the test statistics T_i are smaller than 3.01 except when household income includes the 2009 government living allowance. Thus, we cannot reject the null hypothesis of equality of ordinates: that is, there is no greater inequality in household income and consumption after the earthquake, although there was a decline in the level of income and consumption compared to 2007.

Therefore, the data suggest that, despite the large effect of the earthquake on infrastructure and production, there was no change in household income or consumption inequality between 2007 and 2009. When we consider the government living allowance that was provided to households after the earthquake, we find a different result: the 2009 income distribution Lorenz dominates the 2007 distribution. This implies that the government support increased income and consumption equality after the earthquake. This can be seen by comparing 2009G (household income including living allowance) and 2007 in Table 2.7 and noting that $T_i > 3.01$ for $10 \leq i \leq 18$ and $0 < T_i < 3.01$ otherwise. We are thus able to reject the null hypothesis of no statistically significant difference between Lorenz ordinates for pair-wise comparisons undertaken between 2007 and 2009G. Thus, according to Lorenz dominance tests, we will get the same results by computing standard inequality indexes.

Table 2.8 shows estimates of inequality indexes and test statistics for pair-wise comparisons between 2009 and 2007. The test statistics are for pair-wise difference-in-means t -tests, so the relevant critical value for a 5 percent significance level is approximately 1.96. We find that the estimate of each index for household income decreased between 2007 and 2009 except for GE (2). When we look at consumption, though, every index decreased between 2007 and 2009. If we calculate from the numbers in Table 2.7, we see that the estimated decrease in household income between 2007 and 2009 is the largest for the GE (0) index (8.2 percent), and smallest for the Gini index (0.8 percent). Between 2007 and 2009G, the estimated decrease between 2007 and 2009G is the largest for the GE (0) index (57.9 percent), and the smallest for the Gini index (20.3 percent). In terms of household consumption, the

TABLE 2.7 Lorenz ordinates, standard errors, and test statistics for pair-wise Lorenz comparisons, Town S and Town X combined, 2007 and 2009

Cumulative share	Income			Consumption		
	Year		T _i	Year		T _i
	2007	2009		2007	2009	
			2009 vs. 2007			2009 vs. 2007
			2009G vs. 2007			
0.05	0.0009 (0.0174)	0.0016 (0.0178)	0.0079 (0.0153)	0.0063 (0.0189)	0.0071 (0.0170)	0.03
0.10	0.0048 (0.0174)	0.0063 (0.0177)	0.0208 (0.0152)	0.0172 (0.0189)	0.0208 (0.0170)	0.14
0.15	0.0107 (0.0173)	0.0129 (0.0177)	0.0357 (0.0152)	0.0328 (0.0188)	0.0383 (0.0169)	0.21
0.20	0.0194 (0.0172)	0.0216 (0.0176)	0.0537 (0.0151)	0.0523 (0.0187)	0.0586 (0.0168)	0.25
0.25	0.0310 (0.0171)	0.0329 (0.0175)	0.0726 (0.0150)	0.0735 (0.0186)	0.0831 (0.0167)	0.38
0.30	0.0457 (0.0170)	0.0476 (0.0173)	0.0953 (0.0148)	0.0989 (0.0185)	0.1089 (0.0166)	0.40
0.35	0.0645 (0.0167)	0.0666 (0.0170)	0.1210 (0.0145)	0.1235 (0.0184)	0.1380 (0.0164)	0.59
0.40	0.0906 (0.0164)	0.0905 (0.0167)	0.1514 (0.0143)	0.1525 (0.0183)	0.1702 (0.0162)	0.72
0.45	0.1216 (0.0161)	0.1207 (0.0164)	0.1856 (0.0140)	0.1854 (0.0181)	0.2062 (0.0160)	0.86
0.50	0.1566	0.1549	0.2238	0.2221	0.2428	0.87

(continued)

Cumulative share	Income			Consumption		
	Year		T _i	Year		T _i
	2007	2009		2007	2009	
			2009G vs. 2007			2009 vs. 2007
0.55	(0.0158)	(0.0162)	(0.0136)	(0.0178)	(0.0158)	
	0.1979	0.1958	0.2673	0.2611	0.2825	0.91
	(0.0156)	(0.0158)	(0.0133)	(0.0176)	(0.0156)	
0.60	0.2438	0.2431	0.3168	0.3044	0.3270	0.98
	(0.0152)	(0.0155)	(0.0129)	(0.0173)	(0.0153)	
0.65	0.2967	0.2966	0.3704	0.3533	0.3743	0.93
	(0.0149)	(0.0150)	(0.0125)	(0.0170)	(0.0150)	
0.70	0.3534	0.3570	0.4287	0.4060	0.4274	0.96
	(0.0144)	(0.0146)	(0.0121)	(0.0167)	(0.0146)	
0.75	0.4175	0.4253	0.4913	0.4638	0.4851	0.99
	(0.0138)	(0.0141)	(0.0117)	(0.0162)	(0.0141)	
0.80	0.4944	0.5006	0.5614	0.5315	0.5495	0.87
	(0.0132)	(0.0137)	(0.0110)	(0.0157)	(0.0135)	
0.85	0.5813	0.5878	0.6409	0.6045	0.6242	0.99
	(0.0126)	(0.0130)	(0.0103)	(0.0152)	(0.0127)	
0.90	0.6800	0.6864	0.7305	0.6907	0.7090	0.99
	(0.0116)	(0.0122)	(0.0097)	(0.0143)	(0.0118)	
0.95	0.8035	0.8086	0.8363	0.7972	0.8132	0.97
	(0.0104)	(0.0108)	(0.0082)	(0.0127)	(0.0105)	

Source: Authors' compilation.

Notes: Standard errors are in parentheses; 2009G refers to household income plus government living allowance; test statistics T_i that are greater than the student maximum modulus (SMM) distribution of 3.01 are in bold.

TABLE 2.8 Inequality indexes, standard errors, and test statistics for pair-wise comparisons, Town S and Town X combined, 2007 and 2009

Index	Income					Consumption		
	Year			Statistics		Year		Statistics
	2007	2009	2009G	2009 vs. 2007	2009G vs. 2007	2007	2009	2009 vs. 2007
Gini	0.4931 (0.0072)	0.4894 (0.0075)	0.3928 (0.0064)	-0.35	-10.39	0.4173 (0.0095)	0.3885 (0.0084)	-2.29
GE(0)	0.6617 (0.0256)	0.6072 (0.0230)	0.2784 (0.0089)	-1.59	-14.16	0.3192 (0.0149)	0.2602 (0.0114)	-3.15
GE(1)	0.4241 (0.0159)	0.4178 (0.0165)	0.2618 (0.0113)	-0.28	-8.33	0.3258 (0.0245)	0.2735 (0.0171)	-1.75
GE(2)	0.5353 (0.0449)	0.5360 (0.0472)	0.3328 (0.0273)	0.01	-3.85	0.5626 (0.0941)	0.4281 (0.0467)	-1.28

Source: Authors' compilation.
Notes: 2009G refers to household income plus government living allowance. GE (0, 1, 2) each represent one of the one parameter generalized entropy class of indexes, in which each number corresponds to a specific parameter. The GE class of indexes includes the mean logarithmic deviation (MLD, $\alpha = 0$), the Theil index ($\alpha = 1$), and half the coefficient of variation squared ($CV^2/2$, $\alpha = 2$). Test statistics with absolute values that are greater than the critical value (1.96) for a 5 percent significance level are in bold.

estimated decrease between 2007 and 2009 is the largest for the GE (2) index (23.9 percent) and the smallest for the Gini index (6.9 percent). When comparing 2007 and 2009, we find that *all* decreases in the inequality indexes are statistically significantly different from zero (2009G versus 2007). As a comparison, *no* index in household income is statistically different from zero in the same period (2009 versus 2007).

To better understand the evolution of income inequality, we follow Shorrocks (1982) to evaluate the contribution of each income source to total income inequality. Shorrocks shows that for any additively decomposable inequality measure, the contribution of an income source to total income inequality can be estimated by the covariance of that income source with total income divided by the variance of total income.

Table 2.9 presents decomposition results. We find that the contribution of off-farm wage income to total income inequality increased from 55 percent in 2007 to 62 percent in 2009. Individual business income increased dramatically, by almost 15 percentage points from 2007 to 2009. The increased importance of individual business reflects the increase in business opportunities that developed because of reconstruction after the earthquake. The contribution of livestock income and other income sources to total income inequality declined, by 7 and 15 percentage points, respectively. These

TABLE 2.9 Gini index decomposition by income components, Town S and Town X combined, 2007 and 2009

Components	2007		2009		2009G	
	Absolute	Relative	Absolute	Relative	Absolute	Relative
Crop income	0.0225	4.57%	0.0238	4.86%	0.0162	4.13%
Livestock income	0.0821	16.66%	0.0464	9.49%	0.0339	8.62%
Individual business income	0.0202	4.09%	0.0932	19.03%	0.0704	17.92%
Off-farm wage income	0.2733	55.42%	0.3028	61.88%	0.2246	57.18%
Other income	0.0950	19.26%	0.0232	4.73%	0.0161	4.10%
Government living allowance	n.a.	n.a.	n.a.	n.a.	0.0316	8.05%
Gini index	0.4931		0.4894		0.3928	

Source: Authors' compilation.

Note: 2009G refers to household income plus government living allowance. Because of rounding, the relative values listed above might not always match the results of dividing the absolute values by the total Gini index values; n.a. = not applicable.

TABLE 2.10 Gini index decomposition by consumption components, Town S and Town X combined, 2007 and 2009

Components	2007		2009	
	Absolute	Relative	Absolute	Relative
Food	0.1257	30.12%	0.1447	37.24%
Clothing	0.0489	11.72%	0.0273	7.02%
Health and education	0.1132	27.12%	0.0853	21.96%
Transportation and public utilities	0.0425	10.18%	0.0463	11.93%
Other	0.0870	20.85%	0.0848	21.84%
Gini index	0.4173		0.3885	

Source: Authors' compilation.

Note: Because of rounding, the relative values listed above might not always match the results of dividing the absolute values by the total Gini index value.

declines reflect losses in livestock income and other income sources such as housing rent that suffered severely because of the earthquake. The contribution of crop income to total income inequality showed no significant change despite the effect of the earthquake on agriculture.

We carry out the same exercise for household consumption. Table 2.10 presents decomposition results. We find that expenditure on food is a major component of overall inequality, with an increase from 30 percent in 2007 to 37 percent in 2009. The contributions of expenditures, including those on transportation and public utilities, to overall inequality increased slightly, by between 1 percent and 2 percent. The expenditure on health and education accounts for

more than one-fourth of total consumption inequality before the earthquake, 27 percent, but declines to under 22 percent after the earthquake. The expenditure on clothing contributes less than 10 percent in 2009, which is contrary to the consumption inequality in urban China (Cai, Chen, and Zhou 2010).

Conclusion

This chapter discusses the impact of the 2008 Sichuan earthquake on household income, consumption, and income inequality using a unique dataset collected in rural Sichuan. We find that household income fell by 14 percent because of the earthquake and that income inequality did not increase. With regard to government support, living subsidies were more than enough to offset losses in annual income, but reconstruction aid, such as grants and bank loans for housing, accounted for less than 60 percent of total house-rebuilding costs.

Household consumption continued to grow after the earthquake, increasing by 30 percent compared to the same period in 2007; however, this growth was mainly because of the government living allowance. The consumption elasticity of the living allowance was 0.207, much higher than that of other household income sources. Thus government support was essential for households to be able to maintain pre-earthquake consumption levels. Although the earthquake affected mean household incomes levels, it did not affect the household income distribution; income or consumption inequality did not change significantly because of the earthquake. Furthermore, when we include government support as part of household income, the 2009 household income distribution Lorenz dominates that of 2007, indicating that government living allowance played a role in reducing inequality.

Although this chapter is limited to analyzing household income and consumption in areas affected by the earthquake, the results do have broader policy implications. The importance of off-farm work in allowing rural households to cope with negative shocks shows that policies that make access to off-farm work easier will greatly benefit rural households. Thus, policies such as the *HuKou* system that discourage or restrict the ability of farmers to work in urban areas are likely to have a detrimental effect on the ability of farmers to deal with negative shocks from natural disasters. The government aid to the areas affected by the earthquake was provided in a timely fashion and kept the welfare of rural households from falling sharply; it even decreased inequality in the rural areas examined. However, the aid for families to rebuild their houses was inadequate, and further loans or grants to support reconstruction would benefit all rural households.

THE PAIR-WISE PROVINCE-TO-COUNTY AID MODEL FOR DISASTER RELIEF

Zhenyao Wang

China first adopted a pair-wise aid policy, in which one donor province or city is assigned to a recipient area, in the 1950s as part of its efforts to develop the minority-inhabited border areas, and this practice was first formalized by the central government in 1979 (Qian et al. 2012). Since then, this strategy has also been used to undertake major infrastructure construction projects (such as the Three Gorges Dam in 1992) and disaster relief and recovery (such as that following the 1976 Tangshan earthquake), and China has continued to hone this method of coordinating the entire country to achieve key objectives. The integration of the pair-wise province-to-county aid model, in which a specific province is assigned to help a disaster-stricken county, into China's disaster relief and reconstruction plans following the 2008 Wenchuan earthquake was a significant institutional innovation. According to the model, when several counties or cities are simultaneously hit by a major catastrophe, other relatively wealthy provincial governments of regions not stricken by the disaster use their resources to directly aid a certain county or city on a one-to-one basis. This chapter describes the disaster itself, the government's response, and the policy innovation process behind the formulation of the pair-wise aid relief and reconstruction plan, and it provides additional insights on this policy and its implications.

The Wenchuan Earthquake and Its Challenges for Disaster Relief

At 2:28 p.m. on May 12, 2008, an earthquake of magnitude 8.0 struck Wenchuan County, Sichuan Province. Ten provinces (or provincial-level cities)—including Sichuan, Gansu, Shaanxi, Chongqing, Yunnan, Hubei, Guizhou, Henan, Shanxi, and Hunan—were hit, with northern Sichuan, southeastern Gansu, and southwestern Shaanxi the most severely damaged. In the worst-hit areas, roads, telecommunications, and other infrastructure; factories and other production facilities; and public utilities such as electricity

providers, as well as shops, schools, and hospitals were devastated. The Wenchuan earthquake caused the greatest destruction, affected the widest area, and presented the biggest challenge to rescue operations in China since 1949; it was also a major event in the history of global disasters.

The Wenchuan earthquake was also followed by numerous high-intensity aftershocks. The earthquake measured 8.0 on the Richter scale, with the highest intensity of the epicenter reaching 11 degrees on the Modified Mercalli Intensity scale. As of October 21, 2008, more than 33,000 aftershocks had been detected, with 7 measuring above 6.0 on the Richter scale, more than 60 ranging from 5.0 to 5.9, and more than 600 ranging from 4.0 to 4.9 (China, Ministry of Civil Affairs, NCDR and UNDP 2009). The initial estimate by the Chinese Seismological Bureau for the Wenchuan earthquake was 7.8 on the Richter scale (CCTV 2008). A week later, however, the Bureau revised the number to 8.0. In fact, 10 quakes measuring above 7.0 on the Richter scale hit the area in succession within one minute. Variations in the direction and force of these quakes resulted in massive destruction. As a result, several villages were entirely buried by landslides (Batson 2008). Such unbelievably high seismic intensity is rare in the history of China's disasters.

The Wenchuan earthquake affected a wide range of areas, including 10 provinces (or provincial-level cities) including Sichuan, Gansu, Shaanxi, and Chongqing; 417 counties; 4,667 townships; and 48,810 villages. The total disaster-stricken zone covered 500,000 square kilometers, including 116,700 square kilometers of heavily hit areas. A population of 46.25 million people was affected (China, Ministry of Civil Affairs, NCDR and UNDP 2009). This nationwide catastrophe called for disaster relief efforts with strong management and coordination capacity.

The effective dispatch of disaster relief forces depends on a correct analysis of the regional structure of the disaster—that is, the pattern followed by an earthquake's destructive force—throughout the earthquake-stricken areas. In the past, the destructive force of earthquakes has spread out from the epicenters equidistantly, forming a circular, radial disaster pattern. In the Wenchuan earthquake, however, the worst-hit areas were characterized by a regional structure in which the epicenter was located at the periphery of the disaster-stricken zone.

At first, the traditional perceptions of an equidistant circular disaster structure guided relief efforts, and as a result, disaster relief was focused on cities near the epicenter, such as Yingxiu and Dujiangyan. However, Beichuan, a county hundreds of kilometers away from Wenchuan, was actually the

second-hardest hit (in terms of deaths); nearly the entire county was razed to the ground.

The actual regional structure of the disaster was rare and unusual, following a single-line array pattern. The pattern developed along the Longmen Mountain Fault Zone, and its rays extended to the northwest, with its epicenter at Yingxiu, Wenchuan County. This single-line array formation was almost 300 kilometers in length from the southwest to the northeast and 80–100 kilometers in width from the southeast to the northwest. This unique structure was beyond the experts' traditional understanding of regional disaster patterns. However, later it was learned that Wenchuan County might not be the worst-hit area compared with Yingxiu, Beichuan, and Qingchuan, as many houses in Wenchuan County had recently been renovated (and therefore made more resilient). Wenchuan, Beichuan, and Qingchuan Counties were the most affected. Hanyuan County of Ya'an, Sichuan Province, was also one of the heavily hit areas, even though judging from a map, it appears to be an enclave far away from the epicenter.

The unusual regional structure of the disaster area exerted a huge impact on the command of the disaster relief operations, particularly on the allocation of personnel and the distribution of equipment and materials.

Furthermore, the disaster region featured rugged terrain and a large area, posing a challenge to the disaster relief operations. China, with its centralized administration system, has an advantage in terms of mobilization. However, the entire disaster area covered a mountainous region with an average altitude of more than 1,000 meters and peaks higher than 5,000 meters. The worst-hit areas of the mountainous region suffered from severe traffic and communications disruptions, as well as riverway blockage that impeded the deployment of rescue workers, rescue materials, and large-scale rescue equipment.¹ The road from Yingxiu to Wenchuan was completely blocked by rockfall from nearby mountains, and the recently completed Chengdu–Jiuzhaigou Freeway, in which the Sichuan government had invested more than RMB 1 billion, was totally destroyed.

In addition, the disruption of major transit arteries, rural roads, and communications networks, as well as administrative command networks, hampered the disaster relief command system. Generally, China's organizational

1 This area's terrain is so rugged that it has been said "One man guarding the pass will stop 10,000 from getting through." As if to prove this saying, the government of the Qing Dynasty waged wars for 10 years in this region and failed to enter Yingxiu because of the complexity of the terrain.

system and vast number of grassroots cadres are considered to be important advantages of the Chinese form of government. However, following the Wenchuan earthquake, the grassroots organization network collapsed.

It was impossible to coordinate an orderly evacuation without essential communications capabilities. Therefore, people trapped in the mountains decided to evacuate the young people and children first. Others did their utmost to follow suit once the situation had improved. Most of the infrastructure in the disaster area, including 15 national roads and principal provincial roads close to the epicenter and five railway lines, was severely damaged.

Normal life in the disaster-hit area was disrupted because of extensive outages of electricity, communications, water supply, and other public utilities; production halts among all enterprises; and serious damage to government agencies, schools, and hospitals, as well as ravaged farmland and agricultural facilities. One assessment of economic loss was RMB 800 billion. In fact, the total might be far beyond this number; the actual financial loss may have exceeded RMB 1 trillion.

The Wenchuan earthquake also featured numerous aftershocks and secondary disasters. As of September 1, 2008, more than 27,000 aftershocks had been detected, with several measuring above 6.0 on the Richter scale. Massive landslides and intense post-disaster rainfall resulted in frequent landslides and debris flows, leading to incredibly dangerous barrier lakes. These secondary disasters proved tremendously problematic for the disaster relief operations.

For instance, on May 19, 2008, the earthquake relief headquarters in Sichuan announced that earthquakes measuring above 7.0 on the Richter scale might occur later that day. The warning was broadcast repeatedly on radio and TV, and almost all citizens, more than 300 million people in Xi'an, Chongqing, and Lanzhou, left their homes to avoid the allegedly imminent quake, an evacuation that set a record in the global history of disaster relief. However, it turned out to be a false alarm. In fact, these types of false alarms and errors have brought into question the usefulness of emergency warning systems, which are already plagued by administrative uncertainty in China because no agency has yet been designated as responsible for releasing earthquake warnings (Chen 2014).

That is not to say that Sichuan was not hit by aftershocks. In fact, it was stricken by aftershocks measuring above 5.0 on the Richter scale dozens of times. One such aftershock of magnitude 6.4 hit Qingchuan County, resulting in extensive damage. Moreover, the Tangjiashan Barrier Lake, holding hundreds of millions of cubic meters of water, presented the greatest threat to disaster relief operations.

In addition, the Wenchuan earthquake resulted in a huge number of casualties and triggered the relocation of tens of millions of victims. As of 12 a.m. on September 18, 2008, the death toll stood at 69,227, with 374,643 injured and 17,923 missing (Post-Disaster Reconstruction in Sichuan Province Committee 2010a, 2010b). Sichuan had become the worst-hit province with 68,708 dead and 360,796 injured. In addition, the majority of the buildings in the disaster area collapsed. The counties and townships of Beichuan and Yingxiu in Wenchuan were razed to the ground. Four hundred sixty-six cadres from Beichuan County died in the earthquake, accounting for nearly one-quarter of all civil service personnel and 23 percent of all cadres prior to the earthquake. The loss of the cadres complicated the organizational efforts of relocating victims and handling remains. Another major relief task involved the resettlement of hundreds of thousands of victims transferred from the disaster area to the Chengdu Plain, such as the tens of thousands of victims who were moved to Jiuzhou Gymnasium in Mianyang.

Furthermore, the disruption of major railway lines, especially the Baoji–Chengdu Railway, made coordination of nationwide disaster relief operations difficult. Originally, railways provided the most effective and quickest connection between Sichuan and Beijing, and between North China and Central China. Nonetheless, when the earthquake occurred at 2:28 p.m., a locomotive with 12 cars loaded with gasoline had just entered the No. 109 tunnel on Baoji–Chengdu Railway. The resulting collapse damaged the train and killed the driver and much of the gasoline on board ignited or exploded, damaging portions of the tunnel.

The disruption of the Baoji–Chengdu Railway lasted for 283 hours, almost 12 days. During that time, the large-scale transportation of disaster relief materials was impeded. Fortunately, the Xi'an–Hanzhong–Sichuan Highway, which had just been completed, alleviated some of these logistical difficulties.

