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Chapter 24
Post-Wenchuan Earthquake Reconstruction and Development in China

Ping Xu, Xiaoli Lu, Kelvin Zuo and Huan Zhang

24.1 Introduction

At 2:28 p.m. on May 12, 2008, a deadly earthquake that measured at 8.0-magnitude hit Wenchuan county, Sichuan province, in Western China. The earthquake and numerous aftershocks caused secondary disasters such as landslides, avalanches, debris flow, and formation of barrier lakes (Kapucu 2011; Shi et al. 2010). As one of the most damaging catastrophes in contemporary China, the earthquake resulted in 69,227 deaths, 374,643 injuries, 17,923 missing, and an estimated direct economic loss of 845.2 billion RMB (State Council of the PRC 2008b). It affected lives of more than 120 million people, left 5 million people homeless, and caused extensive damages to the economy and local critical infrastructures.[1]

[1] As a result of the earthquakes, large areas of farmland, natural forests and wildlife habitat were lost. Approximately 19.5 million cubic meters of timber were lost as a direct result of the earthquakes (Yang 2008). The direct loss was equivalent to 200 billion RMB in Sichuan, 2 billion RMB in Gansu, and 1.63 billion RMB in Shaanxi (Chen et al. 2008). The disaster area in Sichuan had an industrial base for chemical engineering, which suffered from a direct economic loss of 12 billion RMB as well as over 4,000 casualties and injuries among the industry workers (Shaanxi Provincial Development and Reform Commission 2008).

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The most severely damaged zones covered 51 townships in Sichuan, Gansu, and Shaanxi Provinces. Some counties near the epicenter, such as Beichuan and Wenchuan, were literally flattened. The affected communities were spread throughout more than 400 cities and towns, totaling 500,000 km^2 (State Council of the PRC 2008a, b). After the earthquake, it was estimated that more than 6 million houses in rural areas and 102 million square meters of apartments in urban areas required reinforcement or rebuilding (State Council of the PRC 2008b). In the meantime, critical infrastructures and public facilities, such as public transportation, power grids, telecommunications, and water supply systems, were also in need of recovery.

Such deadly losses were the result of both the natural disasters and the long-existing vulnerability in the earthquake stricken communities. The region was relatively underdeveloped and remote, and the previous developmental models were unsustainable due to the pollution caused by unregulated industrial factories. All these factors directly increased vulnerabilities of the region in terms of its low preparedness and high environmental risks.

After the earthquake, the Chinese government issued a series of policies aimed at re-building and re-developing the earthquake stricken areas. Post-disaster reconstruction was concluded in less than 3 years, producing positive economic and social outcomes (Dunford and Li 2011; The United Nations Office for Disaster Risk Reduction (UNISDR) 2010). According to the State Council (2012), a total of 1.7 trillion RMB was invested to achieve six major goals of reconstruction: housing for every family, job stability for at least one family member, basic welfare, economic, infrastructure, and ecological improvements in the affected areas. How did the Chinese government achieve these ambitious goals in such a short period of time after a highly destructive natural disaster? In this chapter, we attempt to answer this question by analyzing reconstruction and developmental policies and strategies, and studying the implementation of reconstruction efforts in the case of Shuimo town.

The chapter starts with an introduction of the pre-disaster conditions of the region. We contend that poverty and imprudent developmental models directly resulted in vulnerabilities to natural disasters in the region. In Sect. 2, we examine the major post-earthquake developmental strategies adopted by the Chinese government. We maintain that both the counterpart assistance program and the emphasis of sustainable development result in positive outcomes of the reconstruction. In Sect. 3, we use the post-disaster development of Shuimo town as a case study to illustrate how these two strategies were utilized to shape a sustainable development model in Shuimo. In the last section, we provide concluding remarks, critics, and recommendations.

24.2 Underdevelopment and Vulnerabilities to Disasters

Previous literature of emergency management pointed out that the impact of a disaster results from not only the magnitude of the natural hazard event, but also the vulnerability of the disaster hit area (see Dunford and Li 2011, p. 999; Strömberg

2007; Wisner et al. 2004). Indeed, underdevelopment and imprudent developmental models had caused high levels of vulnerability in the stricken region prior to the earthquake (see Chap. 2 in this volume).

24.2.1 Underdevelopment of the Region

Beginning in 1978, Deng Xiaoping initiated the "open-up reform" by introducing market economy to the country. The East coast region of China has enjoyed special economic development policies and experienced rapid economic development. However, the West region[2], which the Wenchuan earthquake heavily impacted, has remained relatively poor, undeveloped, and stayed as a piece of "forgotten land." In most regions, agriculture has been the largest sector of the local economy. For example, in some counties in Sichuan Province, the percentage of agriculture related labor exceeded 73 % of the total labor force (Sichuan Provincial Bureau of Statistics 2006). As of 2008, the West region occupied 56.8 % of the total land area of China, but its GDP only accounted for 14.3 %, with its per capita GDP approximately equivalent to only 40 % of that in the East (Jin 2008). It is estimated that West China fell behind the economic development of the East Coast by at least 20 years. In 2008, the annual per capita net income of rural residents in Sichuan was only $ 593, and the annual per capita disposable income of the urbanites was $ 1,819 (ChinaView 2008; Xinhua English News 2006). The GDP per capita of Sichuan, Shaanxi, and Gansu ranked 24th, 18th, and 29th, respectively, out of China's 31 provinces and municipalities (China National Bureau of Statistics 2011).