Meanwhile, experts from the Department of Transportation reported that more than 20 million cubic meters of rocks had piled up and had completely blocked the road from Yingxiu to Wenchuan, the only available road connecting Chengdu with disaster areas in Ngawa Tibetan and Qiang Autonomous Prefecture. Experts said it would take at least three months to remove the rocks because of the inability to deploy disaster relief forces. Ultimately, it did take three months and 20 days to complete this arduous task.

As a result, disaster relief teams had to make a detour of 800 kilometers and climb over two mountains, including Jiabin Mountain, to transport disaster relief materials from Yingxiu or Chengdu to Wenchuan. If the roads had not been blocked, they would have had to go only 80 kilometers from Yingxiu

or Chengdu to Wenchuan city. As a result, conducting effective rescue operations in counties of Wenchuan, Li, Mao, and Xiaojin in Ngawa Tibetan and Qiang Autonomous Prefecture was difficult. Only a limited number of helicopters were available for the deployment of disaster relief teams and materials.

Finally, the complicated and protracted nature of the emergency rescue missions of the Wenchuan earthquake made them akin to small-scale modern warfare maneuvers. When the earthquake occurred, the general headquarters of the State Council ordered that the disaster relief teams enter Wenchuan by 12 p.m. on May 13. However, subsequent rockslides from mountains not only blocked critical roads but also threatened the teams.

The early disaster relief operations following the Wenchuan earthquake revealed that significant institutional innovation would be necessary. Fortunately, by 2008 China's natural disaster relief and management system had gone through a dramatic transformation, including shifting from a focus on the reduction of financial losses to a focus on the well-being of people; from post-disaster relief to all-around rescue, and emergency rescue in particular; from reacting to events to systematic preplanning and emergency preparedness; from closed relief to all-around transparent relief operations. This last element involved upgrading relief standards to satisfy basic living requirements and meeting international standards and moving from the use of conventional working methods to the adoption of high-tech equipment.

Indeed, these changes laid a solid institutional foundation for the response to the Wenchuan earthquake in 2008 and therefore paved the way for further systematic and comprehensive improvement of the disaster relief system, even though the changes also created some significant challenges for disaster relief personnel, particularly the national administrative system.

Several initial challenges quickly became apparent. China had no special law for disaster relief; it issued regulations on disaster relief only in 2009. Moreover, no laws on disaster reduction or charity had been enacted, resulting in a huge institutional defect related to disaster relief operations. In addition, no plan was in place for coping with massive catastrophe. According to the current national disaster relief plan, in the case of a disaster resulting in a death toll of more than 200 people, the central government would launch a level 1 response, led by a vice premier. Nevertheless, no other higher response standards were in place in case a disaster resulted in a death toll of 1,000 people or more.

Other countries, by contrast, have established a systematic disaster prevention mechanism. For example, following the September 11 attacks, the United States mandated that either the president or the vice president must remain

in Washington, DC, at any given time and that they are not allowed to attend the same meeting at the same time. China has no such catastrophe plans. Furthermore, the absence of a well-functioning emergency relief organization system was problematic. During the Wenchuan earthquake, the national professional emergency relief team had more than 100 people in total. By contrast, Russia has an emergency relief team of more than 500,000 people. The United States has established 10 regional offices for disaster relief, and France, which is half the size of Xinjiang Autonomous Region, has also divided the entire country into 10 areas and provided 10 transport planes for disaster relief operations. Countries in Central Asia have emergency teams of tens of thousands of people.

Another problem was the lack of a transprovincial scheduling mechanism. In case of an emergency, the central government has to establish direct contact with the relevant local government offices. During the 2008 sleet and snow disaster in southern China, the lack of a special integrated scheduling mechanism hampered disaster relief operations.

Equipment shortages also hampered relief efforts. Disaster relief equipment, such as helicopters and even communications equipment, was in short supply. Inadequate supplies and budgetary allocations for administrative personnel's telephone expenditures in relation to emergency disaster relief communications have exacerbated the obstacles for disaster relief operations. In addition, reserves of relief materials have been insufficient. When the Wenchuan earthquake occurred, only 400,000 tents were available throughout the country, and no latrines, small generators, lighting equipment, or food was stored in the central material storehouses, reflecting how inadequate the supply reserve standards were.

Furthermore, only a few local plans were operational. Many local governments allocated responsibility for disaster relief tasks, but without providing specific operational procedures. The lack of a technical disaster relief assessment mechanism also proved problematic. The continuous improvement of public administration will be impossible without proper and scientific assessments of technologies and procedures. For example, after Hurricane Katrina, the US Congress proposed 17 lessons and 125 suggestions for the improvement of government administration, mainly related to specific technology assessments, in only one year.

In addition, few targeted plans and cases existed for frontline operations. First responders have had too few cases for study and preparation. Training for disaster relief should always focus on practical operations rather than theoretical research.

Finally, the absence of comprehensive emergency operation mechanisms also caused challenges. Emergency management offices at all levels in China have become ordinary offices instead of professional institutes. In contrast, in developed countries such as the United States, the staff of emergency management offices will not work there for more than two years because they must stay on duty all day long and get familiar with various technologies. In case of an emergency, the staff must be ready to establish necessary contacts and formulate plans instead of waiting for orders from the leadership.

During the Wenchuan earthquake disaster relief operations, China faced not only an unprecedented catastrophe but also an incomplete administrative system. At that time, the entire world was closely watching China's relief efforts, and China needed to mobilize all factors to carry out the relief operations promptly and effectively despite all obstacles and to ensure that relief activities met elite international standards in disaster management. Such an aggressive learning and adjustment process posed a historic challenge for China's disaster policies and agencies.

Relief and Reconstruction Efforts: The Emerging Pair-Wise Aid Mechanism

Mobilizing emergency disaster relief following the Wenchuan earthquake was a daunting task: the Chinese government underwent unprecedented and grave tests. Those three months and 20 days, from May 12 to September 2, the day when the Yingxiu–Wenchuan road was officially reopened, can be divided into five stages.

The first stage encompasses the emergency response, from May 12 to May 15. Basic measures that the Chinese government adopted to cope with the situation were as follows: on the afternoon of May 12, the government established a general earthquake relief headquarters for the General Office of the State Council, and it set up nine working groups.

The General Office of the State Council was responsible for (1) the organization of general headquarters meetings and special sessions convened by the general director or the deputy general director; (2) the collection, analysis, submission, and release of significant information; (3) the supervision of the way decisions made by the general headquarters were implemented; (4) the communication and coordination on important matters among relevant offices within local governments, departments, the People's Liberation Army (PLA), and Chinese Armed Police Force; and (5) the discharge of other matters assigned by the general headquarters.

The responsibilities, lead departments, and members of each of the nine working groups were divided as follows (China, Ministry of Civil Affairs, NCDR and UNDP 2009):

- **A rescue and relief group** to clean up the disaster-hit area, search for and rescue trapped and injured citizens, organize the self-help and mutual aid of grassroots cadres and the masses, and organize rescue personnel and air transportation, as well as oversee airdrops of relief material. The group was led by the Ministry of Public Security and included the State Administration of Work Safety (National Workplace Emergency Management Center), the China Earthquake Administration, and the Chinese Armed Police Force, as well as the Chengdu Regional Military Force.
- **A community life-rebuilding group** to develop and implement rescue plans for victims and related measures for the supply of funds and materials; guide local governments on emergency relocation; guarantee victims' basic livelihood and market access; accept and arrange domestic donations and international aid; and manage foreign affairs. The group was led by the Ministry of Civil Affairs and included the Ministry of Foreign Affairs, the National Development and Reform Commission (NDRC), the Ministry of Finance, the Ministry of Housing and Urban-Rural Development, the Ministry of Agriculture, and the Ministry of Commerce, as well as the Red Cross Society of China.
- **An earthquake monitoring group** to monitor earthquakes and prevent secondary disasters; assemble the necessary technical force and equipment for the close monitoring of seismic activity and all-out defense against aftershock; strengthen the monitoring and early warning of major geological disasters; organize the evacuation of people in the event of an emergency; enhance the monitoring of water quality and control of pollutants such as hazardous chemicals; and strictly ensure the safe operation of nuclear facilities. The group was led by the China Earthquake Administration and included the Ministry of Science and Technology, the Ministry of Land and Resources, the Ministry of Environmental Protection, and the China Meteorological Administration, as well as the Administration of Science, Technology, and Industry for National Defense.
- **An epidemic prevention group** to organize medical teams and assemble medical equipment and medicines for medical assistance, epidemic prevention, and treatment of the wounded; examine and monitor drinking

water sources and foods; and prevent and control the outbreak of epidemics. The group was led by the Ministry of Health and included the NDRC; the Ministry of Agriculture; the General Administration of Quality Supervision, Inspection, and Quarantine; the State Food and Drug Administration; the General Logistics Department; and the Chinese Armed Police Force.

- **A publicity group** to release relevant news and organize related reports on the disaster situation and earthquake relief information; notify the international community and Hong Kong, Macau, and Taiwan of updated information; release disaster information promptly and accurately; strengthen the collection and analysis of public opinions; and guide domestic and overseas opinion. The group was led by the Publicity Department of the Party Committee and included the Ministry of Foreign Affairs; the State Administration of Radio, Film, and Television (SARFT); the Taiwan Affairs Office of the State Council PRC; the State Council Information Office; the Hong Kong and Macao Affairs Office of the State Council; and the China Earthquake Administration.
- **A production resumption group** to assist in production and reconstruction, verify the damages and losses of all industries, guide and develop scientific plans for production resumption, and actively implement supportive measures by supplying funds and materials. The group was led by the Ministry of Industry and Information Technology and included the NDRC; the Ministry of Finance; the Ministry of Commerce; the Ministry of Human Resources and Social Security; the Ministry of Agriculture; the State-Owned Assets Supervision and Administration Commission (SASAC); the State Administration of Work Safety; the China Insurance Regulatory Commission; and the Administration of Science, Technology, and Industry for National Defense.
- **An infrastructure guarantee and post-disaster reconstruction group** to conduct emergency repairs and maintenance on railroads, highways, bridges, and tunnels as well as on other infrastructure, such as water supply, gas supply, and communications facilities. The group also organized and assembled rescue equipment, particularly disaster relief materials and medicines to effectively guarantee the supply of disaster relief materials in disaster-hit areas; coordinated transportation capacity for emergency earthquake relief personnel and relevant relief materials; organized and studied post-disaster reconstruction planning; and guided and

coordinated post-disaster reconstruction operations. The group was led by the NDRC and included the Ministry of Industry and Information Technology, the Ministry of Civil Affairs, the Ministry of Finance, the Ministry of Housing and Urban-Rural Development, the Ministry of Transport, the Ministry of Railways, the Ministry of Agriculture, SASAC, SARFT, the State Administration of Work Safety, the China Banking Regulatory Commission, the State Electricity Regulatory Commission, the State Post Bureau, the Civil Aviation Administration of China (CAAC), and the State Grid.

- **A water resources group** to ensure the security of reservoirs in disaster-hit areas, fix deformed riverways damaged by the earthquake, and ensure the safety of drinking water. The group was led by the Ministry of Water Resources and included the NDRC, the Ministry of Finance, the Ministry of Land and Resources, the Ministry of Environmental Protection, the Ministry of Housing and Urban-Rural Development, the Ministry of Health, the Ministry of Agriculture, the China Earthquake Administration, the China Meteorological Administration, the State Electricity Regulatory Commission, and the Operation Department of the General Staff.
- **A public security group** to strengthen security administration in disaster-hit areas; prevent and fight illegal and criminal activities; safeguard public security; maintain orderly traffic; strengthen security for Party and government organizations, key departments, financial institutions, and reserve warehouses; and safeguard social stability. The group was led by the Ministry of Public Security and included the Ministry of Education, the Ministry of Justice, the People's Bank of China, the China Banking Regulatory Commission, the China Securities Regulatory Commission, the National Tourism Administration, the State Bureau for Letters and Calls, and the Chinese Armed Police Force.

The above-mentioned system integrated the Party, the government, and the military at the central government level and served as the most effective disaster management system.

China's response was activated at the highest level: Premier Wen Jiabao arrived at the disaster-hit area on May 12 to command disaster relief operations; he was followed by Hu Jintao, then president of the People's Republic of China and chairman of the Central Military Commission, who arrived at the disaster-hit area on May 16. At the same time, governments at all levels in the

disaster-hit area started their own mobilization activities, establishing an integrated command system.

During this period, the central government invested a large amount of funds and dispatched more than 100,000 soldiers, particularly firefighters, into the disaster-hit area for emergency relief operations. Meanwhile, the central government launched a nationwide mobilization system for supporting operations and, for the first time since the founding of the People's Republic of China, initiated an international cooperation mechanism that allowed international rescue teams into the disaster-hit area. Besides this, the government established a mechanism to ensure information transparency by offering foreign journalists open access to interviewees in the disaster-stricken areas. The State Council Information Office also started to release a daily bulletin of information on the disaster-hit areas.

The State Council's earthquake relief general headquarters established its front headquarters in Sichuan on May 15 and appointed Vice Premier Hui Liangyu as the general director. Following this, the comprehensive coordination of disaster relief operations ran smoothly.

The second stage, from May 16 to May 31, involved comprehensive lifesaving operations and the temporary emergency relocation of victims. The challenge of resettling masses of victims from disaster-hit areas came to the fore. Meanwhile, rescuing and guaranteeing the safety of survivors trapped in collapsed buildings or in remote mountainous areas posed an even greater challenge. During this period, people all over the country and the international community donated huge quantities of relief materials for the emergency relocation of victims. Moreover, many volunteers arrived at disaster-hit areas for direct and immediate relief operations.

On May 19, the front headquarters designated the six provinces of Jiangsu, Zhejiang, Shandong, Guangdong, Hubei, and Henan to utilize their resources to directly aid five cities in Sichuan. After that, Sichuan asked the central government to help provide 3 million more tents. On May 22 the Ministry of Civil Affairs made the decision to establish the partner assistance model in which a specific province is assigned to help a disaster-stricken county; this streamlined relief processes and improved earthquake relief operations. Meanwhile, the central government carried out a living assistance policy by supplying 500 grams of food and RMB 10 to each victim on a daily basis from June to August; it also procured 900,000 tents in one month, as well as 1 million prefabricated houses, as temporary shelters for victims.

The third stage, from June 1 to June 26, involved addressing secondary disasters and the preliminary systematic relocation of victims. On the one

hand, barrier lakes, particularly Tang Jiashan Barrier Lake, posed a threat to disaster relief work. On the other hand, with the gradual clearing and opening of roads, relief materials were continuously transported into disaster-hit areas, the disaster relief mechanism began to be established in a systematic way, and the government integrated restoration and reconstruction into its schedule.

The State Council issued the Regulations on Post-Wenchuan Earthquake Rehabilitation and Reconstruction on June 8, thereby regulating rehabilitation and reconstruction operations by law. On June 12 the Ministry of Civil Affairs, the Ministry of Finance, and the Ministry of Housing and Urban-Rural Development jointly issued guiding opinions on the reconstruction of victims' houses. The central government would grant a subsidy of RMB 10,000 to each family whose house had collapsed or been seriously damaged for reconstruction. As a result, the central government allocated RMB 40 billion as reconstruction funds. On June 13 the CPC Central Committee and State Council convened a meeting of principals of all provinces, autonomous regions, and municipalities, as well as central departments, and made the decision to formulate assistance plans according to the pair-wise province-to-county aid model.

The Standing Committee of the National People's Congress listened to the report on the earthquake relief work of the State Council on June 24 and approved the establishment of the national post-disaster restoration and reconstruction fund on June 26 to guarantee related reconstruction efforts. On June 10, the hidden danger posed by the Tang Jiashan Barrier Lake was successfully eliminated, and the discharged flood peak passed by Mianyang urban district smoothly without causing any casualties. In addition, by June 21 a total of 1,570,000 tents, 4,860,000 quilts, and 14,100,000 items of clothing had been disbursed to the disaster-stricken area. Furthermore, governments at all levels had invested RMB 54.3 billion, including 49.6 billion from the central government and 4.7 billion from local governments. As a result, each family affected by the earthquake had access to a temporary dwelling.

The fourth stage, from June 27 to July 18, involved the deepening of all disaster relief policies and the further relocation of those affected by the earthquake. It became apparent that funding sources would need to be identified for the various restoration and reconstruction policies. Therefore, during this period, the top priority was to formulate major policies on recovery and reconstruction.

On June 29, the State Council issued the Opinions of the State Council on Policy Measures for Assistance in Post-disaster Recovery and Reconstruction after the Wenchuan Earthquake so as to carry out further reconstruction

work. The Opinions set forth specific provisions on the policy for post-earthquake recovery and reconstruction funds; these provisions related to policies on central finance, financial expenditure, taxation, use of government funds and revenue from administrative and institutional fees, industrial support, land and mineral resources, employment assistance and social insurance, and food, as well as many other matters.

The Ministry of Civil Affairs, the NDRC, the Ministry of Finance, the Ministry of Land and Resources, the China Earthquake Administration, and the National Committee of Experts for the Wenchuan Earthquake completed an Earthquake Disaster Range Assessment jointly with the provincial governments of Sichuan, Gansu, and Shaanxi on July 11. The Assessment for the disaster range of the Wenchuan earthquake found the following: 417 counties (a county encompasses either a city or a district) were affected by the earthquake, including the 10 very worst-hit counties (cities), 36 worst-hit counties (cities, districts), 191 disaster-hit area counties (cities, districts) as well as 180 affected area counties (cities, districts). The entire affected area was 500,000 square kilometers, including 26,000 square kilometers of the very worst-hit area entirely located in Sichuan province, 90,000 square kilometers of worst-hit area, and 384,000 square kilometers of disaster-hit area.

This assessment laid a solid foundation for related restoration and reconstruction planning. Policies were also made for living arrangements for the people in the disaster-hit areas. On July 18, the Ministry of Civil Affairs and Ministry of Finance issued the Notification on Matters Concerning Subsequent Life Assistance to the Needy in Areas Struck by the Wenchuan Earthquake in order to provide further assistance for orphans, solitary elderly people, solitary disabled people, poor family members of the deceased and the seriously disabled, internally displaced persons, and those whose houses had collapsed or were damaged in the earthquake. This relief policy lasted for three months, from September to November. Subsequently, cash, instead of provisions, would be provided to the victims at a monthly rate of RMB 200 per capita. Upon the expiration of such a relief policy at the end of November, for victims in need, different relief policies would apply according to different circumstances. These relief policies included basic cost-of-living allowances for urban and rural residents and, in rural areas, the existing “Five Guarantees” social assistance system (which ensures the provision of food, clothing, housing, medical care, and a proper burial for the neediest in rural areas).

The fifth stage, from July 19 to September 2, involved the systematic establishment of post-disaster recovery and reconstruction mechanisms at both the central and local government levels and the comprehensive implementation

of all policies. During this stage, as the road from Yingxiu to Wenchuan was not yet reopened, one had to make a long detour to get to western and northern Sichuan, which hampered the relief work. The situation was further aggravated in the rainy summer, which caused occasional regional flooding. However, this was a critical period for recovery and reconstruction. Greater efforts had to be made to work out concrete overall plans for recovery and reconstruction.

The road from Yingxiu to Wenchuan finally reopened on September 2, thereby restoring the direct connection between Ngawa Tibetan and Qiang Autonomous Prefecture and the entire Chengdu Plain. Furthermore, the governments in Gansu and Shaanxi also started to conduct systematic planning of post-disaster rehabilitation and reconstruction activities.

On September 19, 2008, the State Council officially issued the Overall Plan on Post-Wenchuan Earthquake Rehabilitation and Reconstruction for the unified deployment of post-disaster rehabilitation and reconstruction forces. On October 8, the CPC Central Committee, the State Council, and the Central Military Commission jointly convened a national commendation conference for earthquake relief, representing the end of the basic phase of emergency earthquake rescue operations.

On May 19, the front headquarters designated the six provinces of Jiangsu, Zhejiang, Shandong, Guangdong, Hubei, and Henan to use their resources to directly aid five cities in Sichuan on a one-to-one basis. At that time, Jiangsu was designated to aid the worst-hit Shifang and Mianzhu cities within Deyang municipality; Zhejiang was designated to aid the prefecture-level Guangyuan city, particularly Qingchuan County within the Guangyuan Prefecture; Shandong and Henan were designated to aid several cities and counties of the worst-hit Mianyang city (another prefecture-level city), such as Beichuan, Pingwu, and Jiangyou; Guangdong was designated to aid Ngawa Tibetan and Qiang Autonomous Prefecture, particularly Wenchuan County; and Hubei was designated to aid the prefecture-level Ya'an city, particularly Hanyuan County.

The establishment of the pair-wise province-to-county aid model was imperative because of the limited post-disaster logistical capabilities. For example, the Chengdu Railway Station has a maximum daily handling capacity of 300 cars during ordinary conditions. During the disaster relief period, the capacity could be increased to 700 or even 1,000 cars per day. However, during the first week after the Wenchuan earthquake, more than 2,000 cars of materials had to be transported into Sichuan on a daily basis, posing a logistical challenge.

Similar problems were encountered at the Chengdu Airport, where the supply of diesel for cargo handling machines ran out because of the huge amount of materials being handled. Consequently, numerous volunteers were relied on for the manual unloading of relief materials. In addition, many drivers transporting disaster relief materials from Chengdu to other disaster-hit areas had gone a week without rest, which was, needless to say, dangerous. In addition, officials in charge of the disaster relief operations in Dujiangyan demanded that trucks full of relief materials from other provinces unload the materials directly in Dujiangyan instead of Chengdu for convenience. However, aid personnel rejected the dictate and insisted on transporting materials into Chengdu in accordance with procedures.

At that time, it was clear that an administrative logjam had occurred in the Wenchuan earthquake relief efforts because traditional administrative systems, experience, and operational channels were no longer sufficient. The author reported these problems to the general director of the front headquarters, Vice Premier Hui Liangyu. As a result, Vice Premier Hui Liangyu decided to take actions to overcome such barriers in the administrative system.

The vice premier invited the six provinces to provide direct assistance to the five cities. He made a call to the secretary of the Provincial Committee of the CPC and asked the minister of civil affairs to call the head of Sichuan's Department of Civil Affairs to implement his decisions. This chapter's author, who was serving as director of the disaster relief department of the Ministry of Civil Affairs and director of the National Disaster Reduction Center, was then made responsible for the coordination work.

At that time, only a disaster relief commissioner from the Ministry of Civil Affairs disaster relief department and an official from the emergency department of the National Disaster Reduction Center worked with me at the front headquarters. Because the Department of Civil Affairs was responsible for the organization of the relief work, the three of us acted as liaisons with the department. Our coordination work proved to be challenging, as reports had to be made to the Department of Civil Affairs of Sichuan, and we needed to communicate with local leaders to make sure that staff from all six provinces carried out assistance directly to the quake-hit cities and counties and that reception personnel were available for the implementation of the plans at the city level.

The pair-wise province-to-county aid model was designed to offer direct aid to disaster-hit areas and to simplify lengthy and redundant administrative procedures. As can be seen in the relief effort overview above, the establishment of the pair-wise province-to-county aid model was a process involving

continuous exploration and improvement. The next section describes the learning process in depth.

The Formulation and Implementation of the Pair-Wise Aid Policy

Although the effectiveness of the pair-wise aid policy was proved by successes such as those experienced between Hubei and Ya'an, new challenges and problems arose on May 22, three days after the implementation of the new model. For example, complications arose with the aid to Mianyang and Deyang. At that time, Shandong and Henan were designated to aid Mianyang. However, the system was set up such that relief materials could not be divided up until they reached Mianyang city, so all of these materials were transported directly to Mianyang city instead of being distributed to other assigned recipients, such as Jiangyou County, along the way. As a result, Henan then had to transport relevant materials back to Jiangyou County, resulting in a significant waste of time and logistical resources. The deputy director-general of the Department of Civil Affairs of Henan Province, who was in charge of the related work, asked if measures could be taken to avoid such inefficiency.

Meanwhile, the working group from Jiangsu was faced with similar challenges in Deyang. At first, Jiangsu Province planned to designate Suzhou city and Wuxi city to directly aid Shifang and Mianzhu on a one-to-one basis. The idea was adopted, and disaster relief coordinators led the working group of Jiangsu to report to Vice Premier Hui Liangyu. However, three days later, disaster relief coordinators got news of challenges. For example, the two recipient cities debated about where the Jiangsu earthquake relief headquarters should be located, how much aid each city should receive, and when they should get the aid, and Jiangsu Province was unable to resolve these issues. Afterward, Sichuan required the central government to provide 3 million more tents. However, after performing independent calculations, those working in the front headquarters provided a more accurate estimate of 1 million tents.

In the meantime, the State Council demanded that a detailed plan be carried out for the distribution on a one-to-one basis of millions of prefabricated houses to the disaster-hit area. On the morning of May 21, all major leaders accompanied Premier Wen Jiabao on his visit to the disaster-hit area. During this visit, the director-general of the Department of Civil Affairs of Hebei Province suggested that the assistance of counties on a one-to-one basis would

BOX 3.1 Disaster Management Experience with Typhoon Saomai

Typhoon Saomai, which landed at the junction between Zhejiang and Fujian at 17:25 on August 10, 2006, was a type of typhoon rarely seen before. It developed right on the heels of Typhoon Maria and Tropical Storm Bopha on the surface of the western Pacific Ocean, with the three mercurial typhoons further reinforcing one another and gradually building up a devastating power between them. The time the typhoon landed happened to coincide with high tide, and the confluence of wind, rain, and tide only made the situation more menacing.

Saomai, which slammed into Fujian with its peak wind speed hitting 75.8 meters/second, registered a maximum wind force of Force 17 on the Beaufort scale. This put it in the category of Hurricane Katrina, which pounded New Orleans. According to relevant statistics collected by Fujian on August 16, 14 counties and 164 towns within the province were affected, with a population of 1.45 million: 45,700 houses collapsed, 215 people were killed, and 157 people were missing.

A large number of ships were sunk, the worst case being at the Shacheng port in Fuding city, where 952 ships sank and 1,139 were damaged. Crop-land of 68,800 hectares was affected, with 44,230 hectares destroyed; 234 industrial and mining enterprises were forced to close, with the direct economic loss reaching RMB 6.357 billion (Baidu Encyclopedia n.d.).

Almost immediately following the devastating typhoon, Fujian put in considerable relief efforts; the provincial party chief and governor both showed up at the frontline of relief efforts. However, because the disaster had dealt a devastating blow to communications, electricity, and transportation, many reporters couldn't get comprehensive and accurate information, so they wrote negative news reports, causing a great deal of misunderstanding within the society.

This chapter's author was directly involved in the handling of this incident and since then has continued to consider one issue: how to conduct a rescue after a devastating disaster hits a region. Local government alone is by no means capable of handling massive disasters, and the direct intervention of the central government, including the provision of rescue armed forces and specialized equipment, is imperative.

Even more important is the adoption of a coordinated but decentralized system, which is not unprecedented in the international rescue and relief community. Actually, in international rescue and relief practice, especially the relief operations following the 2004 Indian Ocean tsunami, the few participating countries all acted relatively independently yet also collaboratively under certain circumstances. Such experience with direct rescue provided inspiration for the Wenchuan earthquake relief efforts.

be more convenient and effective. At that time, Hebei Province had established contact with Chongzhou and wished to aid it specifically.

Given past experiences with other disasters (Box 3.1) and the realities on the ground, a notice was drafted on May 21 and sent to Beijing for modification. On May 22, the Ministry of Civil Affairs issued the Emergency Notice on Specific One-to-One Aid for Affected Areas of the Wenchuan Earthquake. The first line in the Notice read “according to the overall deployment of the general earthquake relief headquarters for the State Council on one-to-one aid work”; this line demonstrated that one-to-one aid work had gradually become the general consensus.

As it had become clear that the scale of the reconstruction required would exceed the capacity of the six provinces initially assigned, the list of both donors and recipients was expanded to include 21 donor-recipient pairs, as follows: Beijing-Shifang, Shanghai-Dujiangyan, Hunan-Pengzhou, Heilongjiang-Wenjiang district, Shanxi-Pi County, Inner Mongolia-Dayi County, Hebei-Chongzhou, Jiangsu-Mianzhu, Liaoning-An County, Shandong-Beichuan County, Jilin-Pingwu County, Henan-Jiangyou, Guangdong-Wenchuan County, Fujian-Li County, Tianjin-Mao County, Anhui-Songpan County, Jiangxi-Xiaojin County, Guangxi-Heishui County, Zhejiang-Qingchuan County, Hubei-Hanyuan County, and Hainan-Baoxing County. In addition to the pair-wise relief efforts for affected parts of Sichuan, the notice designated Beijing and Tianjin to aid Longnan and Gannan of Gansu Province, respectively. And donations from Guizhou, Tibet, Qinghai, Ningxia, Xinjiang, and the Xinjiang Production and Construction Corps that were not assigned to specific aid missions were used mainly for the living arrangements of victims and the rehabilitation and reconstruction of the affected area of Shaanxi Province.

The Emergency Notice was carried out urgently and ignored regular administrative orders. Afterward, some people, even a few officials in Sichuan Province, had doubts about whether the determination procedures used for producing the notice were legal, whether the decisionmakers responsible for this notice had the authority to draft it, and whether aid-providing areas had been paired to the correct aid-receiving areas.

In fact, the list was formulated through in-depth consultation with the Department of Civil Affairs of Sichuan Province and members of the Sichuan earthquake relief headquarters. Nonetheless, the information provided to those who were overseeing disaster relief efforts was limited at that time, and they were able to adhere to the list only for the time being.

The issuance of the document by the Ministry of Civil Affairs served to disseminate the Ministry's rich experience and effective administrative procedures. Furthermore, Jiangsu, Zhejiang, Hubei, Shandong, Henan, and Guangdong needed to shift their focuses in accordance with this notice to guarantee the successful completion of their respective missions and the comprehensive handover of the relevant work.

The Emergency Notice identified the primary missions of the aid-providing provinces to be as follows:

1. To provide temporary shelters for victims, including tents, prefabricated houses, and transitional makeshift houses, and to strive to offer a temporary dwelling for each relocated family
2. To provide cotton quilts, clothes, food, and drinking water, as well as household items such as cooking utensils and beds, to meet the basic needs of victims
3. To assist the relevant local governments of disaster-hit areas in rehabilitation and reconstruction operations such as the reconstruction of civilian houses and the renovation of infrastructure
4. To assist the relevant local governments of disaster-hit areas in the recovery and development of the economy, including economic cooperation and technical guidance

The above-mentioned missions are related to the disaster relief work of the Ministry of Civil Affairs, because of its guiding role in the disaster relief work and the post-disaster rehabilitation and reconstruction. Both aid-providing and aid-receiving provinces were also required to carry out four other tasks identified in the notice.

First, they needed to deepen their understanding of and attach greater importance to disaster relief work. All levels of civil affairs departments had to resolutely implement instructions on the pair-wise province-to-county aid model of the Party Central Committee and State Council, fully realize the extreme importance and urgency of one-to-one disaster relief work, understand the urgent demands of disaster-hit areas, organize emergency mobilization, regard one-to-one disaster relief work as a top priority, and achieve practical results.

Second, these provinces needed to enhance communication and work in close collaboration. Each assisting province and disaster-hit area would establish a special working group and select backbone personnel with both political

integrity and professional competence for full-time disaster relief work. An assistance province and corresponding disaster-affected area would establish a direct contact and collaboration mechanism to ensure the smooth implementation of relevant disaster relief operations.

Third, the provinces needed to pinpoint specific demands and determine corresponding tasks. Each disaster-hit area would report its prioritized requirements to the corresponding province. Each assisting province would determine its tasks and relevant time constraints and organize the production and allocation of the required materials on time and in accordance with the actual demands of the disaster-hit area. The priority was to provide sufficient tents, quilts, clothes, food, and drinking water, as well as household items such as cooking utensils and beds, to the disaster-hit area. Provincial governments would assign special personnel to enterprises designated by the Ministry of Civil Affairs to manufacture relief tents. These special personnel would supervise and inspect the scheduling and coordination of production and would settle any production and transportation difficulties in order to ensure the timely completion of relevant production missions.

Fourth, these provinces would carry out recovery and reconstruction on the basis of the present situation but informed by a long-term view. In addition to livelihood assistance to the victims, aid providers should provide them with both technical and financial support for engineering construction and the design of urban and rural planning. Meanwhile, plans for recovery and reconstruction in earthquake-hit areas would be worked out as quickly as possible and integrated into post-disaster reconstruction and the longer-term sustainable economic development of the earthquake-hit areas, especially in the case of infrastructure development, so as to enable the growth of locally appropriate industries.

These requirements were proposed in accordance with the specific circumstances of the general disaster relief operations. After the issuance of the notice, those overseeing the relief efforts visited Shifang and Dujiangyan immediately. People in the disaster-hit area were pleased and inspired. Dujiangyan even issued extra leaflets as a welcome to the working group from Shanghai.

However, the local officials of Shifang were dissatisfied with the new decision because they had to abandon their work with Guangdong on projects worth tens of millions of RMB, as Guangdong was designated to aid Wenchuan County. At that time, the Beijing support team was still in another place, but the officials of Shifang were told that Beijing would send its personnel and materials to Shifang soon. Nevertheless, Beijing dispatched one of its

deputy mayors to Shifang the same day to learn about supply requirements. Soon afterward, Beijing organized 80 train cars of relief materials and quickly transported them into Shifang, largely resolving the most urgent problems in Shifang.

Since the establishment of the pair-wise province-to-county aid model, all the paired provinces and cities had set up their own front headquarters, thereby standardizing national earthquake relief operations. With the help of this new model, earthquake relief processes were streamlined, and relief operations were effectively improved.

Upon stabilizing emergency relief, restoration and reconstruction were brought onto the agenda. However, the central government faced a challenge in effectively and efficiently carrying out restoration and reconstruction across such an extensive area as that which was affected by the Wenchuan earthquake. Therefore, the Political Bureau of the CPC Central Committee convened a meeting on June 5 to examine and assess the implementation of the partner assistance model of pairing a province with a county during the post-disaster restoration and reconstruction.

In fact, prior to the meeting held by the Political Bureau on June 5, the partner assistance model had never been mentioned in the documents issued by the State Council. A majority of people thought that the institutional arrangement was made by the Ministry of Civil Affairs, while some even believed (mistakenly) that it was carried out by the Ministry of Civil Affairs without the approval of the State Council. With the Political Bureau's decision to implement the partner assistance model, it became a comprehensive national-level institutional arrangement.

At a meeting held on June 11, the CPC Central Committee decided that the partner assistance model that paired a province with a county would be put into practice comprehensively. According to the requirements laid out by the CPC Central Committee, money and materials annually donated by the provinces providing partner assistance should be no less than 1 percent of their local government revenues for the previous year. Later on, a formal system of partner assistance was set up, in which 18 provinces were assigned to assist 18 cities and counties in Sichuan Province, Tianjin Province was assigned to assist Shaanxi Province, and Shenzhen Province was assigned to assist Gansu Province.

This institutional arrangement was actually made by a higher level of management, that is, the CPC Central Committee rather than the Ministry of Civil Affairs. The arrangement made by the Ministry of Civil Affairs wasn't necessarily appropriate because it was made during the emergency relief

TABLE 3.1 Pairs of aid providers and recipients, Sichuan earthquake response

Aid Provider	Aid Recipient
Guangdong Province	Wenchuan County
Shandong Province	Beichuan County
Zhejiang Province	Qingchuan County
Jiangsu Province	Mianzhu city
Shanghai city	Dujiangyan city
Beijing city	Shifang city
Henan Province	Jiangyou city
Hebei Province	Pingwu County
Liaoning Province	An County
Fujian Province	Pengzhou city
Shanxi Province	Mao County
Hunan Province	Li County
Jilin Province	Heishui County
Anhui Province	Songpan County
Jiangxi Province	Xiaojin County
Hubei Province	Hanyuan County
Chongqing city	Chongzhou city
Heilongjiang Province	Jiange County
Guangdong Province (mainly, Shenzhen city)	the worst-hit areas in Gansu Province
Tianjin Province	the worst-hit areas in Shaanxi Province

Source: China, State Council (2008b).

period. For example, Heilongjiang Province was originally assigned to assist Wenjiang district, which turned out to be suffering less damage than other areas. To further improve the partner assistance system, necessary adjustments were inevitable. Table 3.1 shows the new arrangements that followed these adjustments.

Although most of the arrangements were the same as those during the emergency relief period, some major changes were made to partner assistance arrangements. For example, former arrangements for Heilongjiang Province, Shanxi Province, Hebei Province, and Tianjin Province, as well as some other provinces were changed, and relatively poor provinces, including Inner Mongolia and Guangxi Province, were no longer on the partner assistance list. And Tianjin Province and Shenzhen city, which are economically powerful, were assigned to assist Shaanxi Province and Gansu Province in their post-disaster restoration and reconstruction.

In order to motivate the efficient and effective implementation of the partner assistance mechanism, the CPC Central Committee designated it as a priority task and one that would be standardized. Standardization serves to facilitate measurement and comparison and thereby triggers competition among officials of the donor provinces, who operate within China's tournament-style bureaucratic system in which promotion depends on excelling in meeting goals (Zhong and Lu 2015). Transparency of public opinion and the supervision of auditing departments also contributed to the success of the assistance program as a whole (Fengyangxiaozhu 2011).

To carry out the comprehensive restoration and reconstruction and to help with the implementation of Beijing's partner assistance to Shifang, a national restoration and reconstruction system was developed under the leadership of the NDRC, with assistance from the Sichuan Provincial People's Government and Sichuan Department of Housing and Urban-Rural Development. The system's members included the following:

- Shaanxi Provincial People's Government
- Gansu Provincial People's Government
- Ministry of Education
- Ministry of Science and Technology
- Ministry of Industry and Information Technology
- State Ethnic Affairs Commission
- Ministry of Public Security
- Ministry of Civil Affairs
- Ministry of Finance
- Ministry of Human Resources and Social Security
- Ministry of Land and Resources
- Ministry of Environmental Protection
- Ministry of Transport
- Ministry of Railways
- Ministry of Water Resources
- Ministry of Agriculture

Ministry of Commerce

Ministry of Culture

Ministry of Health

National Population and Family Planning Commission

People's Bank of China

State-Owned Assets Supervision and Administration Commission of the State Council

State Administration of Taxation

General Administration of Press and Publication

State Administration of Radio, Film, and Television

General Administration of Sport of China

State Forestry Administration

China National Tourism Administration

Chinese Academy of Sciences

Chinese Academy of Engineering

China Earthquake Administration

China Meteorological Administration

China Banking Regulatory Commission

China Securities Regulatory Commission

China Insurance Regulatory Commission

State Electricity Regulatory Commission

National Energy Administration

State Administration of Cultural Heritage

State Food and Drug Administration

State Council Leading Group Office of Poverty Alleviation and Development

Many other ministries and departments were involved. The national mobilization system was rather effective as a result of this structural arrangement.

In addition, the partner assistance offered by provinces previously assigned by the Ministry of Civil Affairs was still carried out. Hainan Province was originally designated to help Baoxing County, Sichuan Province. Though neither Hainan nor Baoxing was listed among the emergency aid providers or recipients, they maintained their partner assistance relationship because Hainan had about RMB 100 million in donor funding. Relatively poor areas such as Qinghai, Xinjiang, and Tibet also delivered their donor funds to the disaster-hit areas.

The general layout of the pair-wise province-to-county aid model generated great political, economic, and social benefits and further enhanced social cohesion. Restoration and reconstruction in disaster-hit areas also helped to promote innovations in public governance. In a system dominated by ideas of vertical management, in which initiative proceeds from higher to lower levels of the hierarchy (from the central government to a provincial government) or horizontal management, in which initiative proceeds from one manager to another at the same hierarchical level (from one bureau to another or from one province to another), networked systems and relationships have created new management opportunities. The new networked system allows, for example, one province to initiate a relationship with a county in a different province. As for the achievements of the pair-wise province-to-county aid approach, in a press conference organized by the Information Office of the State Council on May 10, 2011, the deputy director of the National Development and Reform Commission noted that the innovative partnership program had made outstanding contributions to speeding up the reconstruction campaign, enhancing reconstruction quality, and raising the reconstruction level.

By the end of September 2010, the post-disaster restoration and reconstruction campaign had generally achieved the goal of “completing a three-year mission in two years.” Currently, nearly 95 percent of the total number of the planned post-disaster reconstruction projects have been completed. Three provinces have built 1,908,500 rural housing units, 288,300 urban housing units, 3,839 schools, 2,169 health and rehabilitation organizations of all types, and 5,000 infrastructure projects of all types, which amounts to a decisive victory in post-disaster recovery and reconstruction.

Some of the most heavily hit counties, townships, and villages, including the “Three Chuans” (Wenchuan, Beichuan and Qingchuan) and “Two Townships” (Yingxiu township and Hanwang township), have been impressively reborn and are now reemerging with a whole new look. Priority has been

TABLE 3.2 Assistance funding and projects by partner, Sichuan earthquake response

Partners	Funding (million RMB)	Number of projects
Guangdong Province–Wenchuan County	11,200	702
Shandong Province–Beichuan County	12,000	369
Zhejiang Province–Qingchuan County	8,500	538
Jiangsu Province–Mianzhu city	11,000	295
Shanghai city–Dujiangyan city	8,250	117
Beijing city–Shifang city	7,000	108
Henan Province–Jiangyou city	3,002	302
Hebei Province–Pingwu County	2,800	108
Liaoning Province–An County	3,400	88
Fujian Province–Pengzhou city	4,734	143
Shanxi Province–Mao County	2,162	226
Hunan Province–Li County	2,010	99
Jilin Province–Heishui County	1,297	201
Anhui Province–Songpan County	2,130	320
Jiangxi Province–Xiaojin County	1,300	51
Hubei Province–Hanyuan County	2,115	116
Chongqing city–Chongzhou city	1,700	111
Heilongjiang Province–Jiange County	1,550	146
Tianjin Province–Shaanxi Province	2,237	121
Shenzhen city–Gansu Province	3,000	165
Total	91,387	4,326

Sources: Zhou (2010a), Mu and Sha (2010), Shen (2011), Jiangsu Provincial Audit Office of China (2011), Hua (2011), Chen (2010), Geng (2010), Yang and Ma (2010), Fujian Pairwise Aid Post-Disaster Reconstruction Penzhou Front Headquarters (2011), G. Li (2011), L. Li (2011), Wang (2011), Anhui Province's Songpan County Assistance Office (2011), Aba Prefecture (2010), Yong and Wang (2010), Chen (2011), Zhang (2011), Yang and Chi (2010), Zhou (2010b), Cheng (2010).

given to the completion of urban and rural housing units, schools, hospitals, and public infrastructure projects, while other specially planned projects have also entered their final phase.

The number of assistance projects and amount of aid funds involved make it clear that the post-earthquake recovery campaign has enhanced the infrastructure of the affected areas. The total amount of assistance funds contributed by all assistance-giving provinces and municipalities reached RMB 91.387 billion, with a total of 4,326 projects of all sizes undertaken (Table 3.2).

These numbers are only part of the evidence for the power of the partner assistance model. Because provinces and cities concentrated their efforts on helping rebuild their partners, “a three-year mission can be achieved in two years.” The whole society has thus fully realized the institutional advantages of letting large places help small ones. After that, it’s only natural for the central government to adopt the one province–one county approach in making partner assistance arrangements for certain places, especially the Xinjiang Autonomous Region.

Institutional Context for the Pair-Wise Aid Policy

The one province–one county disaster relief model provides an innovative strategy in which each province partners with a particular county and offers targeted assistance, thereby ensuring that all affected counties receive comprehensive assistance. All relevant provinces first have specialized working bodies stationed in their counterpart counties and then make further arrangements to partner their eligible cities or districts with particular affected townships—financially well-off counties under their jurisdiction extend assistance all the way down to the village level.

Such a practice of breaking down and assigning the assistance tasks level by level and exercising centralized control over large assistance projects affirms the government’s basic approach of “performing centralized deployment and breaking down tasks.” It’s worth noting here that this institutional innovation is also partly inspired by international experience. As the person who first directly promoted the establishment of the direct assistance system, the chapter author drew inspiration from the rescue and relief efforts following Typhoon Saomai that struck Fujian in 2006, as discussed in Box 3.1.

The pair-wise province-to-county aid model is essentially a structural shift whereby assistance decisionmaking no longer has to be passed down from the central government all the way through the Sichuan provincial government to Chengdu, Mianyang city, Deyang city, Ngawa Tibetan and Qiang Autonomous Prefecture, or Ya’an, and so on. Instead, direct interaction can be established between the government of the donor and the government of the affected recipient counties.

The pair-wise province-to-county aid model is a major institutional innovation. It aims to promote competition among relevant provinces so as to hone their respective capabilities through a mutual learning process. However, the role of the central government cannot be ignored. The central government’s

overall coordination and supervision ensures that a clear division of labor has been achieved among various places.

The pair-wise province-to-county aid model demonstrates the room for reform within the government's administrative system. In fact, even if the current system is not reformed but certain administrative behaviors are adjusted, considerable organizational opportunities can still be created. In other words, decentralization may well determine the degree to which the institutional efficiency is improved.

The establishment of the one province-one county system is a gradual process. At the initial stage, the system has no clear goals to speak of, and every step is merely driven by the most urgent need so that pressing problems can be promptly addressed. However, once it is in practice, the system can operate with great vitality and can immediately show its tremendous influence.

The establishment and smooth operation of the one province-one county disaster relief system requires some unique political and social conditions. These include the following:

First, a relatively sound disaster relief system must be in place. The four-level emergency response system China set up requires the central government's disaster relief officials to arrive at the affected areas and mobilize relief supplies and funds within 24 hours. This institutional guarantee is the prerequisite for the one province-one county direct relief system to function.

Before the Wenchuan earthquake, the four-level emergency response system had already been operating effectively for a few years. In March 2008, the Sichuan Provincial Civil Relief officials had just undergone a relevant training program in Zhuhai city, organized by the Ministry of Civil Affairs, and had since become well acquainted with the disaster relief system. That's why the partner assistance model could be readily adopted. In other words, for the model to work most effectively a proper system must be in place, and some officials must be familiar with the necessary procedures and know what to do in the event of an emergency.

Second, a strong mobilization capacity and a transparent system of public opinion must be in place. China's mobilization capacity can readily apply focused efforts nationwide on rescue and relief work during the relief period. In particular, when the central government required the local governments to donate 1 percent of their provincial budgets to support disaster relief and recovery, everything ran smoothly, without many institutional barriers in the way. Equally important, China's top leaders personally headed to the affected areas to see the situation on the ground with their own eyes and get to know the difficulties firsthand before they determined courses of action.

In addition, it's important to nurture a transparent news system. For instance, the practice of allowing foreign journalists free access to the disaster area to report on the progress of disaster relief may promote fair competition between them and their Chinese counterparts. This competition is a good thing, because in the absence of oversight by public opinion, large-scale tragedies like 1958's Great Leap Forward, with its foolhardy sky-is-the-limit philosophy, might reoccur.

The oversight of public opinion helps enhance the quality of the information transmitted so that the government can get prompt and accurate information on relief progress and problems in various places and make the best-informed and soundest relief and recovery decisions. Following the Wenchuan earthquake, media openness played an important role in the rescue and reconstruction by stimulating donations, drawing attention to corruption, and enabling mass collaboration in finding people.

As for the pair-wise aid mechanism, some policymakers initially intended to fulfill the task only by building 1 million prefabricated housing units. But in the implementation process, they realized that the construction of prefabricated houses may damage the rice fields; in addition, because of the mountainous location, the amount of land available to serve as reconstruction sites was limited. And the relatively short cycle of China's reconstruction effort meant that there was no need to learn—from Japan, for instance—about building modular houses for long-term use. The Qingchuan County party chief explained his view of the situation: "Our county only has 8,000 acres of arable land, and if all is used for building modular houses, what will my people eat in the future?" But obviously he alone couldn't change the decisions made by his superiors. In fact, it was public opinion that finally led to the adjustment of the modular house construction plan. The original task of blindly building 1 million modular houses was called off.

Third, an open system must be in place, informed by the power of charity. Institutional openness implies openness both to external influences and to certain internal elements. The Wenchuan earthquake relief operations were open to the outside world and to Chinese society, as well as to internal institutions. For example, the Recovery and Reconstruction Training Course for Local Leaders Going Abroad for Study, which was organized by the Organization Department of the CPC Central Committee, invited policymakers behind the formulation of the partner assistance policy to deliver a lecture to the participants about the importance of the policy and the relevant key issues to consider.

Though not responsible for the disaster relief work, the Organization Department of the CPC Central Committee has also played an important role in promoting the pair-wise province-to-county aid policy. Additionally, the power of charity should not be underestimated. During the Wenchuan disaster relief process, social consciousness in China was aroused to a considerable height, such that even beggars joined the ranks of donors. At the time, mobilizing additional support for the disaster relief efforts was easy, as most areas expressed the wish to join the rescue and relief operations in an orderly and effective manner.

In fact, participating provinces and municipalities all held special conferences commending their workers who engaged in recovery and reconstruction work. The workers regarded the rescue and relief mission as their own missions, all showing a strong sense of morality. The Wenchuan earthquake disaster relief operations indeed inspired the moral enthusiasm of the whole society and changed the public perception of youths as being deficient in social responsibility. Indeed, the post-1980s generation made an impressive debut during the relief period of the disaster. This sense of responsibility was a good social foundation upon which to implement the one province—one county model.

The practice of partnering a province with an affected county has played a strong role in enhancing social cohesion. A vertical system meets a horizontal system, resulting in networked functions. Of course, as an important innovation of the emergency response system, the pair-wise mechanism can't be used too often in daily administration. The one province—one county model has certain limitations, as described in this chapter. However, the one province—one county model has inspired some new insights concerning institutional construction and reform. The enhanced topic of institutional construction and reform serves as a whole new area for interested researchers to explore and draw on. With this in mind, the final section presents some initial findings regarding the implications of the pair-wise aid policy, as well as insights on its future development and implementation.

Conclusion

The pair-wise aid model has been widely characterized as a success. Chen and Booth (2011) note that the use of the pair-wise assistance mechanism following the Wenchuan earthquake supported the government's long-term strategy by optimizing the allocation of resources, upholding the principle of

coordinated regional development, and establishing a model for future disaster response efforts.

Xu and Lu (2013) conducted a study that compared the pair-wise mechanism with other aid models and found the pair-wise model to have been feasible and effective (citing its implementation a second time following the 2010 Yushu earthquake) and to have a number of advantages. Xu and Lu (2013) also found the pair-wise model to be more efficient and effective than other typical mechanisms—such as central government–oriented aid, national nongovernmental organization aid, and international humanitarian aid—with efficiency and effectiveness being measured by such metrics as assistance scope, support forms, and organizational coordination.

Criticisms of the mechanism, however, have also emerged in the research literature and popular press. For example, one *China Daily* reporter cited problems ranging from construction delays to misuse of funds and decreasing trust of public officials, as well as labor issues, in a story describing the progress of the reconstruction policy (Hu 2010). Xu and Lu (2013) and IRP (2010) note several problems with the pair-wise model, including power asymmetry between the donor and the recipient and exclusion of other organizations, such as NGOs and community organizations. Excluding community organizations led to cultural barriers and recipient inconvenience and dissatisfaction because of a lack of local experience and cultural knowledge. In addition, Xu and Lu (2013) note that the performance-oriented setup of the mechanism led to a preference for short-term infrastructure projects over other projects that could better alleviate poverty, as the latter type of project involved investments that were generally larger and more long-term. Furthermore, the disparity between the financing provided by various donor provinces and municipalities (with some donors providing several times as much as others) has been linked with the problem of some recipient areas receiving excessive funding and other partner areas receiving not enough (Ni, Zhang, and Yu 2009).

In addition, while the competitive nature of this mechanism has been cited as improving reconstruction efforts, the absence of a maximum limit for giving has been seen to have encouraged an unhealthy level of competition for political gain, which resulted in an inefficient allocation of funds. Moreover, preliminary findings by Bulte, Xu, and Zhang (2013) indicate that aid may have even had a Dutch-disease effect on the recipient counties and that aid was associated with a contraction of these counties' manufacturing sectors. Given the novelty of this mechanism, some scholars point out that additional research on detailed regulations for the mechanisms' implementation and supervision is needed (Wang 2008).

With these considerations in mind, five challenges lie ahead for the pair-wise province-to-county aid model:

1. This model should not be universalized. A big step has already been taken from pair-wise disaster relief and recovery to pair-wise aid for development, as in the case of the Three Gorges Dam in 1992. However, these instances of partner assistance are almost always between well-off places and either impoverished areas that are experiencing unique social conditions—for instance, big disasters—or severely poverty-stricken areas. In other words, the peculiarities and limitations of this model should be clearly recognized, and the model should not be adopted in inappropriate contexts.
2. This model stems from poverty-relief activities between particular partners and is backed by certain traditional elements but is not otherwise legally guaranteed. Other challenges exist in more effectively managing the model. For example, the central government often has a coordinating body to implement the partner assistance program, but uniform training and promotion of effective communication, especially the exchange of experiences, remain challenging. After the Wenchuan earthquake rescue and relief efforts concluded, various local governments held only summary and commendation conferences, and the central government didn't do anything other than hold a brief press conference. This is, admittedly, an institutional flaw.
3. Providing comprehensive and appropriate assistance and ensuring project quality are difficult in the case of large-scale, long-distance partner assistance. A pair-wise aid relationship requires cooperation and mutual respect. Partner assistance is always conducted under the condition that the recipients fully respect the assistance providers. In the same way, assistance providers need to take into account recipients' perspectives and circumstances, especially unique cultural practices. They might also address ways to integrate recipients' cultural practices and participation into a detail-oriented approach to the construction of infrastructure facilities.
4. Partner assistance is predominantly construction oriented and often marginalizes administrative development. For example, while there is nothing wrong with the infrastructure component, it also involves certain development and management issues such as operating infrastructure after its construction is completed. Operating sophisticated

infrastructure projects after the restoration and reconstruction phase has become a challenge in many places.

5. Participation of civil society organizations is insufficient. Because the assistance efforts are mostly infrastructure oriented, nongovernmental organizations don't have much of a chance to participate. However, in the long run, only nongovernmental organizations can establish multiple levels of contact, thus lending permanence to partner assistance activities. China's NGOs are still underdeveloped (Wang 2013), and that's why the issue has not yet made it into the agenda of the partner assistance program. But with the further opening up of the society, the issue of the participation of nongovernmental organizations will only become more significant.

Despite many challenges, the pair-wise province-to-county aid model established a precedent for leveraging institutional forces in conducting relief and recovery operations, which is nothing short of a historic breakthrough for China. Besides, such an institutional model can emerge only from those who have abundant administrative experience and are capable of looking at problems from an institutional and structural perspective. The fact that such a model emerged in China demonstrates that China's public administration is undergoing a significant shift. The notions of China's administrative elite and cultural elite are undergoing a relatively systematic transformation. This kind of cultural consciousness in approaching and handling problems from an institutional perspective, if further developed, will give a significant impetus to China's social reforms.

CROSS-SECTOR SOCIAL INNOVATIONS

Qiang Zhang

A crisis creates malleability, a moment of opportunity to introduce new ideas and to bring changes to the global system, a more propitious set of circumstances for beginning to advance or at least formulate some genuinely interesting proposals, which will have a much more positive reception among global leaders and others than would be the case in more normal times.

(Malloch-Brown 2009)

Both the emergency rescue effort that saved lives in the aftermath of the Wenchuan earthquake and the reconstruction campaign that took place afterward on the ruins were systematic and highly complex projects that were swiftly implemented. They required close and well-coordinated attention to myriad issues, including agenda setting, capacity building, resource mobilization, and policy implementation. Further, the examples of past responses to such large-scale disasters have taught us that such projects cannot rely merely on the capacity and wisdom of the government; the private sector, volunteers, and nongovernmental organizations (NGOs) also have an important role to play.¹

As discussed in the introduction, China's emergency management system, like most public policy systems, is dominated by a top-down scheme. The government plays a central part in the process, whereas regular citizens and NGOs are rarely involved. However, following the devastation of the Wenchuan earthquake, a large number of volunteers, NGOs, corporations, and media organizations eagerly offered an outpouring of help in the form of their time, money, and material supplies, and they were all willing to do their part in helping to relieve the pain experienced in the aftermath of the disaster and in contributing to the reconstruction campaign. In fact, 2008 became

¹ *Third sector, nonprofit organizations, public welfare organizations, and social organizations essentially mean the same thing as NGOs. In order to highlight the interaction patterns between these organizations and the government, they are uniformly referred to in this chapter as NGOs.*

known as the beginning of China's era of "civil society" and "civilian volunteer activities" (Xu 2008). Amid the tragedy and chaos of the huge earthquake, a modern civil society was born in chronically disaster-afflicted China (He 2009).

The growing role of NGOs in disaster management was promoted by the government in the official Wenchuan recovery and reconstruction plan, in which the principle of *Chuàngxīn jīzhì xiézuò gòngjiàn*—which roughly translates to "establishing a mechanism to integrate government, the private sector, NGOs and the public to cooperate in the recovery"—is central. The plan formally identified NGOs as key partners in the response and reconstruction efforts. Although NGOs supported nearly every area of disaster relief and recovery, including medical aid, finance management, technical expertise, and knowledge provision (Guo 2012), their primary role was to supplement the public service delivery system, so the growth in the operational space and role of NGOs following the Wenchuan earthquake was mainly within this domain.

Unfortunately, the participation of NGOs in disaster management following the Wenchuan earthquake also resulted in some unintended negative consequences. For example, a lack of professional capacity and poor communication with the local people and local governments, as well as an absence of an effective platform for information sharing and collaboration between NGOs and local stakeholders, discouraged local populations from participating with NGOs in the future (Zhang and Yu 2009). A major question related to this issue is how the outsider status of these NGOs complicated their efforts and whether more emphasis should be put on improving the local grassroots capacity within Sichuan.

International disaster management experience has shown that disasters tend to trigger three major changes related to the role of NGOs in society, including increasing their capacity and level of participation, improving public attitudes toward NGOs, and enhancing policies related to NGOs. A typical case is the Hyogoken-Nanbu earthquake that hit the city of Kobe, Japan, in 1995. After the earthquake struck, more than 1.35 million volunteers swarmed into the affected zone to offer assistance. More significantly, a large number of new NGOs blossomed following the disaster, with an efficient collaborative relationship also forming among relevant organizations. In general, most NGOs established in the aftermath of past disasters help to pave the way for a broader role for NGOs in general (Li 2009). For example, because of the impressive performance of Japanese NGOs during the earthquake rescue and relief efforts, the public started to show great appreciation for NGOs as a

whole. Riding on this momentum, in 1998 Japan passed the Law to Promote Specified Nonprofit Activities, which rendered the relevant institutional environment more conducive to the development of the Japanese civil society (Zhang and Yu 2009).

However, the development of proposals into actual institutional reform is a complex, long-term, and dynamic process. Which factors actually give rise to opportunities for NGO participation? Can sustainable institutional changes be effected? To answer these questions, we used a multiple streams framework to conduct in-depth research on and analysis of the central government, local governments, and NGOs based on collaborative surveys. The aim is to explore the drivers of social innovation and also to probe the long-term impact associated with these changes.

Literature Overview: Responses to Huge Disasters and Cross-Sector Collaboration

In analyzing the impact of natural disasters on society, we have found the “crisis approach” identified by Boin and ‘t Hart (2007), which emphasizes the perception of an urgent threat to a way of life or set of values, helpful. This approach is useful because even when responses to natural disasters or major force events are consensus based and emphasize cooperation, conflicts may emerge because of differences in the relevant state or social institutions involved and how they respond to disasters. It’s not hard to perceive the aforementioned situation as an opportunity for structural change (Cuny 1983). The case of Hurricane Katrina vividly demonstrates how, aggravated by low government efficiency and severe social inequality, a somewhat ordinary natural disaster can turn into an appalling social catastrophe (Hartman and Squires 2006).

The inherent characteristics of the disasters themselves usually determine the scope and complexity of the response. W. L. Waugh (1994) points out that the first-response efforts would determine the success or failure of the whole response operation and also enable the prediction of the entire cost incurred during the recovery.

The appropriate party to lead the rescue or relief efforts has been a topic for heated debate in both academic circles and in actual practice. Academic research tends to focus on the coordination measures and interactions employed by government systems. Clary (1985) points out that emergency management in the United States attaches special importance to the functions of localities and their role as first responders during disaster. However,

government bodies at the county and city level are expected to shoulder the direct responsibility of emergency management, while government bodies at the state and federal level come into the picture only in the event of extenuating circumstances that exceed local disaster management capacity and which are predetermined by existing disaster management policy.

Japan has a well-developed and meticulously designed coordination mechanism for emergency response, the most defining feature of which is a tailor-made emergency management approach; that is, different emergency response agencies and operational mechanisms have been established to address different types of disasters (Wu 2005). Russia, by contrast, relies more on the power of the president and the Security Council of the Russian Federation to conduct its emergency management procedures.

Hurricane Katrina, which hit the United States in 2005, has caused people to question the prevailing model of emergency management. The federal government proved excruciatingly slow in its response to the hurricane, with its government-centered crisis management system nearly paralyzed by the disaster. This has prompted people to shift the focus of research to multiparty collaboration. As an important disaster response actor in the event of market failures and government failures, NGOs' participation in emergency response efforts has been attracting more and more attention.

Kapucu (2005) proposes the concept of "interorganizational networks," using the Dynamic Network Theory and the Complex Adaptive Systems Theory to shed light on the importance of an interorganizational network among government, private sector, and NGO actors. This type of network serves to maximize emergency management's efficiency. In responding to complicated social problems such as those caused by major natural disasters, we are always beset with a series of difficult situations ranging from government failure to market failure to a lack of volunteers. It is at moments like these that cross-sector collaborations—that is, collaborations that involve some combination of public, private, or civil-society actors—are expected to break down the ever-eroding borders between different types of organizations to arrive at optimal solutions.

This kind of interorganizational collaboration implies the formation of a networked and dynamic public management framework involving multiple parties such as government agencies, the private sector, and NGOs, as well as communities (Bryson, Crosby, and Stone 2006). Simo and Bies (2007) apply the cross-sector collaborative framework proposed by Crosby to the field of disaster response. They use empirical research related to Hurricane Katrina and Hurricane Rita to assert that the establishment of a cross-sector

collaborative framework—comprising NGOs and other parties involved in disaster response—can help realize public values and prevent failures to which agencies working alone are typically prone. In fact, this measure has also proved exceptionally effective in addressing the severe lack of public services typical in the post-disaster phase.

China is a disaster-prone country, with more than 70 percent of its cities and more than 50 percent of its population distributed in areas vulnerable to meteorological, seismic, geological, or oceanographic disasters (China, Ministry of Civil Affairs, Department of Disaster Relief 2008). Disaster response has always been an important part of the country's national public governance system. However, because China's bureaucratic assessment system has traditionally measured performance according to short-term goals, its disaster management posture has been fairly shortsighted, and policymakers tended to place more emphasis on rescue and relief efforts. Especially during China's recent rapid economic growth, the losses caused by disasters typically have not seriously compromised its fast-growing economy.

In the past, top-down political mobilization and post-disaster centralized command served as the nation's main coping mechanism. In the meantime, bottom-up social organizational capability failed to materialize in China. As a result, the local governments lacked initiative, and civil society was virtually nonexistent, leading to a paradigm in which the central government served as the main actor in emergency response.

China's response to SARS (severe acute respiratory syndrome) in 2003 marked an important turning point in China's disaster management history as the whole of Chinese society began to realize the government's limited ability to manage public crises. As an overall planner and allocator of public resources, the government is not omnipotent; it needs to establish new governing structures in consideration of the definition, characteristics, phases, motivating factors and status of modern crisis management (Xue and Zhang 2003). Effective crisis management requires the government to consolidate its forces at all levels, including those of social organizations, and also to mobilize all kinds of social resources (Zhang 2003).

NGOs can play an important role in mobilizing and allocating social resources during the response to a crisis. However, the underdeveloped nature of China's NGOs and low level of participation in them seriously undermine their functionality (Deng 2003). China should pay more attention to cultivating and developing social forces during crisis responses (Mao 2003).

To this end, the country unveiled in recent years a series of laws and regulations containing stipulations that explicitly encourage the participation

of NGOs or volunteers. For instance, the Emergency Response Law of the People's Republic of China stipulates that "citizens, legal persons and other organizations shall be obligated to participate in responding to emergencies"; and "the State encourages citizens, legal persons and other organizations to provide materials, funds and technical support and make donations to the people's governments for the work needed in responding to emergencies" (China, Standing Committee of the 10th National People's Congress 2007).

The National Emergency Relief Plan on Natural Disaster also explicitly points out that "in terms of working principles, such diverse parties as citizens, grassroots self-governing organizations and social welfare groups shall be allowed to play their respective roles"; "due efforts shall be made to cultivate and develop NGOs and volunteer teams, whose roles shall also be brought into full play"; "the civil affairs departments at the provincial, prefecture and city levels shall organize professional training sessions at least once annually for county-level and township-level civil affair assistants; and shall also organize training programs on an irregular basis for responsible officials of relevant government agencies, all kinds of professional emergency rescue teams, NGOs and volunteers" (NCDR 2006).

The Overall National Public Emergency Contingency Plan also explicitly proposes that "all kinds of social forces including social groups, business enterprises, public service institutions and volunteers shall be encouraged to participate in emergency rescue work" (China, State Council 2005). However, previous social participation has unfortunately been heavily dictated by governmental connections, resulting in not just limited participation but also an inordinate representation of NGOs possessing ties to the government.

The development of NGOs in China before the Wenchuan earthquake struck can be measured by their effectiveness in public service provision and their social autonomy. Regarding service provision, the government remained the main provider of public products, while NGOs gradually wedged their way onto the scene and started to demonstrate their strengths, which included growing professionalism, specialization, and agility. Nevertheless, NGOs cannot compare to the government in terms of both power and scale. As independent entities committed to social autonomy, NGOs are also found to be ineffective in public policy advocacy. In this respect, their true potential to catch up with the government in their capacity as independent entities remains to be fully tapped (Zhang and Yu 2009).

Table 4.1 lists NGOs' roles in massive disasters in China prior to the Wenchuan earthquake.

TABLE 4.1 NGOs' disaster response prior to the Wenchuan earthquake

Event	Level of NGO Participation	Characteristics
1976 Tangshan earthquake	NGOs did not participate, and international aid was also rejected.	A government-led, civil-mobilization-based response
1998 Yangtze River floods	The Red Cross Society of China participated fully in the rescue and relief work and accepted RMB 323.27 million's worth of international aid and RMB 670 million's worth of domestic donations of funds and goods. More than 9,000 medical volunteer teams were sent to the affected areas, in collaboration with public health authorities at all levels, to carry out quarantine measures and disease prevention.	A disaster response in which only a small number of NGOs, predominantly GONGOs, participated
2003 SARS outbreak	The China Charity Federation, the China Association of Social Workers, the Red Cross Society of China, and the China Women's Development Foundation jointly advocated that aid be given to frontline medical workers and impoverished relatives of patients. What is noteworthy is that some grassroots organizations such as centers of social work facilitators also spearheaded initiatives aimed at helping vagrant children and migrant construction workers fend off SARS. Some volunteers also participated on their own initiative.	NGOs, though still predominantly GONGOs, started to get involved in a limited manner, with grassroots NGOs also participating to some extent. However, because of a lack of organizational methods beyond government sponsorship, the scale and level of donations by corporations and individuals and the participation of volunteers were far from ideal. (The government designated the Red Cross Society of China and the China Charity Federation as the main channels for receiving donations.)
2008 Chinese winter storms	In addition to some traditional GONGOs such as the Red Cross Society of China, the China Foundation for Poverty Alleviation, and the China Charity Federation, some grassroots NGOs also started to play an active role in disaster response processes. For instance, eight Guizhou-based NGOs, including the Guizhou Institute of Highland Development, formed the Guizhou Volunteer Rescue Team, in which the Jet Li One Foundation Project swiftly invested RMB 950,000, and certain international NGOs, including World Vision, also carried out relief work in Jinxiu Yao Autonomous County.	NGOs started to play a significant role in disaster response, with a multiparty response model also developing. However, the scale and effect of participation remained limited.

Source: Zhang (2015).

Note: GONGO = government-organized nongovernmental organization.

What factors are likely to provide opportunities for NGO participation and thereby facilitate cross-sector collaborations in responding to disasters? The cross-sector collaboration framework for post-disaster response was significantly improved by Gloria Simo and Angela L. Bies (2007). Simo and Bies identify how cross-sector collaboration during extreme events contributes crucial elements to a successful response process. These crucial elements include organizational capacity and individual and prosocial behaviors. However, the Simo and Bies conceptualization fails to delineate the dynamic aspects of the process, including the extent to which institutional actors are shaped by their experience with the collaboration mechanism. This mechanism represents an important factor in determining whether or not relevant disaster response mechanisms can be sustained and institutionalized.

In exploring this issue, an evaluation of the disaster response work following the Wenchuan earthquake might be instructive. The Wenchuan crisis is significant not only because it influenced changes in strategies for coping with disaster but also because it serves as a reminder of the important role played by NGOs and the new paradigm for collaboration between the government and NGOs. Effective crisis management requires collaborative partnerships to be formed among the government, civil society, corporations, the international community, and international organizations (Zhang 2003).

This chapter presents a panoramic review of the heightened participation by volunteers, NGOs, and other civil society members during the Wenchuan earthquake response. It also seeks to outline how the model for post-disaster collaboration between NGOs and local governments—a model based on the changing state-society dynamic—has evolved (Teets 2009). Examining this model illuminates how an opening has emerged for collaborations among the public, private, and civil society sectors in the post-disaster phase. In addition, the chapter sets out to identify and discuss those influences that led to the cross-sector collaboration mechanism being institutionalized.

Research Methods and Data Sources

Thrust into a leadership role, or voluntarily playing such a role, to fill in the gaps in available services caused by local, state, and federal administrative failures, nonprofit organizations frequently respond to crises by forming or engaging in collaborative activities. This approach is by no means new (Agranoff and Pattakos 1979), but it is groundbreaking and of great significance as far as China's institutional environment is concerned.

This chapter reviews the cross-sector collaboration paradigm formed in the aftermath of the Wenchuan earthquake and analyzes the trajectory of changes in the behaviors of major actors such as the central government, local governments, and NGOs. A multiple-streams framework of public policy processes is employed to explore the institutional causes of such a window of opportunity's emergence. This approach will help shed light on the factors that influence the changes in cross-sector collaboration mechanisms.

The data come primarily from on-site observations, analysis of available literature and research, structured interviews, and large-sample questionnaire surveys the author and his research team have conducted in areas affected by the Sichuan earthquake since 2008. In 2012 we conducted two tracking surveys on NGO participation. The first one was conducted on 263 NGOs that participated in the earthquake rescue and relief work in 2008: the service entry information for 129 were studied, and 74 of these NGOs were selected for organized structured interviews.

The second survey was conducted in 2009 and focused on the participation of NGOs in reconstruction campaigns in affected areas. This survey included 28 NGOs (20 Chinese-mainland-based NGOs; 4 Hong Kong/Macao/Taiwan-based NGOs; 3 international NGOs; and 1 collaboratively established organization) and involved interviews with the heads of these organizations. Given the informal and poorly monitored nature of NGO participation, the first stage of participant selection was simply based on involving as many NGOs as possible. In the meantime, we also consulted with or conducted interviews with relevant policymakers in the central government and the leading cadres within relevant local governments.

This chapter also uses the data of the "Survey on the Needs of Residents during the Reconstruction Campaign Following the Sichuan Wenchuan Earthquake" (2010) conducted by the School of Social Development and Public Policy of Beijing Normal University. The survey adopted a stratified sampling method, with sampling conducted on earthquake-affected residents in the Mianyang area at four levels: the county/city level, township level, village level, and household level. The subjects sampled at each level were first ranked based on economic status, and then an equal number of samples were selected among subjects of high economic standing, subjects of medium economic standing, and subjects of low economic standing. Finally, a total of 733 affected residents were surveyed, yielding 730 effective subjects, 68.4 percent of whom were male and 31.6 percent of whom were female.

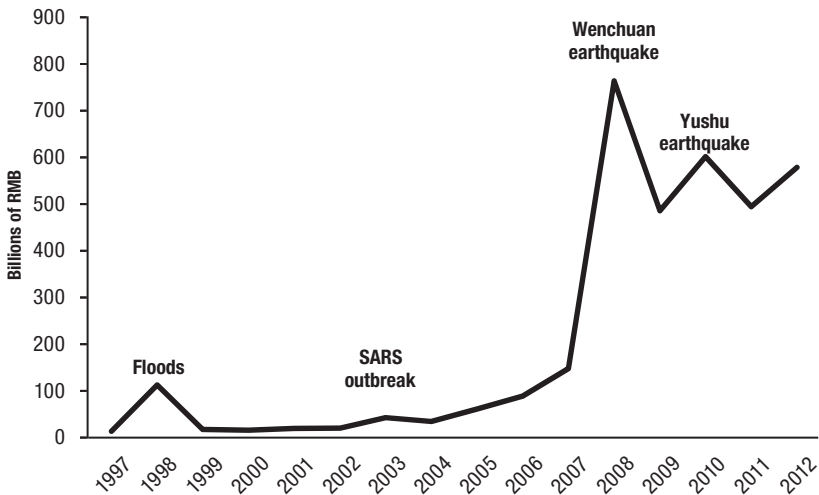
Panoramic Review: Cross-Sector Collaborations in Response to the Wenchuan Earthquake

Autonomous social participation reached its peak following the Wenchuan earthquake. Take donations for instance: survey results indicate that a total of RMB 107.05 billion was received (including monetary and in-kind donations) in 2008, registering an annual growth rate of 515 percent over 2007 (for a different assessment of donation amounts that uses government statistics, see Figure 4.1). The first volunteers who entered the earthquake-affected zone to offer help (on May 13 and 14, 2008) were mainly self-initiated/self-organized volunteers (Tan 2008). (Note that the “volunteers” mentioned herein are both registered members of all types of NGOs/volunteer groups and self-organized/self-initiated volunteers.) According to the Sichuan Provincial Civil Affairs Department, more than 150,000 volunteers from within the province either directly participated in rescue and relief work or provided services to armed forces engaged in disaster relief as well as to earthquake victims (Bian, Wang, and Wang 2011).

The number of volunteers who set out to help with rescue and relief work in the zone affected by the Sichuan earthquake totaled 1.3 million (Deng 2009). The Working Committee of Volunteers of the China Association of Social Workers estimate that, in areas outside of the earthquake-affected zone, the number of volunteers participating in boosting Wenchuan earthquake awareness, raising donations, and moving earthquake relief materials exceeded 10 million. The value of the services provided by all volunteers is estimated to have reached a whopping RMB 16.5 billion (China Charity and Donation Information Center 2008).

In responding to one of the most destructive natural disasters in China and one of the world’s most devastating disasters in recent years, volunteers and local quake victims played a significant role. More than 87,000 people were rescued from the earthquake, some 70,000 of whom were self-rescued or mutually rescued (Qu 2007).

During the period of heightened social participation following the Sichuan earthquake, NGOs became an important resource facilitator binding together all relevant parties, and they also directly promoted the formation of a post-disaster cross-sector collaborative paradigm between the government and society as a whole. The sections that follow describe the work conducted by NGOs and the roles they played during the Wenchuan earthquake’s emergency rescue phase, as well as during the post-earthquake reconstruction phase.

FIGURE 4.1 Social donations in China, 1997–2012

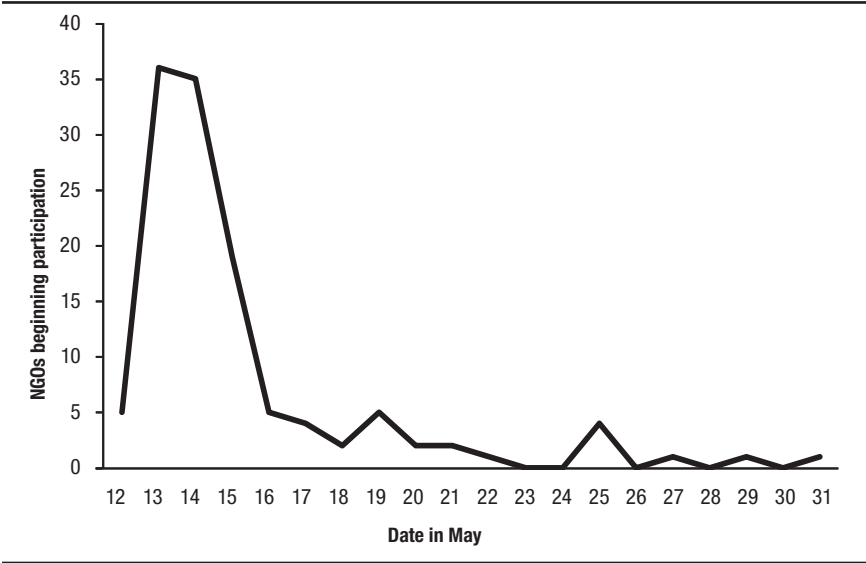
Source: National Bureau of Statistics of China (2013).

Emergency Rescue Phase

According to the Sichuan Provincial Civil Affairs Department, after the May 12 Wenchuan earthquake occurred, more than 6,000 nonprofit organizations from within the province participated directly or indirectly in the rescue and relief work. Of these, 2,456 nonprofit organizations directly participated in rescue and relief work, providing services to armed forces personnel engaged in disaster relief as well as aid to earthquake victims. More than 5,600 nonprofit organizations issued calls for disaster relief donations and raised a total of RMB 2.62 billion in cash and RMB 1.66 billion in supplies. More than 300 nonprofit organizations also participated in the first-responder relief task forces that went to the affected areas to save lives, treat the injured, evacuate victims, and transport aid supplies. They helped rescue or treat more than 170,000 injured victims, aided more than 300,000 quake victims, established 32 settlements for victims, and evacuated more than 120,000 victims (Bian, Wang, and Wang 2011).

We tracked 263 NGOs that participated in rescue and relief work, and we researched the service entry information of 137 organizations. Figure 4.2 shows the results for 129 of those organizations (8 organizations are not covered in Figure 4.2 because they entered affected areas after the month of May). The

FIGURE 4.2 NGOs beginning participation in earthquake relief operations, May 12 to May 31, 2008



Source: Zhang et al. (2008)

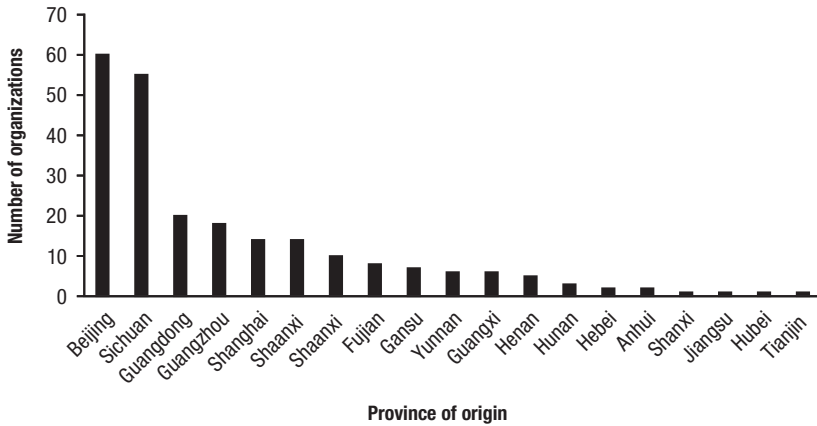
Note: NGOs = nongovernmental organizations.

horizontal axis denotes pertinent dates in May, while the vertical axis signifies the number of NGOs starting work in the quake-affected zone on each of those days.

Figure 4.2 shows that NGOs were extraordinarily quick in responding to the earthquake. Their swift reaction is also reflected in the prompt establishment of a collaborative operational network for NGOs. As one news report described it, “Almost immediately after the earthquake struck, NGOs throughout the country promptly rallied their forces and initiated mutual collaborations in offering aid and help to the earthquake zone.” (Figure 4.3 shows their geographic origins.) On the second day after the earthquake, Chengdu Urban Rivers Association initiated prompt negotiations with NGOs and volunteer groups in such diverse places as Chengdu, Beijing, Guizhou, Shanghai, and Yunnan and established the 5/12 Nongovernmental Aid Service Center. Its purpose was to offer aid information to interested NGOs and volunteers to ensure a smooth rescue operation and effective relief work.

On the same day, more than 40 informal NGOs from within Sichuan Province and other places such as Yunnan and Guizhou jointly issued calls for nongovernmental aid, attracting more than 100 NGOs to participate in the cause. On May 14, the NGO Collaborative Office for Sichuan Earthquake

FIGURE 4.3 Geographic origins of organizations conducting rescue and relief work in Sichuan



Source: Chen et al. (2008).

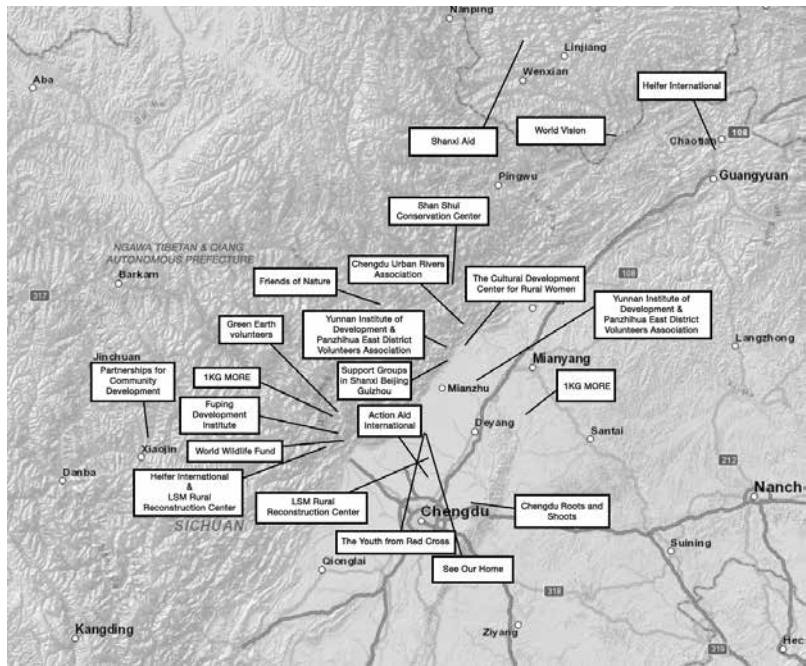
Notes: The data are based on a study of 234 responses out of 263 surveyed NGOs that were conducting rescue and relief work locally; some NGOs (nongovernmental organizations) offered their services in two or more places.

Rescue and Relief was set up in Chengdu; it subsequently went into operation at the office of the Roots and Shoots Environmental Culture Exchange Center. Figure 4.4 shows that in the earthquake-affected zone, volunteers and nongovernmental welfare organizations were active throughout the most heavily affected areas in Sichuan, including Chengdu, Ngawa Tibetan and Qiang Autonomous Prefecture, Deyang, Mianyang, and Guangyuan. Outside of the affected areas, nongovernmental welfare organizations in more than 10 provinces and municipalities, including Beijing, Shanghai, Guizhou, Guangdong, and Xiamen, launched active aid campaigns that offered supplies and monetary donations to the affected areas and provided information and technical support as well as volunteers.

Figure 4.5 breaks down NGOs by type and shows that grassroots organizations constitute a significant share. Among the types of NGOs shown, the “duly-registered enterprises,” “pre-existing unregistered NGOs,” and “individual-driven organizations” (organizations that are run by a limited number of people and lack a clear governance structure), are actually rather typical grassroots NGOs.

During the emergency response phase, NGOs provided services mainly in four ways. The first way is to provide monetary aid and supplies; Figure 4.6

FIGURE 4.4 Geographic distribution of some NGOs providing services to areas heavily affected by the Sichuan earthquake



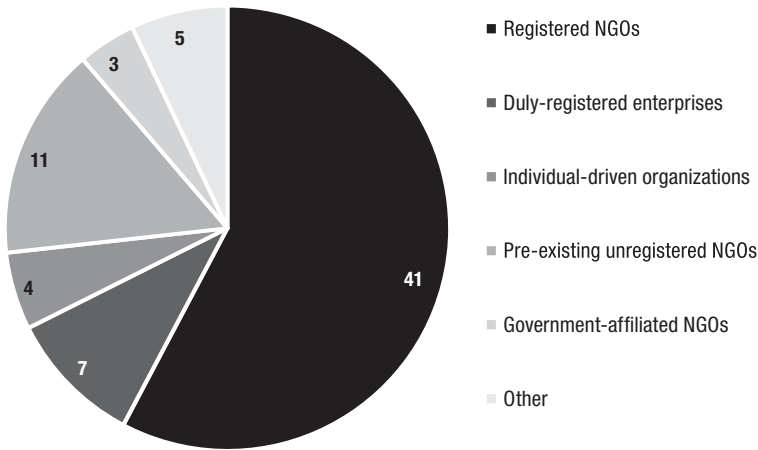
Sources: Map from National Geographic's MapMaker Interactive; data from the Centre for Civil Society Studies, the Hong Kong Institute of Asia-Pacific Studies, the Chinese University of Hong Kong, and the Institute for Civil Society (ICS) of Sun Yatsen University (n.d.).

Note: NGOs = nongovernmental organizations

shows that more than two-thirds of the participating organizations donated money and supplies. The second way is to provide specialized services and aid on the spot and to collaborate with the government in enhancing awareness and issuing calls for action. The third way is to provide technical support and information. The fourth way is to coordinate and manage the work of volunteers and provide them with specialized training (Zhang et al. 2008, “Research on the Mechanism of NGO Participation in Rescue and Relief Work”).

During the earthquake rescue and relief process, some organizations temporarily shifted their services from those they specialize in to those the earthquake-affected areas needed most urgently. Surveys and investigations also discovered that though many NGOs specialize in fields other than disaster rescue and relief, they nonetheless actively participated in rescue and relief work, a tendency most obvious among several local NGOs (Han and Ji 2008).

FIGURE 4.5 NGOs participating in rescue and relief work during the emergency response phase after the Sichuan earthquake, by type



Source: Zhang et al. (2008).

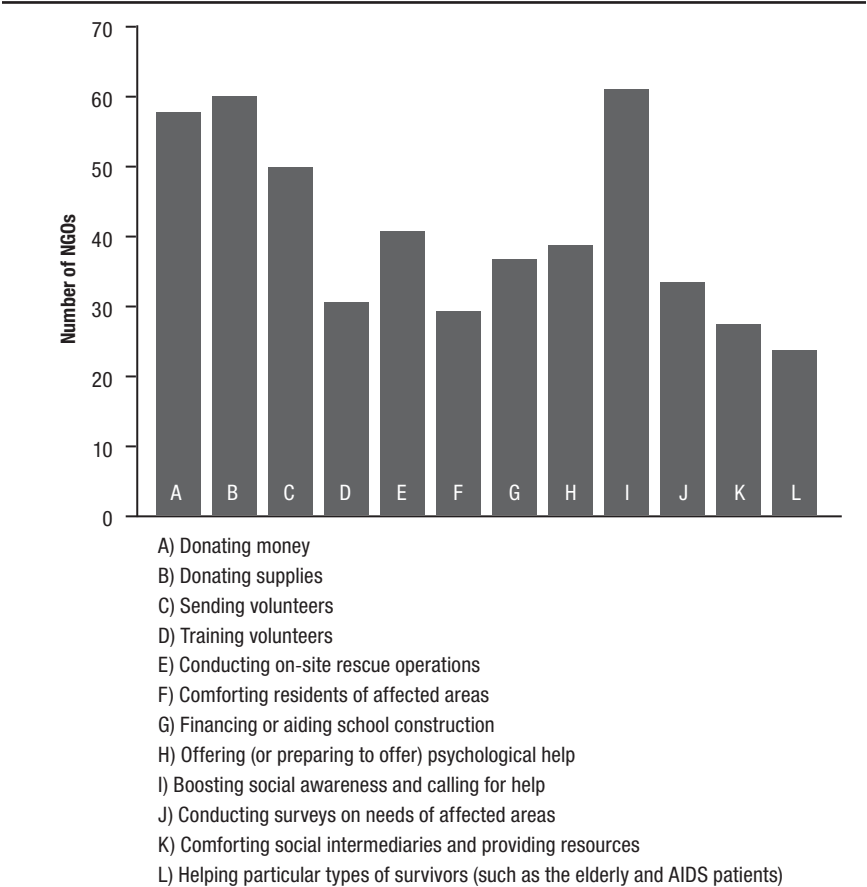
Note: NGOs = nongovernmental organizations. Data shown here cover 71 organizations that provided relevant information. Individual-driven "organizations" are organizations that are run by a very limited number of people and a lack of clear governance structure.

A 2008 survey conducted by the Chinese Academy of Science and Technology for Development on social capital in Sichuan earthquake-affected areas shows that among the local participants in public welfare activities, the highest proportion, 67.9 percent, consisted of civilian voluntary organizations. Researchers on social capital also stress that the active participation of local civilian voluntary organizations and social forces (including NGOs) had become a highlight of the local public welfare cause. This demonstrates and reaffirms a basic feature of civil society, that is, voluntary social participation (Zhao, Deng, and Li 2010).

Post-Earthquake Reconstruction Phase

On June 8, 2008, the State Council promulgated the Regulations on Post-Wenchuan Earthquake Rehabilitation and Reconstruction, which stipulates six principles that were to be followed in earthquake zone rehabilitation and reconstruction. The second principle was that "the strategy of combining a government-led approach and social participation shall be adopted." Thus, NGOs were acknowledged as an important social participation force and became legally permitted to participate in the reconstruction of earthquake-affected areas.

FIGURE 4.6 NGOs by type of work conducted during the emergency response phase after the Sichuan earthquake



Source: Zhang et al. (2008).

Note: NGOs = nongovernmental organizations. The data shown here cover 74 NGOs that provided relevant information.

Evidence shows that in addition to sending rescue and relief forces to the quake-affected zone at the earliest possible time after the earthquake hit, NGOs also became highly active in all aspects of the government-led post-earthquake reconstruction campaign, playing a critical role in rehabilitation and reconstruction efforts. Additionally, relevant foreign experiences demonstrate that highly specialized NGOs not only can play a significant role in rescue and relief efforts by taking advantage of their specialized knowledge

FIGURE 4.7 NGOs operating during the post-earthquake reconstruction phase, by type

Source: Zhang and Yu (2009).

Notes: NGO = nongovernmental organization; data shown here cover 28 representative NGOs.

and expertise, but they can also be vitally helpful in terms of post-disaster reconstruction.

With services spanning numerous areas in post-earthquake reconstruction, NGOs mainly provided assistance in the following fields: housing reconstruction, medical care and health, livelihood development, environmental protection, psychological reconstruction, education development, cultural preservation, and resources support (Zhang and Yu 2009). The present author conducted both in-depth, on-site surveys and structured interviews with 28 selected organizations that are representative of NGOs that carried out the above-mentioned functions. Twenty of them were established before the May 12 earthquake, five of them were established during the emergency response phase (May 12 to June 8), and three of them were established during the post-earthquake reconstruction phase (June 9 and after). Figure 4.7 shows the organizations by type.

NGOs also played a crucial role during the post-earthquake reconstruction phase by providing an array of public services to meet medical, psychological, cultural, educational, and reconstruction needs (See Table 4.2). In government-led infrastructure reconstruction projects, such as housing reconstruction and school campus reconstruction, NGOs were well positioned to exploit their advantages in offering personalized services. They were capable of identifying and incorporating local cultural characteristics and better meeting the needs of local residents.

In terms of the provision of intangible public services such as psychological and physical rehabilitation, NGOs also played a significant role, because the

TABLE 4.2 Main functions of NGOs in post–Wenchuan earthquake reconstruction

Field	Function	Representative Organization	Problems and Challenges
Housing reconstruction	Financial support	The Caring for Children Foundation	Earthquake victims have credit problems Difficulties in coordinating interests Difficulties in working with the government
	Technical guidance	Mianzhu Livelihood Cooperative	
	Direct participation in rebuilding activities	Habitat for Humanity China	
Medical care and health	Services for the disabled	Eden Social Welfare Foundation	Earthquake victims being too conservative High costs Difficulties in integrating local resources
	AIDS prevention and treatment	Chengdu Tongle Health Counseling Service Center	
		Aibai Chengdu LGBT Youth Center	
Livelihood development	Full services for projects	Liangshan Yi Empowerment Center	Shortages of funds and techniques Earthquake victims being uncooperative
		Wild Grass Cultural Communication Center	
		China Social Entrepreneur Foundation	
		NGO Disaster Preparedness Center	
Environmental protection	Combination of environmental protection and livelihood development	Shanshui Conservation Center	Earthquake victims being too conservative Insufficient resources
		Wild Grass Cultural Communication Center	
Psychological reconstruction	Professional psychological perspective	Mianyang Project, Jiangsu Volunteer Service Psychological Aid Team Aibai Chengdu LGBT Youth Center	Insufficient professional techniques Earthquake victims being too conservative
	Perspective of professional social workers	NGO Disaster Preparedness Center Aide et Action (AEA)	
		Horizon Education Center of China China Foundation for Poverty Alleviation Liangshan Yi Empowerment Center	

(continued)

government had long been unable to meet the needs of these areas even before the earthquake hit. NGOs boast professional advantages over the government in those fields. More importantly, the bottom-up participation model embodied by NGOs also motivated the voluntary participation of earthquake victims.

NGOs are well positioned to establish platforms for coordinating resources, set up community service centers, and provide personalized care for the disabled, the widowed, and the elderly within communities and help them rebuild their lives. They can further consolidate community resources and

Field	Function	Representative Organization	Problems and Challenges
Education development	Financing for school construction	China Foundation for Poverty Alleviation The Caring for Children Foundation China Social Entrepreneur Foundation Aide et Action (AEA)	No prominent problems
	Financial assistance and other aid for children	NGO Disaster Preparedness Center Aide et Action (AEA)	
Cultural preservation	Assistance in developing ethnic-style products for the improvement of livelihood	Liangshan Yi Empowerment Center Tibetan-Qiang Association of Technology-Driven Poverty Alleviation & Development	Resource deficiency
	Financial support	China Social Entrepreneur Foundation NGO Disaster Preparedness Center	
Resources support	Information platform	Zundao Township Social Resources Coordination Office 5/12 Nongovernmental Assistance Center www.51gongyi.org	Deficient NGO capability Insufficient collaboration among NGOs
	Consultancy service	Chengdu Tongle Health Counseling Service Center	

Source: Zhang and Yu (2009).

combine livelihood development with social reconstruction by offering community services, and they can tap the full potential of community residents, and growing grassroots democracy, through the organization of participatory activities of all kinds.

The collaboration between such NGOs as the China Social Entrepreneur Foundation and the Mianzhu government is representative in that tangible operating bodies have been established. The adopted collaborative mechanism also consistently showed signs of improvement and expanded in the ensuing three years. From organizations such as Zundao Township Volunteers Coordination Office to Zundao Township Social Resources Coordination Office to Mianzhu Social Resources Coordination Office to Mianzhu Public Welfare Joint Conference, a new, trailblazing model for government–NGO collaboration, known as the Mianzhu model, has been aggressively explored.

This exploration of collaboration models has contributed enormously to the post-earthquake reconstruction campaign of Mianzhu city (Bian, Wang, and Wang 2011). The formation of the Mianzhu model has demonstrated

that in response to the Wenchuan earthquake, the degree of NGO participation has reached such a point that the relationship between the government and NGOs evolved from a supplementary and complementary relationship to an adversarial relationship at the social self-governance level. In other words, NGOs prod the government into formulating and adjusting public policies so as to ensure that it must itself be held accountable to the public. On the other hand, the government can influence the behavior of NGOs by regulating their services and by being more or less responsive to their requests (Young 1990).

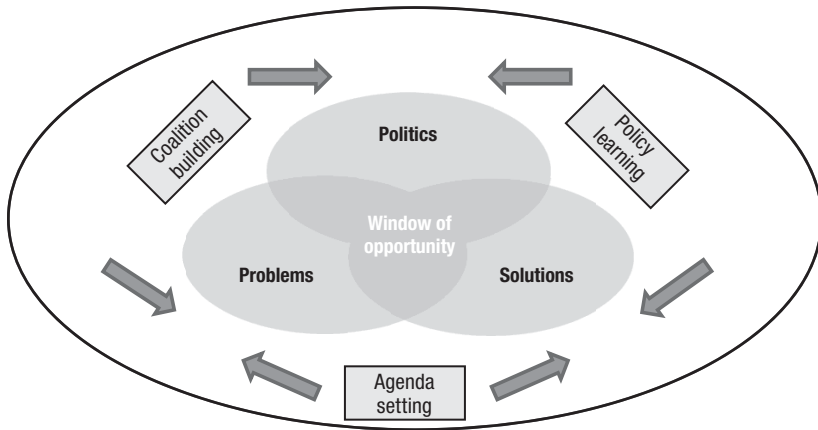
Opening of a Window of Opportunity: A Multiple-Streams Analytical Framework

The panoramic review presented above makes it clear that a collaborative governance model between the government and social organizations has emerged in response to the Wenchuan earthquake, resulting in policy changes at some levels (relevant documents issued by the central government prescribe the strategy of combining a government-led approach with social participation, with local governments also piloting self-dependent policy innovations such as the Mianzhu model).

What gives rise to such a variety of cross-sector collaborations that involve NGO participation on a large scale and draw attention to social needs at the grassroots level? How can we begin to comprehend the driving force behind such a policy change phenomenon? Currently, in analyzing and rationalizing policy change, some classic policy change theories have already formed in academic circles. These theories include the multiple-streams framework, the punctuated equilibrium theory, and the advocacy coalition framework. In order to delineate the dynamic complexity of the policy change process, the evolutionary theory has also been adopted as a basic theoretical framework (John 2003).

To better illuminate policy changes that take place in huge disaster scenarios, the present research adopts the multiple-streams framework with a view to understanding the driving mechanism behind the changes. This policy process model was first proposed by American public policy expert Kingdon, who believed that “if an item is put on an agenda, it is the result of the confluence of multiple factors interacting at a particular moment, not of any individual factor acting alone” (Kingdon 1995). This kind of interaction represents the confluence of the “problem stream,” the “policy stream,” and the “political stream.”

The problem stream contains all kinds of information the government must pay attention to and address; the policy stream contains various types of

FIGURE 4.8 Theoretical framework for the transformation of knowledge into policy actions

Source: Adapted from Ashford et al. (2006).

policy suggestions, propositions, and plans; and the political stream contains such factors as public mood, public opinion, power redistribution, and shifts in interest group configurations, which reflect political situations, trends, and backgrounds. Therefore, the confluence of the three streams implies an organic integration of particular issues, policy plans, and political situations. In order for the three streams to achieve confluence, policy entrepreneurs (that is, stakeholders who are able to inspire others to prioritize particular issues and to use specific solutions to address them) will also have an important role to play (in greatly promoting the said confluence or by taking optimal advantage of the opening of a policy window). Kingdon argues that when, at a particular moment, the three streams meet, the “window of opportunity” would open, putting relevant problems on the policy agenda and allowing policy plans to get finalized (Birkland 2011).

Some researchers rationalized policy change in the following way using the multiple sources framework: changes in problem stream or political stream → opening of policy window → policy entrepreneurs effectively utilize the opportunity → confluence of three streams → policy change (Bai 2010). However, in concrete situations, the confluence of the three streams is usually not linear, which is why the present research tends toward a more dynamic interaction framework, as shown in Figure 4.8, known as the Theoretical Framework for the Transformation of Knowledge into Policy Actions. This framework

postulates that when an organic confluence among the three streams is achieved, the window of opportunity for policy change will arise. Three actions will be helpful in promoting the opening of a window of opportunity: agenda-setting, coalition building, and policy learning (or enhanced policy-maker knowledge about specific issues) (Ashford et al. 2006).

This section analyzes the characteristics of the post-earthquake actions of a series of institutional actors that include the central government, local governments, and NGOs. It aims to identify the institutional cause of the opening of a window of opportunity for social innovations using the multiple-sources framework. Of course, all of these analytical attempts are based on a premise outlined by the Public Choice School concerning government action, that is, as “rational economic men,” governments at all levels all pursue self-interest maximization.

Problem Stream: Government Failure in Huge Disasters

Under the multiple-sources framework, what causes policymakers to pay attention to the problem stream is not political pressure but quasi-systemic influences. These influences might be (1) positive or negative changes to indicators that have received widespread attention; (2) increased public attention to one or more high-profile events—either because the events have just occurred or because the events have generated a significant formal or informal response; (3) the presence of some alternative solutions (Kingdon 1995). From the perspective of the multiple-sources framework, a major natural disaster is a typical high-profile event that causes profound changes in the basic social indicators pertaining to the residents of affected areas and also receives global attention.

The Wenchuan earthquake destroyed a huge number of houses and large swaths of infrastructure, caused massive losses to the local industrial and agricultural sectors, and greatly disrupted the local natural environment. It has not only had a direct impact on the daily lives of the local residents but has also made a serious dent in the government’s public governance ability. In responding to huge disasters, a traditional top-down government structure such as China’s risks a huge public policy debacle, resulting in situations of “government failure” (Le Grand 1991) or a “weak state.” In the case of the Sichuan earthquake, policymakers faced three major challenges to mounting an effective response.

First, there were large differences in the demands being made for policy change. The areas affected by the earthquake were huge, covering

417 counties in four provinces, with an affected population of a whopping 46.24 million. There were big differences among those areas. The earthquake-affected areas span a variety of terrain, including mountainous regions, hilly regions, and plains. They include economically strong counties such as Shifang and Mianzhu (both are among Sichuan's top ten economically strong counties), but also some poor counties that receive aid from national- or provincial-level offices. Some of the affected counties and cities boast strong industrial foundations, whereas others rely heavily on agriculture and labor export.

Such disparities in the economies of the affected areas were bound to result in demands for different policies, which created challenges in designing reconstruction policies and in maintaining fairness. Because the affected areas and populations were vast, a great deal of effort was made to ensure that principles of fairness shaped the process of designing and formulating recovery policies. The principle of equitable recovery policies doesn't necessarily imply simple and absolute equality, nor does it suggest that affected areas should be ranked on the basis of damages suffered in being on the receiving end of recovery policies; instead it is more determined by how the affected residents psychologically respond to the policies. Therefore, the sense of fairness in recovery policies cannot be reflected in the results of the implemented policies but rather in the formulation process itself.

Second, the social impact of disasters poses challenges for traditional response mechanisms. Not only will an earthquake have a devastating effect on the local economy and cause large numbers of deaths and casualties, it will also have an impact on the local social fabric (Zhang, Zhang, and Zhang 2008): some family networks, neighborhood networks, and co-workers' networks got seriously disrupted in an instant; some people had to relocate numerous times, leaving their familiar communities behind; village autonomous organizations and functions of communities underwent great changes; middle-aged earthquake survivors, local rescue workers who had relatives killed in the earthquake, and even some volunteers working in the affected areas have all, to varying degrees, suffered emotional trauma or social difficulties.² Such problems as the rehabilitation of the disabled, the restoration

2 The collapse of a large number of school buildings had caused a great many deaths among students. By May 8, 2009, there had been a total of 5,335 students who were pronounced dead or designated unaccounted for by the Sichuan provincial government. Under the one-child policy that had been implemented for decades in China, the loss of a young child usually means dashed hopes for many middle-aged parents.

of community functions, and psychological reconstruction could persist for years and continue to compromise the local reconstruction campaign.³ China's crisis management system and past experiences in crisis management merely focus on the offering of aid and assistance to restore livelihoods and productive capacities; the top-down administrative mobilization mechanism is inadequate and has repeatedly failed to address problems relating to reconstruction of the social fabric.

Third, policymakers face implementation challenges. When designing and formulating policies, we tend to take it for granted that all policies will be properly implemented, and if the local governments fail to do so, all we need to do is introduce some supervision and oversight measures. However, in the Sichuan earthquake, the local governments and administrative bodies were greatly damaged, with buildings destroyed and lives lost. Therefore, in designing and formulating policies, we should keep in mind that the local governments had been greatly compromised in their ability to function properly; hence, we should not expect too much of them.

During the emergency response phase, because a large number of government officials had been killed in the disaster, all affected areas suffered administrative command system failures. Take one county, Beichuan, for instance. Four hundred sixty-six local officials were killed in the quake, accounting for 23 percent of the county's total number of officials before the earthquake. Another 200 or so local officials were injured in the quake (Deng 2009).

In addition, the earthquake significantly damaged the communications infrastructure. According to an estimation by the Sichuan Communications Administration, the quake cut off communications with 109 townships under the jurisdiction of eight counties in the most heavily affected areas. At the early stage of rescue operations, because of communications failure and widespread road closures, information on quake damages couldn't be gathered and

3 Based on past experiences, some professionals estimate that the Sichuan earthquake caused 145,000 people to suffer mild disabilities, 83,000 people to suffer moderate disabilities, and 31,000 people to be severely disabled (Zhao 2008). People who survived the Tangshan earthquake (which struck on July 28, 1976) tended to develop post-traumatic stress disorder (PTSD), which plagued their mental health for a long time afterward. These people are three to five times more likely to suffer from psychological problems such as depression, anxiety, and phobias. Findings of the "Monitoring the Lives of Residents of 5/12 Earthquake-Stricken Areas" survey, jointly conducted by the Horizon Research Consultancy Group, the China Foundation for Poverty Alleviation, and the Social Entrepreneur Foundation, showed that up to 66.7 percent of adults in the affected areas felt a strong sense of pressure and 33.1 percent suffered from severe melancholy and sadness. Sixty-six percent of adult residents of the affected areas who were themselves injured or had injured relatives, as well as 58 percent of adult residents who lost some relatives in the disaster, suffered from severe PTSD.

conveyed to the operations and command center, leading to the latter's lack of awareness of the distribution and extent of damages in the affected areas. On May 14 and 15, maritime satellite phones became jammed and were consequently unable to convey commands swiftly; as a result, the rescue teams could not get accurate information and were unable to go to the places where they were most urgently needed.

In a sense, this meant they missed out on the best window of time to conduct rescue operations. For example, the county seat of Beichuan was literally wiped out in the quake, but the county government couldn't get the information out. All they managed to do was to send three separate teams of people, walking on foot, to report on their situations to the Mianyang city government. When the State Council and the Sichuan Earthquake Relief Operations and Command Center realized that Beichuan was actually among the most devastated areas in the quake, one vital day had already passed, which disrupted the overall rescue and relief operations.

In fact, Beichuan wasn't alone in adopting this foot messenger method to get the information out. Most of the other heavily affected townships did practically the same thing. Among the 238 townships surveyed by the author, each and every one of them was faced with communications failures immediately following the earthquake, with some severely affected areas not having their communications capability restored until two weeks later.

In such serious disasters, because of a high level of uncertainty regarding the extent of damage and the affected parties, adopting an adaptive, flexible leadership framework becomes vitally important. Such a system helps inspire innovative strategies, encourages collaboration awareness among working teams, and establishes a fault-tolerant incentive mechanism (Howitt and Leonard 2009).

In comparison, the traditional top-down policymaking process is less effective and cohesive, which is likely to create more problems. On the one hand, as earthquakes are usually highly destructive, they tend to affect a broad expanse of land as well as a huge number of people. Serious information asymmetry exacerbates the challenges posed by policy- and decisionmaking, which requires decisionmakers to formulate and unveil each policy with great care. On the other hand, the dreadful living conditions faced by a large number of affected local residents following the earthquake also requires decisionmakers to respond swiftly to the need for new policies and reform. In this policy-making dilemma, the need to strike a balance between conflicting demands has become a major challenge for policy- and decisionmakers, especially in the event of catastrophes (Zhang and Zhang 2008).

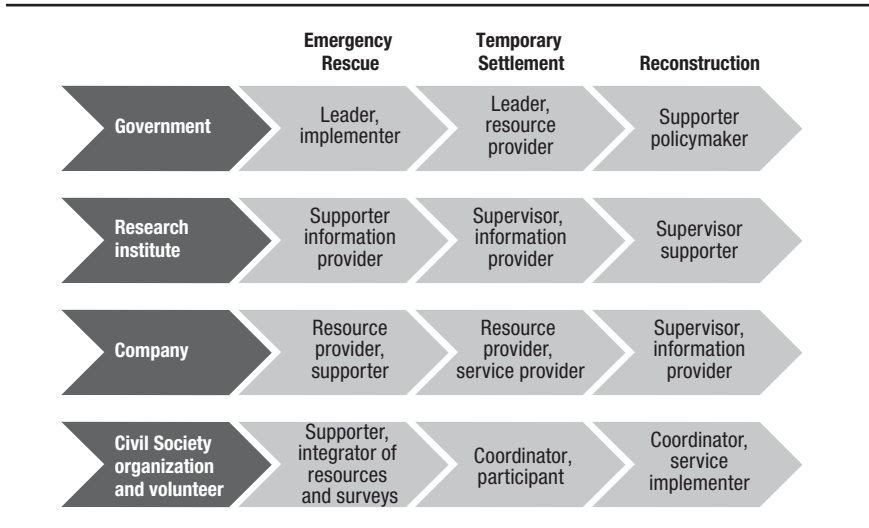
Policy Stream: Innovative Solutions

Under the multiple-streams framework, the “policy stream” refers to viable solutions. The selection process that ensues is not unlike the natural selection process we observe in the biological world. Among all the ideas proposed, only those that meet the following two criteria can be recognized as viable solutions: the first criterion is technical feasibility, which concerns not just budget analysis but also whether the execution path and the envisaged result meet the public’s expectations; the second criterion is value acceptability, which refers to the political or ideological feasibility of the solution. Over the course of such a process, policy entrepreneurs will have an important role to play (Kingdon 1995).

International experiences with disaster response indicate that because of the erratic and unpredictable way in which major disasters tend to strike, the successful formation of a policy stream in response to such events depends on two conditions. The first condition is cooperation among government, academia, civil society, and business circles. Different sectors have different needs and roles to play at different stages. Figure 4.9 lists the roles of different sectors in three stages—emergency rescue, temporary settlement, and reconstruction—following the Taiwan 921 earthquake.

The second condition is that actors boldly conduct innovative experimentation and dynamic policy adjustments. Therefore, in response to the Wenchuan earthquake, even if the disaster disrupted government activities to such an extent that it was unable to provide sufficient public services, solutions would not have been found were it not for the fact that the central government, the local governments, and NGOs conducted viable innovative experimentation and shared relevant international experience. This was crucial to facilitating the emergence of a window of opportunity for cross-sector collaboration.

After spending years building up its emergency management system, the central government put in place a well-developed contingency plan for crisis response and aid systems; on the other hand, and more importantly, relevant decisionmaking power has also been shifted downstream, and a government-to-government partner assistance model established. On May 19, 2008, in the immediate aftermath of the earthquake, the Sichuan earthquake relief command center wisely established a model that provided for collaboration between six provinces—Jiangsu, Zhejiang, Shandong, Guangdong, Hubei, and Henan—and five affected cities in Sichuan. The latter received relief supplies from the newly instituted partnership, which laid the foundation for subsequent policy changes.

FIGURE 4.9 Roles of sectors of society in the three stages of disaster response

Source: Zhang and Yu (2009).

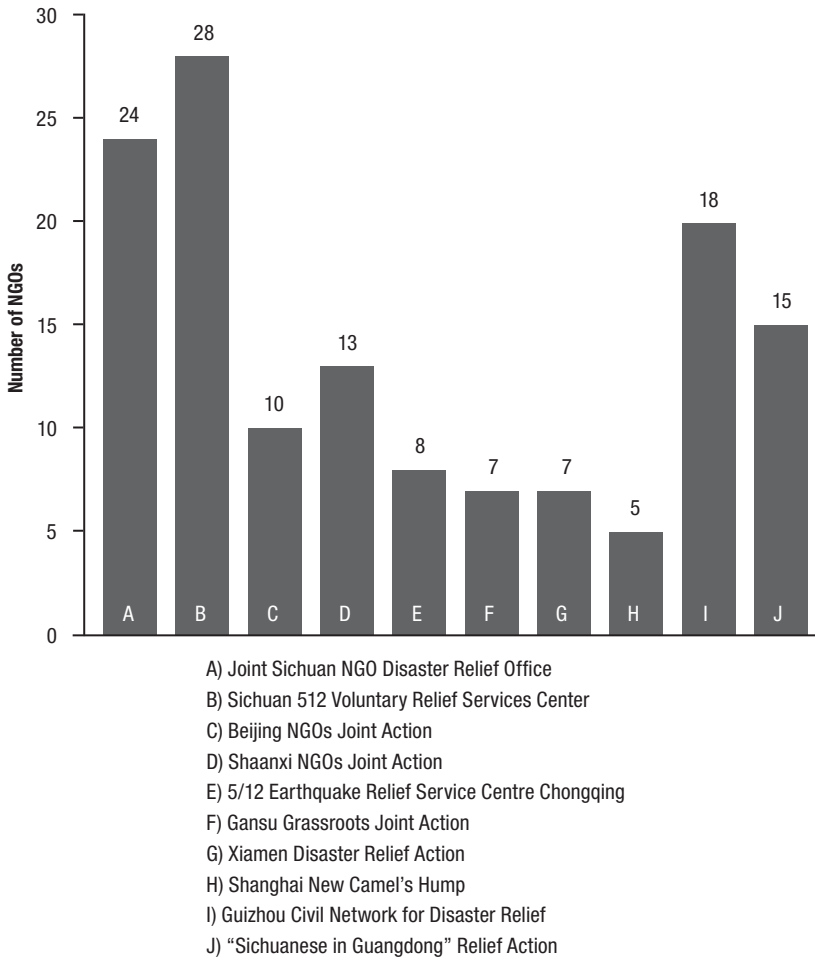
For local governments, the emergence of a number of innovative pilot programs has also produced viable options for subsequent policy changes. A typical example is the formation of the Mianzhu model. During the very first stage following the earthquake, on May 15, 2008, under the coordination of the China Social Entrepreneur Foundation and the Communist Youth League Committee of Mianzhu city, such organizations as Vanke and the Shenzhen Mountaineering Association collaborated in establishing the Zundao Township Volunteers Coordination Office. For the first time, the government and private companies joined hands to create an open platform for disaster relief. After the establishment of the office, thanks to the joint efforts of all parties concerned, a coordination mechanism involving four parties—government, businesses, NGOs, and individual volunteers as well as external resources—was successfully established, with the office serving as its operations center. A total of 40 NGOs (28 of which were registered and 12 unregistered) and more than 470 registered volunteers participated in the mechanism, which has since been widely hailed as the “Zundao model.” The local government communicated related experiences and lessons in a timely manner and took further steps to institutionalize the mechanism.

The Social Resources (Aid) Coordination Platform Project in Mianzhu was established in Mianzhu city, Sichuan Province, on July 17, 2008, with

the aim of “Receiving Aid, Demonstrating Love.” On September 26, 2008, the government of Zundao township issued formal documents in establishing the Zundao Township Social Resources Coordination Team, with the CPC secretary of the township serving as its head. A CPC deputy secretary of the township and a representative from the Vanke volunteer group were jointly appointed as deputy heads. A Zundao Township Social Resources Coordination Office was also set up under the program. In 2009, the Social Entrepreneur Foundation, the Mianzhu City People’s Government, the Mianzhu City Administrative Service Center, the Mianzhu City Committee of the Communist Youth League, and the Mianzhu City Bureau of Civil Affairs, collaborated with 30 NGOs working in Mianyang and jointly established the Joint Conference Mechanism for Public Welfare Organizations in Mianyang (Ran 2011).

On the NGO front, the networked linkages among the various organizations represent a viable opportunity for China’s underdeveloped NGOs to fill the response gaps left by government efforts and to establish a proactive collaboration directly with government officials (the pairing system did not designate the partner provincial governments as liaisons for their own local NGOs). A foremost example is the rapid formation of an extensive inter-organizational network alliance (Figure 4.10) among NGOs, government-organized nongovernmental organizations (GONGOs), informal volunteer groups, and businesses. Of the 70 NGOs surveyed, 58.6 percent collaborated on an ad hoc basis with at least three other organizations in conducting operations in Sichuan. Only 29 percent of the surveyed NGOs operated independently there.

Figure 4.10 also shows that the networks have provided organizations and volunteer groups interested in earthquake relief work with an important platform. In helping introduce NGOs into the affected areas, these networks have played a role as significant as that of the government. Of the surveyed organizations, 48 percent relied on these networks, a proportion close to that of the organizations that relied on the government in entering the affected areas (50 percent). Not surprisingly, surveys also show that compared with duly-registered organizations (both official and unofficial), organizations registered with the industry and commerce authority, as well as unregistered ones, were more likely to rely on NGO networks in entering the affected areas (Shieh and Deng 2011). The most prominent networks include the 5/12 Nongovernmental Aid Service Center (Zhao 2009) and the NGO Joint Relief Office (Lei 2012).

FIGURE 4.10 Networks of NGOs engaging in civil collaboration in Sichuan earthquake relief

Source: Zhang et al. (2008).

Note: Some organizations operate within two collaborative networks simultaneously.

In addition, the Internet has played an important role in the exchange of relevant information. A variety of nongovernmental forces built up platforms for information exchange on the Internet and provided information and technical support in connection with front relief efforts. The platforms also acted

as a medium for promptly forwarding authoritative information released by the government in disaster relief procedures; for providing relief-related research information as well as data relating to relief demand, relief supplies, and volunteers; and for undertaking a variety of other initiatives.

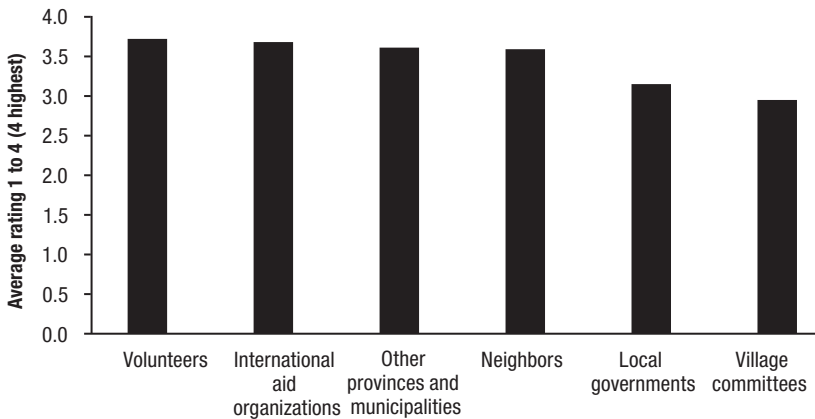
One typical platform is NGO CN (www.ngocn.net), which is dedicated to exchanging information on public welfare undertakings and was first set up in 2005. After the Wenchuan earthquake, NGO CN launched a dedicated page, “512 Earthquake Disaster Relief Operations,” aimed at providing organizations interested in participating in the earthquake relief effort with information exchange services—an initiative intended for the public interest. During the emergency rescue phase, the monthly data traffic generated by the web page reached 770,000 hits, with its highest number of individual thread views hitting a whopping 7 million, providing more than 1,100 items of information on earthquake relief. In addition, the Sichuan 512 Voluntary Relief Services Center opened up its own dedicated website, which included sections on topics such as service information, supplies distribution, a disaster relief organizations directory, and relief fund-raising. The Joint Sichuan NGO Disaster Relief Office also regularly released information on supplies and volunteers on the www.ngocn.net website. The joint office also directly accepted supplies and volunteer resources via the NGO CN site, and after processing the information it collected in affected areas, it allocated resources efficiently to those affected areas that had received less attention than others. Thus, it was able to make up for the deficiencies of the government’s relief efforts (Zhang et al. 2008).

The Political Stream: The Relationship between the Central Government and Local Governments

Under the multiple-streams framework, the political stream is independent of both the problem stream and the policy stream and has its own dynamics and rules. Its most important variables include changes in public mood, election results, regime changes, ideology, party politics, and changes in government officials, as well as campaign strategies of interest groups and their consequences (Kingdon 1995).

The relationship between the central government and local governments has always been an important factor in China’s political reform and economic development. On the one hand, as the implementers and enforcers of the policies issued by the central government, local governments undertake the function of running the country in every practical sense; they also wield considerable autonomous power within their own jurisdictions. There are great

FIGURE 4.11 Local residents' satisfaction with assisting agencies and organizations in Sichuan earthquake relief



Source: Horizon Research Consultancy Group and the Foundation for Poverty Alleviation and Social Entrepreneur Foundation (2008).

Notes: Ratings by survey respondents where 1 = "Not at all satisfied" and 4 = "Very satisfied"; Volunteers = NGOs because local respondents were not familiar with the concept of NGOs.

differences among local governments, as well as a certain level of competition (Saich 2011), given China's promotion of a tournament-style local government structure, in which promotion depends on excelling in meeting goals (Li and Zhou 2005; Zhong 2007; Xu et al. 2014). In responding to huge disasters, this kind of political pattern also lays the foundation for the emergence of windows of opportunity, making it possible for local governments to initiate collaborations with external NGOs.

In responding to earthquakes, local governments come under pressure on multiple fronts. They must undertake the pressing task of performing emergency rescue operations and conducting post-earthquake reconstruction. At the same time, they must deal with complex problems relating to affected areas and local residents. In addition, they are forced to compete with other local governments for resources from the central government, with a view to fulfilling their respective political goals. Under the tough post-earthquake circumstances when resources tend to be in short supply, they find it difficult to accomplish any of these tasks.

Figure 4.11 shows the results of surveys of local residents conducted in 2008, addressing their degree of satisfaction with the local government and other assisting groups. It makes clear that most residents of the affected areas thought local governments performed poorly.

TABLE 4.3 Channels used by NGOs to enter the area of the Wenchuan earthquake

Type of Organization	Personal Relationships	Home District Local Governments	Quake Area Local Governments	NGO Networks	Other
All organizations	23.8%	14.1%	50.0%	48.4%	12.5%
Registered NGOs	20.0%	20.0%	62.9%	48.6%	5.7%
NGOs registered as businesses	33.3%	16.7%	66.7%	66.7%	33.3%
Unregistered NGOs	9.1%	0.0%	27.3%	45.5%	18.2%
Individual-driven organizations	50.0%	0.0%	25.0%	25.0%	0.0%

Source: Survey on 64 participating NGOs, conducted by Professor Tao Chuanjin (2008).

Notes: Based on a survey of 64 NGOs; because some NGOs use multiple channels, percentages may add up to more than 100; “individual-driven organizations” refers to organizations that are run by a very limited number of people and lack a clear governance structure.

Though the pressures of fulfilling tasks assigned by the central government, addressing public concerns in the affected areas, and winning the competition with other local governments were high, local governments succeeded in starting to make rational, practical choices. They began to show willingness to work with NGOs to solve the social service problems relating to emergency rescue and reconstruction. Many local governments not only welcomed volunteers and NGOs to come aboard but even took the initiative by leveraging the institutional setup of the local Red Cross to help with the fundraising.

As mentioned earlier, a truly innovative model in this regard is the Mianzhu model, which set up a coordination office to promote NGO participation in local relief work. As shown in Table 4.3, among the 64 NGOs surveyed, 41 were introduced into the affected areas under the auspices of the governments of the affected areas or the governments where they are headquartered. The governments of the affected areas realized that NGOs can constitute an important force in disaster management measures.

According to the results of questionnaire surveys and interviews conducted by the Southwest University of Finance and Economics, government officials were generally satisfied with the services provided by the participating nonprofit organizations; they expressed their belief that nonprofit organizations are capable of actively contributing to the work of the government in effectively meeting the needs of the masses. Having played an important role in earthquake relief and post-disaster reconstruction, nonprofit organizations have made commendable contributions to maintaining social stability and advancing the development of a harmonious society. They are poised to become an important partner of the government in addressing social

problems and conflicts, promoting solidarity, and safeguarding social stability (Bian, Wang, and Wang 2011).

For these reasons, despite severe shortages of resources, local governments have spared no effort to help the participating nonprofit organizations to carry out their services. The survey shows that among the local governments that offered assistance, 67.7 percent provided venues for activities; 63.5 percent communicated or coordinated with their superiors to facilitate the operations of NGOs; 49.5 percent provided office space; 41.7 percent provided NGO personnel with accommodations and meals; 44.3 percent provided policy consulting services; 19.8 percent provided transportation; 45.3 percent addressed people's concerns raised by relevant NGOs; 10.4 percent provided financial support; and 1.6 percent provided other forms of assistance, such as briefing NGOs on local conditions, and notifying or organizing the target audience of each participating NGO. Of course, of the forms of assistance provided by local governments, such as offering office space and venues for activities as well as communicating or coordinating with superiors in facilitating NGO operations, make up the largest proportion of the service provided, whereas extending financial support remains a rarity (Bian, Wei, and Deng 2009).

Conclusion

Based on the findings outlined in the previous sections, we can pinpoint the factors driving the emergence of the window of opportunity for cross-sector collaborations in the aftermath of the Wenchuan earthquake. According to the empirical analysis using the multiple-streams framework, the Wenchuan earthquake, being unforeseen and devastating, resulted in government failure. Specifically, the government failed to respond completely to such a large-scale emergency in a timely manner, which in turn engendered the problem stream.

In the meantime, dynamic innovations performed by all participating actors generated feasible and win-win solutions to the problem: the central government adopted the partner assistance model to move decision-making downstream and encourage social participation; local governments started to work with NGOs and explored new working mechanisms such as the Mianzhu model; and NGOs made themselves more networked so as to strengthen their service delivery capability. All of these dynamic innovations formed the policy stream that was indispensable to the opening of a window of opportunity.

What's more, given the current pattern of relationships between the central government and local governments, the latter are motivated to collaborate

with NGOs, thus forming the political stream. As described in detail in the previous sections, the confluence of the three streams triggers the opening of a window of opportunity for new policies, ushering in the possibility of burgeoning collaborations between the government and civil society in responding to huge disasters.

Further Discussion

As a result, most of the collaborations formed between NGOs and local governments did not extend beyond calculus-based trust and relationship-based trust. The Mianzhu model, which was believed to have made certain breakthroughs as a coordinating mechanism, seems to focus more on resource channeling and hence hasn't reached the level of institution-based trust either (Xu 2008). Granted, the emergence of a window of opportunity gives rise to some social innovations conducive to a kind of "organic synergy" between the government and civil society. However, whether a fundamental change in social institutions can be achieved remains to be seen.

That said, one thing is certain: China's civil society is still growing rapidly. At the end of 2010, there were 439,000 registered social organizations in China, including 243,000 social groups (an increase of 3.4 percent over the previous year); 195,000 nonbusiness civil institutions (up 3.7 percent over the previous year); and 2,168 foundations (an increase of 17.9 percent over the previous year) (China, Ministry of Civil Affairs 2011). Following the Wenchuan earthquake, people gradually realized that powerful social groups can coexist with a powerful yet flexible state, which implies that a strong society does not necessarily mean a weak state; the two can achieve mutual empowerment. However, a strong state without active social participation is actually weak and unable to withstand the test of social changes. As Joseph S. Nye (2004) suggests, "soft power"—the ability to make others want what you want—of Western developed countries stems from the robust growth of civil societies there, rather than stimulative government policies. In the years to come, China will have to learn some important lessons and mobilize the forces of the whole of society in developing soft power and reconcile it with forms of more coercive "hard power," so as to nurture the proper combination of both known as "smart power" (Nye 2012). In this way, China will finally be able to achieve a win-win combination of a smart state and a strong society, instead of a problematic combination of a strong state and a weak society.

INTEGRATING DISASTER MANAGEMENT AND POVERTY REDUCTION

Chengwei Huang and Claire Hsu

In light of the growing theoretical and policy paradigm of integrating disaster reduction and poverty alleviation efforts (World Conference on Natural Disaster Reduction Yokohama 1994; Wisner et al. 2004), China sought to blend risk and vulnerability reduction, disaster mitigation, and poverty alleviation in its short-term recovery program following the Wenchuan earthquake (Dunford and Li 2011). The task of integrating these policy goals, however, remains relatively recent, much remains to be done, and many knowledge gaps remain to be filled (Huang and Li 2012). This chapter introduces the concepts of disaster and poverty, reviews the available literature on their interaction during the Wenchuan earthquake, and recommends ways to better combine these two policy agendas, with community-based disaster management (CBDM) figuring centrally.

Disaster, Poverty, and Vulnerability

Disaster, Disaster Risk, and Disaster Risk Management

Disaster is a general term for an event that destroys people's lives and environments. Disasters can be man-made or natural, depending on the cause, whether they are geological, climate-related, environmental, or biochemical. This chapter mainly focuses on natural disasters, which are extreme events that occur in the natural environment and threaten human safety and property, including unexpected disasters (such as earthquakes, volcanic eruptions, mudslides, tsunamis, typhoons, and floods), gradual disasters (such as land subsidence, land desertification, drought, and coastal change), and environmental disasters (such as ozone depletion, water pollution, soil erosion, and acid rain caused by human activities) (China, National Validation Committee on Scientific Terminology 2007). Disasters usually threaten or damage lives, property, productive activities, and the livelihoods of exposed populations.

Moreover, their largely unpredictable nature poses a challenge for risk prevention and management.

Risk is calculated based on the expected loss associated with the occurrence of hazardous events, and it is related to the concept of incidence. Risk factors include natural disasters, social risks (crime, violence, politics, etc.), personal risks (diseases, injuries, accidents, domestic upheavals, etc.) and economic risks (unemployment, loss of assets, etc.). Current studies on the concept of risk have yielded the following conclusions: First, risk represents any possibility of negative consequences caused by uncertain factors. Second, risk can be identified, analyzed, evaluated, and prevented with modern science and technology. Third, risks in modern society include not only natural disaster risks but also man-made risks, and risk sources in modern society are more widespread and complex than they were previously. Improved understanding of disaster and risk analysis have produced a series of concepts about disaster risk management.

Disaster risk management is aimed at developing a well-rounded, sustained, multi-agent management system. This system is based on the traditional emergency management deployed during post-disaster reconstruction and pre-disaster prevention and crisis management, placing priority on results instead of actions. Research suggests that the capacity of government and society for disaster management, prevention, and mitigation can be improved using legal, political, economic, technical, educational, and engineering tools. Whole-process disaster management can also help improve capacity by identifying, estimating, and evaluating potential disaster risks.

As a result, the management of natural disasters actually involves prevention, response, and alleviation in order to protect public interest, lives, and property and ensure a normal social order and sustained development (Zhang, Okada, and Tatano 2006). This concept consists of four specific elements, including all types of natural disaster management, all phases of natural disaster management, integrated natural disaster management, and total natural disaster risk management (Okada and Amendola 2002; Okada 2003).

Poverty and Poverty Reduction Concepts

Poverty poses a problem that is both economic and social. Conceptualizations of poverty and poverty reduction vary across disciplines, illustrating the multiple facets of poverty and its implications, as well as the complexities of its reduction.

The concept of poverty has evolved, from the idea of income poverty, which is simply defined according to income and consumption; to capacity poverty, which is defined according to social factors like health and education;

to rights poverty or human poverty, which is defined according to political, psychological, and cultural factors.

Meanwhile, the measurement of poverty has expanded from merely considering absolute and short-term poverty (or temporary poverty) to including the assessment of relative poverty and long-term poverty (or persistent poverty) (Guo and Luo 2005). Recently, researchers and policymakers have increasingly adopted multidimensional and multilayer analyses of poverty in theoretical studies and policy, thereby increasing the prevalence of the multidimensional poverty paradigm. Additional concepts that have only recently emerged include knowledge poverty, information poverty, and ecological poverty (Chen 2008; Shang and Yao 2005; Wang and Alkire 2009; Hu and Tong 2010; Hu and Li 2001).

As noted in the *1997 Human Development Report* of the United Nations Development Programme (UNDP), *poverty* is not only the lack of income but also the deprivation of rights, life expectancy, knowledge, dignity, and an acceptable standard of living. Measurement methods include the human development index and the human poverty index. According to the World Bank's *2000/2001 World Development Report*, poverty includes not only material shortages but also poor health and education, vulnerability to risks, the inability to express demands, and a lack of influence in the community. The multidimensional redefinition of poverty has significant implications for poverty reduction strategies and for the selection of policy instruments.

Poverty reduction involves the use of specific policy instruments to reduce or alleviate poverty, as measured by coverage area, population size, degree, and depth. Major poverty evaluation indexes typically examine the total poor population or the poverty incidence rate.

Vulnerability among the Poor

According to the World Bank, *vulnerability* is defined as the probability of individuals or families facing certain risks and the probability of losing property or of living standards declining below the average level. This definition encompasses two dimensions of vulnerability: an external dimension, in terms of the likelihood to experience a shock, and an internal dimension, which relates to the ability to withstand the shock (Han 2004). Similarly, Chambers (1995) points out that vulnerability "has two sides: the external side of exposure to shocks, stress and risk; and the internal side of defenselessness, meaning a lack of means to cope without damaging loss."

In addition, Dercon (2001) has established an analytical framework for conceptualizing risk and vulnerability that integrates resources, income,

consumption, and relevant institutional arrangements (such as market mechanisms and public policies, etc.). In this framework, there are three risk types for farmers: asset risks (which threaten human resources, land assets, material assets, financial assets, public goods, and social assets), income risks (which threaten income creation, returns on assets, asset disposal, savings and investments, remittances, and economic opportunities), and welfare risks (which threaten nutrition, health, education, social exclusion, and ability deprivation) (Chen 2005).

Disaster impacts are not evenly distributed across affected areas. When disaster strikes, poor populations suffer more because they have greater vulnerability. People tend to seek advantages and avoid disadvantages; they may choose to live in places with a lower risk of natural disasters, for example. Therefore, people who choose to live in areas with harsh environments and frequent disasters often do so because of the economic constraints associated with poverty. Those who are able to escape poverty usually choose to relocate to safer environments, while the poorest often have little choice but to continue to reside in the most dangerous places. This pattern exemplifies the social and historical development of the relationship between disaster and vulnerability.

When disasters occur, they reveal the vulnerability profiles of poor groups, unless the disasters are not severe enough to cause major destruction. The poor have limited resources for disaster prevention, and once disaster strikes, it affects them in multiple ways. Because they are constrained by financial resources, poor people are more likely to choose residences with lower-cost building materials and design, which lower the resilience of the buildings when disaster strikes. Poor people also live in areas that often have a high population density because of land shortages. In particular, poorly planned neighborhoods with excessively crowded buildings and narrow streets are more likely to fall victim to disasters.

In terms of production, industries that mainly employ poor people are typically dependent on natural conditions and are characterized by low technology, rough tools, and inadequate protection. This means that when disasters happen, there is an additional dimension of vulnerability for poor people because of the losses associated with these means of production. Moreover, the property structure of poor people is extremely simple. Because farmers customarily put most of their savings into building their homes, the structural damage caused by disasters can lead to financial ruin. Furthermore, the productive activities of poor people are also simple because their main income

comes from traditional family farming. When disasters occur, poor farmers dependent on nature for their livelihoods are more vulnerable than those who have savings and other sources of income.

Also, after disasters occur, poor people have a weak capacity to recover and rebuild, for several reasons. First, reconstruction costs in poor areas are higher than those of non-poor areas because of the remote locations and the higher logistical costs involved. Second, certain policies are ill-suited for poor people. For instance, poor people have no choice but to give up projects with only partial subsidies because of their inability to raise money. Third, poor people bear a greater burden when they are saddled with debt.

The Relationship between Disaster and Poverty during the Wenchuan Earthquake

Given the well-established relationship between poverty and disaster, the Wenchuan earthquake understandably drew the attention of researchers, such as Dalen et al. (2012), Dunford and Li (2011), and Sun et al. (2010b), who were interested in better understanding the practical implications of the disaster for poverty in China. The literature indicates that poor households were more seriously affected (Dalen et al. 2012; Dunford and Li 2011). Dunford and Li note that the convention within the English-language post-disaster reconstruction literature (which is primarily focused on disasters in developed countries) is to measure economic costs by their absolute value and therefore to consider the costs the greatest in developed areas. Emphasizing costs as a share of overall income instead makes less-developed areas the hardest hit and the least able to recapture their previous rate of economic development.

Dalen et al. (2012) also note that poor households require longer periods to regain their pre-disaster income levels. In the case of the impacts of the Wenchuan earthquake on poverty, Dunford and Li (2011) point out that 4,834 official poverty villages required reconstruction, while additional villages became reclassified as official poverty villages (thereby increasing the number from 505 to 590 in Mianyang, and from 108 to 125 in Beichuan) as a result of the disaster. Similarly, Dalen et al. (2012) find that more households fell into poverty (according to the new 2009 poverty line of RMB 1,196 per capita net annual income) in most areas even though mean annual household income in seriously affected areas remained largely unchanged following the disaster.

Further, Dalen et al. (2012) report an increase in the number of households living below the poverty line, from 9 percent before the earthquake to 11 percent after it. They also suggest that poorer households take longer to recover, because among the households expecting to require at least five years to recover, households below the poverty line accounted for 16 percent while the lowest income group accounted for approximately 30 percent. Sun et al. (2010b) identify a similar trend, finding that the disaster also increased households' likelihood of becoming poor in the future.

Integrating Poverty Reduction into Disaster Management

In addition to surveying the impact of the Wenchuan earthquake on poverty, Dunford and Li (2011) also summarize the key poverty alleviation provisions of the earthquake reconstruction plan: the adjustment of China's general poverty alleviation policies and the State Council Leading Group Office of Poverty Alleviation and Development's (LGOPA's) earthquake reconstruction master plan, under which LGOPA targets the 4,834 official poverty villages that required reconstruction.

The LGOPA leads China's poverty alleviation policy, which is area centered and development oriented. As part of the policy, village-level investments are used to improve (1) village infrastructure, services, and productivity; (2) agricultural production and downstream value-added activities; (3) labor training and labor transfer policies; and (4) special categories of areas. These measures remain relevant for the earthquake zone but are specially adjusted there. In particular, following the 2008 revision of the strategy, the poverty standard and minimum allowance were both updated, with the new standard coming into effect as early as 2009 (Dunford and Li 2011).

Reinforcing these efforts, the LGOPA also adopted and implemented an earthquake reconstruction master plan for the 4,834 poverty villages, which were estimated to have required an average restoration and reconstruction cost per village of RMB 3.25 million (China, LGOPA 2009). Dunford and Li (2011) note that there were several sources of this money, including the Central Post–Wenchuan Earthquake Restoration and Reconstruction Fund, government poverty reduction funds, donations, and loans. Nevertheless, as the government funds, which were primarily dedicated to infrastructure, production recovery, capability enhancement, environmental improvement, and unforeseen costs, did not reach the estimated per-village funding requirement, only some of the projects were implemented. As Dunford and Li point out,

analysis of this investment further reveals that the emphasis in the reconstruction on areas that suffered greater damage resulted in a lack of emphasis on poor villages.

In the most severely affected areas in Sichuan, poor counties designated to receive aid from provincial-level offices (the latter working in partnership with state-owned enterprises), received approximately one-half as much special central and local government funds as non-poor counties and one-third as much partnership funds as non-poor counties (because of the amount of damage suffered) (China, LGOPA 2009). However, poor counties did receive aid from nongovernmental sources. Given the concentration of government resources in the most seriously affected areas, domestic and international donations and aid were dedicated to less seriously affected areas. Poor villages in poor counties (which, as far as government funds are concerned, are designated to receive aid from both provincial-level and national-level offices) received more than 90 percent of this nongovernmental type of support.

As for the effectiveness of these interventions, Dunford and Li (2011) acknowledge that the integration of risk reduction and poverty alleviation into short-term post-disaster recovery succeeded. They recommend that the shortened two-year reconstruction program be extended and developed into a new program of medium-term economic development and poverty alleviation that uses enhanced production methods to improve village farming productivity and income. Village farming would involve the production of higher value-added products and the creation of alternative employment in downstream activities in rural and urban areas.

As part of its large-scale project on the poverty dimensions of the Wenchuan earthquake, the International Poverty Reduction Center in China offers a broad array of macro and micro recommendations for integrating China's poverty reduction and disaster management policies. The full range of recommendations spans various issues such as improving the integration of NGOs into disaster work and poverty reduction work (Li and Huang 2012); promoting environmentally sustainable reconstruction (Huang and Xiang 2012); and clarifying and improving the division of labor among various levels of government. But the key recommended policies include improving, expanding, and integrating social safety nets and strengthening community disaster management capacity. In particular, the Center explains that capacity building will require improving awareness of disaster prevention and mitigation, increasing local knowledge of disaster management techniques, and establishing an emergency response system at all village levels.

Recommendations for Deepening the Integration of Poverty Alleviation and Disaster Management

Given this rich discourse and supportive context, China's 2011 National Comprehensive Disaster Prevention and Reduction Plan (2011–2015), which calls for the integration of disaster management and economic and poverty alleviation plans by the end of 2015, is especially encouraging (Jiang 2013). In the plan, well-defined disaster prevention and reduction goals, tasks, and major projects are put forth to build China's capacity for comprehensive disaster prevention and reduction and to promote sustainable economic and social development.

In order to meet these and other goals, 10 specific capacity-building tasks are identified in the plan. These tasks include natural disaster monitoring and early warning, risk management, civil engineering measures, community disaster reduction, emergency response, recovery and reconstruction, technology empowerment, and social mobilization. In particular, community-based disaster management (CBDM) approaches, which develop locally owned and locally appropriate strategies for disaster preparedness and risk reduction, are frequently cited as key to the integration of poverty alleviation and disaster management (De Silva and Burton 2008; Yodmani 2001; Schmidt, Bloemertz, and Macamo 2005). Recent projects dedicated to CBDM—such as the UNDP and Department for International Development (DFID) trilateral project, *Sharing and Learning on Community-Based Disaster Management in Asia*, which aims to reduce poverty by improving community resilience to disasters—additionally underscore the centrality of this strategy for alleviating poverty while also reducing disaster risk.

Zhang, Yi, and Zhao (2013) review China's recent progress in CBDM development and highlight key remaining challenges. They explain the recent development of the CBDM concept and China's implementation of capacity-building activities. These capacity-building activities involve constructing "national safe communities" in which people can safely live, work, and play (Wu and Zhou 2005), by means of setting relevant community safety standards and establishing a community safety assessment system. In addition, a comprehensive disaster reduction community assessment system has been set up to guide local governments and community managers in their risk mitigation planning and emergency preparedness, response, and recovery efforts, with communities that achieve scores of at least 60 points (out of a possible 100) becoming candidates for a special "comprehensive disaster reduction demonstration community" designation.

Zhang, Yi, and Zhao (2013) note that CBDM development requires the enhancement of relevant policies and laws in China, including the Opinions of the State Council on Strengthening and Improving Community Service Work (which mandated that governments establish disaster and accident emergency response mechanisms and enhance communities' emergency and incident response capacity), the Opinions of the State Council on Comprehensive Strengthening Emergency Response Management Work (which proposed that communities should develop and popularize effective emergency response plans), the 11th Five-Year Plan on Comprehensive Disaster Reduction: 2006–2010 (which called for the strengthening of urban and rural community disaster reduction capacity building and community disaster reduction capacity building demonstration programs), the Standards on National Comprehensive Disaster Reduction Demonstration Communities (2007) (updated in 2010, standards that provide the most comprehensive CBDM policy guidance in China), the Opinions on Strengthening Building Grassroots Emergency Response Task Forces (which provided guidance on the establishment, management, and support of grassroots emergency response teams), and the State 12th Five-Year Plan on Comprehensive Disaster Reduction: 2011–2015 (which called for the enhancement of communities' comprehensive disaster prevention and reduction capacity and growth in the number of national comprehensive disaster reduction demonstration communities). All these efforts related to CBDM were the result of recent domestic emergencies and disasters (the 1998 flood, SARS in 2003, and so on), as well as international disaster reduction activities, such as the International Decade for Natural Disaster Reduction and the 1994 World Conference on Natural Disaster Reduction. They also note that despite these encouraging signs of progress, China's nascent CBDM implementation still faces challenges. These challenges include developing China's CBDM-related organizations and coordinating mechanisms, boosting low levels of participation by community residents, refining disaster risk assessment methods, promoting NGO development, and spreading safety-oriented ideas and values.

Enhancing individual participation in CBDM activities. Zhang, Yi, and Zhao (2013) call attention to inadequate participation by individuals in CBDM in China. They note that outside experts generally operate the comprehensive disaster reduction demonstration community construction projects and the national safe-community construction projects, while the government generally performs the assessments and examinations of these projects. Not only are many community members not involved in their local

disaster prevention and reduction activities, but they are usually unaware of what type of disaster prevention and reduction activities are carried out in their communities.

This situation is unfortunate, Zhang, Yi, and Zhao (2013) explain, because individual participation in the management process is essential to the success of community-based disaster reduction activities. Such participation develops when community residents are allowed to participate in the management process. Abarquez and Murshed (2004) explain that community members must acquire a comprehensive understanding of the relevant hazards and disaster risk levels and must support hazard elimination and risk mitigation activities. Improving individuals' understanding of community disaster response plans and their personal roles in the plan will help to reduce casualties and property loss (Zhang, Yi, and Zhao 2013). Ultimately, Zhang, Yi, and Zhao (2013) recommend measures to guide individuals to participate in community management.

Enhancing CBDM organizations and coordination mechanisms. Zhang, Yi, and Zhao (2013) explain that in addition to the five standard administrative levels of the Chinese government (province, prefecture, county, township, and village), there is also another level, known as the “natural village.” Unlike the five standard levels, the natural village is not defined by any official administrative division—a village in the administrative sense can contain anywhere from two to dozens of natural villages. Although most services such as health-care, education, emergency management, and economic development are delivered at the county level, the natural village is the ideal unit for the creation of CBDM activities that enable communities to undertake self-help and mutual-help activities immediately in the event of a disaster.

Community-level volunteer disaster management organizations must be established (Gaillard 2010), and the government must provide these organizations with timely and accurate information on hazard risks and mitigation measures. This will ensure that the community's disaster management organizations are sufficiently aware of and prepared for key disaster risks (Sims and Baumann 1983).

Zhang, Yi, and Zhao (2013) explain that despite the introduction of some public sector–led CBDM pilot programs in China, the gains from and potential for these programs are severely constrained by the current lack of legislation, funding, and implementation mechanisms. These authors also note the small share of NGOs within the nascent NGO community in China that are dedicated either to disaster prevention (that is, avoiding a disaster) or to risk reduction (limiting the damage caused by a disaster)—fewer than 1 in 1,000

NGOs in China are devoted to such work. Given the potential role NGOs can play to support CBDM, these facts call for the development of CBDM-related NGOs as well.

Zhang, Yi, and Zhao (2013) highlight two key strategies for advancing this agenda: (1) the creation of a favorable social environment by the government through the refinement of laws and regulations related to NGOs and (2) the outsourcing of services to NGOs.

Refining community-based disaster risk assessment methods. Although China's governments have promoted CBDM at all levels, the implementation of China's CBDM remains preliminary for two reasons: depth of guidelines and scale of assessment (Zhang, Yi, and Zhao 2013). Regarding guideline depth, the National Committee for Disaster Reduction's *Standards on National Comprehensive Disaster Reduction Demonstration Communities* (2010) includes an innovative attempt at creating a community-level disaster management assessment system and a scoring system to determine candidacy for comprehensive disaster reduction demonstration community designation. Nevertheless, the *Standards* covers only "what to do" and neglects to explain "how to do it."

Regarding the scale of assessment, current community methods for disaster risk assessment are configured at the regional scale (Birkmann 2006; King and Macgregor 2000), but the assessment methods should instead be defined on the smaller scale at which the community acts when disasters occur (Dwyer et al. 2004; Medina-Vera et al. 2010; Barzyk et al. 2010).

Conclusion

Before the Wenchuan earthquake, China's government responded to disasters with little regard for the distinctions between different groups' recovery experiences. After the earthquake, however, the government realized that, in the face of disasters, people with different conditions have different recovery periods and requirements, and that this is especially true for poverty-stricken populations. As a result, the idea of integrating disaster management and poverty reduction was born.

Unfortunately, translating policy into practice involved confronting several obstacles, such as the shortsightedness of the integration. Moving forward, the integration of poverty reduction and disaster management could involve natural disaster monitoring and early warning, risk management, civil engineering measures, community disaster reduction, emergency response, recovery and reconstruction, technology empowerment, and social mobilization.

SUMMARY AND LOOKING AHEAD

Kevin Z. Chen and Claire Hsu

This book focuses on how China's disaster management system—which is dedicated to the prevention, relief, and reconstruction efforts, carried out by the entire society, associated with the occurrence of natural hazards—performed during the Wenchuan earthquake. After briefly describing in Chapter 1 the earthquake's effects, the government's response, the evolution of China's disaster management system, and the increasing attention paid by China's government to disaster management in recent years, the remainder of the book focuses on key policy innovations throughout the disaster management process and system. It also covers the problems encountered, such as inadequate preparedness, misuse of funds, preference for short-term infrastructure projects over other projects that could better alleviate poverty, and inefficient allocation of funds. Below we summarize the key findings of the analysis of the relief and reconstruction efforts.

In Chapter 2, the authors use a unique dataset to examine the effects of the 2008 Sichuan earthquake on income and expenditure levels of rural households. They examine what role, if any, government aid played in recovery. In response to the disaster, the government provided temporary living subsidies to families and, to help rebuild homes, a mix of aid and bank loans for home reconstruction. The authors find that living subsidies were adequate to offset losses in annual income, but the mix of aid and bank loans were not sufficient to cover all reconstruction costs. As of 2009, consumption had stabilized, mainly because of the living subsidies provided by the government, and household income or consumption inequality had not changed despite the heterogeneous effects of the earthquake on households.

In Chapter 3, the author describes his experience coordinating the pairwise aid policy. First, he reviews the multiple challenges for disaster relief presented by the Wenchuan earthquake. Next, he describes the prohibitive administrative and logistical constraints that led to the exploration of the pairwise province-to-county aid model. He then explains the general design of the model and its outputs. Finally, he briefly outlines future challenges.

In Chapter 5, the authors examine the multidimensionality of poverty and its relationship with disaster management. First, they explain the terminology of core concepts, including disaster, disaster risk, and disaster risk management; poverty and poverty reduction; and vulnerability among the poor. Next, they elaborate on the relationships between disaster and poverty and between disaster risk management and poverty reduction in reference to the Wenchuan earthquake. Last, they discuss the importance of continuing to integrate disaster management and poverty reduction strategies and the modalities and policy recommendations for accomplishing this integration.

Looking Ahead

This book identifies and examines key disaster management policy innovations, ranging from the pair-wise aid policy, increased cooperation with NGOs, and the integration of poverty reduction and disaster management. Additional research on China's policy learning following the Wenchuan earthquake, such as Birkland and Warnement (2014), notes that China exhibited clear problem solving and learning behaviors in the wake of the 2008 Wenchuan earthquake because of institutional factors such as its technical, organizational, and economic strength.

As a result of this adaptive behavior, our analysis indicates that a number of policy trends emerged across the many dimensions of China's disaster management efforts following the devastation of the Wenchuan earthquake, including increased emphasis on disaster prevention and mitigation, partnerships, and poverty reduction. As noted above, diffusing disaster management efforts—both over time and across the policy environment so as to include a greater number of agencies and actors—as a means of reorganizing China's hierarchical social and governance structure serves as a unifying concept for the policy innovations discussed in this report. In the future, diffusion and the other policy trends will continue to redefine the development of China's disaster management. Below, we discuss a number of key conclusions and insights about the larger and longer-term impacts of these trends.

Increasing international emphasis has been placed on the role of prevention in disaster management (Sanghi et al. 2010). China's own preventive shift, as can be seen in its post-2008 focus on building code improvement and enforcement, has already effectively prevented building collapse and damage in subsequent earthquakes (Associated Press 2013). In addition, some researchers promote the supplemental adoption of nonstructural mitigation strategies, such as enhancing community resilience through greater

community involvement in responding to disasters (as promoted in Chapter 4 and Chapter 5). First responders are often members of the affected communities, if not survivors themselves.

However, a number of remaining challenges face China's community-based disaster management prevention efforts. These challenges include boosting low participation by community residents; developing community-based disaster management (CBDM) organizations and coordinating mechanisms, refining disaster risk assessment methods, promoting NGO development, and spreading safety-oriented ideas and values.

Increasing attention has been paid internationally to innovative cross-sector partnerships for disaster management formed through multilateral frameworks and initiatives. Examples of such partnerships include the United Nations Development Programme (UNDP) Public-Private Partnerships for Service Delivery, which was designed to examine and promote the local provision of basic services to the poor by companies and NGOs, and the World Bank Institute's Public-Private Partnerships in Infrastructure program, which is oriented to equipping and encouraging public officials to undertake cross-sector partnerships.

This global trend toward cross-sector partnerships has also been observed in China's recent experience following the Wenchuan earthquake. China's post-Wenchuan enthusiasm for innovative partnerships both within government (between provinces and counties as discussed in Chapter 3, and between government agencies as described in Chapter 1) and between government and charities or society at large (as discussed in Chapter 4), has done and will continue to do much to improve the nation's coping capacity.

The future of some of these partnerships has been called into question. For example, although the formal identification of NGOs as key partners in the response and reconstruction efforts following the 2008 Wenchuan earthquake promoted a historic level of civil society engagement in relief efforts, the unsustainability of this engagement within the region has been noted by Tsinghua University's Professor Guosheng Deng. Professor Deng's research revealed that the number of NGOs active in the region decreased from 300 to 50 between 2008 and 2009, and the number of volunteers shrank from 3 million to 50,000 (Ramzy 2009). Ultimately, he suggests that the emergence of China's civil society may take longer than was hoped.

Increasing pressure has been put on policymakers to reduce regulatory hurdles that currently stymie NGO and charitable organization development and growth (Shieh and Deng 2011). Although recent NGO corruption scandals have heightened public skepticism toward charities and disaster relief

(Yu 2013), subsequent disasters have nonetheless led the government to allow more NGOs to officially participate in fund-raising and disaster relief efforts (Huang 2013).

Another growing trend in international disaster management is the integration of disaster reduction and poverty alleviation efforts, in light of the growing awareness that people with different conditions have different disaster recovery periods and requirements and that this is especially true for poverty-stricken populations (World Conference on Natural Disaster Reduction Yokohama 1994; Wisner et al. 2004). As discussed in Chapter 5, China also sought to blend risk and vulnerability reduction, disaster mitigation, and poverty alleviation in its short-term recovery program following the Wenchuan earthquake (Dunford and Li 2011). In particular, the government adjusted the existing poverty alleviation policies and formulated a Leading Group Office of Poverty Alleviation and Development earthquake reconstruction master plan specifically targeting China's 4,834 official poverty villages.

Unfortunately, translating policy into practice involved confronting several obstacles, such as the shortsightedness of the integration (Dunford and Li 2011), and the task of integrating these policy goals remains relatively recent, with much yet to be done and many knowledge gaps to be filled (Huang and Li 2013). In the future, the integration of poverty reduction and disaster management could involve several measures highlighted in Chapters 4 and 5, such as natural disaster monitoring and early warning, risk management, civil engineering measures, community disaster reduction, emergency response, recovery and reconstruction, technology empowerment, and social mobilization (Jiang 2013).

The improvement of disaster prevention and mitigation at the community level is key to many of these poverty-oriented disaster management recommendations. However, the government should also focus on the development of policies specifically dedicated to mitigating the income shocks induced by catastrophes (which exceed household coping ability), such as expanding and improving social safety net coverage and increasing the availability of agricultural insurance (Jin et al. 2011). In addition, further study of the Dutch-disease effects of disaster aid, as measured in terms of income and employment (indicated by the preliminary findings of Bulte, Xu, and Zhang 2013), as well as of households' income-smoothing behavior (as explored by Jin et al. 2011), would support the development of income mobility and reduce rural inequality.

China has contributed to the global policy discourse through its response to the 2008 earthquake. Our aim is that these lessons from the earthquake response facilitate the continued development of not only China's own disaster management capacity but also that of other countries. In particular, the concepts of diffusing disaster management efforts, of leveraging external resources, and of coordinating effectively with actors on multiple levels and across sectors offer great hope for improving resilience against natural disaster.

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The Wenchuan County earthquake of 2008 was the most severe earthquake, as measured in sheer magnitude, in the history of the People's Republic of China. Killing almost 90,000 people and creating economic losses of 845 billion yuan (US\$132 billion), the earthquake also elicited a vigorous response from various government agencies, private businesses, and nongovernmental organizations (NGOs). The ways these actors' responses to the earthquake proved effective in distributing appropriate aid to those in need and the areas where the actors' earthquake response needs to be improved are discussed and analyzed in *Earthquake Lessons from China: Coping and Rebuilding Strategies*.

The authors identify three earthquake responses that proved helpful to earthquake-affected communities: the use of a pair-wise aid policy, in which a donor province or city is assigned to give aid to a particular earthquake-affected area; expanded NGO and volunteer involvement; and various kinds of public financial aid to earthquake-affected households. They also pinpoint areas that need further work: public aid specifically for home reconstruction, which has been inadequate, and the capacity of local communities to manage their own disaster responses, which is too low. Perhaps most important, the authors found that the high levels of NGO and volunteer involvement in disaster response should be expanded and sustained beyond what they were in the aftermath of the 2008 earthquake. The authors believe that increased nonpublic sector involvement can not only improve the level of response to natural disasters but also foster a robust civil society and grassroots democracy in China.

These and other findings that are discussed in *Earthquake Lessons from China* can assist the continued development of China's disaster management capacity—and also be useful to other countries facing similar disasters.

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