Underdevelopment in this region directly contributed to the vulnerability of communities to natural disasters. The remote mountain areas lacked basic transportation infrastructures to connect to adjacent regions. Numerous residential houses and school buildings failed to sufficiently adopt safety protocols and standards. The whole region did not prepare enough emergency supplies such as tents, medicine, first aid items, and did not have clear contingency plans for potential disruptions to essential utilities such as electricity, water, and telecommunication systems.

24.2.2 Unsustainable Developmental Models

While experiencing rapid economic development throughout the past three decades, China's East coastal region also witnessed heavy pollution and increased labor costs (Zhang 2009).[3]As a result of these negative consequences, many high-energy-

[2] According to the definition of the Chinese government, West China covers six provinces: Gansu, Guizhou, Qinghai, Shaanxi, Sichuan, and Yunnan; one municipality: Chongqing; and six autonomous regions: Ningxia, Tibet, Guangxi, Inner Mongolia and Xinjiang; parts of Hunan and Hubei provinces. The earthquake stricken area all belonged to West China.

[3] For instance, Guangdong province reported 5,490 cases of occupational diseases from 1989 to 2004, including 2,418 cases of lung disease caused by air pollution. The cost of lung diseases caused by dust air was up to 200 million RMB (Xian Zhang et al. 2009).

consuming and high-polluting enterprises were relocated from the East coastal region to the relatively underdeveloped West region (Zhang et al. 2009). For example, in 2008, Guangdong province in the Eastern coastal region, encouraged hundreds of high-energy-consuming and high-polluting enterprises to relocate out of Guangdong (Zhang et al. 2009).

Since the West had only experienced a relatively short period of development, local governments have not fully realized the importance of a sustainable development model.[4] In China, an important criterion for local officials' career advancement is the performance of local economic development. Such a criterion was largely based on the number of projects and enterprises established and the growth rate of local GDP figures (Landry 2008). Therefore, even though some of the developmental projects were visionless and imprudent, many local governments still competed to attract more investment, build more factories, and construct more buildings (Landry 2008; Yin 2001). When the East was eager to relocate their high-energy-consuming and high-polluting enterprises out of their own region, the West was more than happy to host them.

Due to such imprudent developmental models, the economy in the West was not only underdeveloped, but also poorly structured. Heavy industry, especially high-energy-consuming and high-polluting enterprises, dominated the economy in many regions. For example, the iron and steel industry in Sichuan was ranked second among all provinces in China (China Guide 2012; China Perspective 2011). In 2009, Shaanxi ranked third in China for its production of coal, natural gas and crude oil (China Perspective 2012b). In Gansu, most of the province's economy was based on mining and mineral extraction (China Perspective 2012a). One *Industrial Demonstration Zone* in Aba Prefecture (where the earthquake heavily impacted) in Sichuan had 63 high-energy-consuming and high-polluting enterprises, all of which discharged wastewater and emissions to the environment.

When the earthquake hit the region, the highly concentrated polluting industry caused more damage to the environment. For instance, pipelines in a number of chemical plants broke during the earthquake releasing poisonous gases like liquid chlorine and ammonia (Jin 2008). In addition, high-energy-consuming and high-polluting enterprises in this region released wastewater, emissions and other pollutant and made the ecological system extremely fragile (He and Jiang 2008; Liu 2008; Liu 2003).

[4] It was not until 2000 when the State Council led by then Premier Zhu Rongji decided to develop the economy in the West in order to catch up with the East coast. The State Council established a leadership group in charge of the "Western Development Campaign" Which was written in law in 2004. Before 2008, several significant projects were completed to help develop the education, transportation and energy industries in the West. For example, in 2005, the Chinese government exempted the tuition and fees for students in their 9-year compulsory education. In 2006, a railway from Qinghai to Tibet was built.

24.3 Post-Wenchuan Reconstruction and Development Policies and Strategies

Even though post-Wenchuan reconstruction was full of challenges, it was completed within 3 years and generated positive social and economic outcomes in many regions. Using post-disaster reconstruction as an opportunity, many towns and cities set their development on a much more sustainable path. Our analysis of why this could happen in China in such a short period of time led us to two important factors—the counterpart assistance program and the emphasis of sustainable development models.

Shortly after the earthquake, the Chinese central government collected suggestions from experts in various fields and drafted guidelines for the reconstruction.[5] These guidelines were finished and posted on all major medium outlets (i.e., major TV stations, web sites, etc.) on August 12, 2008. After receiving public suggestions and comments, the State Council publicized the final version of the guidelines, the *Post-Wenchuan Earthquake Recovery and Reconstruction Master Plan* (referred to as the *Master Plan* aforementioned) on September 19, 2008. This *Master Plan* served as an ultimate blueprint for all stakeholders involved in the reconstruction process. It included general principles and instructions on rebuilding infrastructure, residential houses, historical sites, public service facilities, industries, and spiritual homes; as well as policies in relating to ecological and environmental protection and disaster mitigation.

This *Master Plan* clearly stated the timeline and goals of the reconstruction, which included six major goals to be achieved within 3 years. The six major goals are: (1) rebuilding a house or apartment for every family; (2) ensuring the job stability for at least one member of each family, with annual disposable personal income exceeding the pre-disaster level; (3) providing basic social welfare for disaster survivors, i.e., 9-year free public education, public health and basic medical care, social welfare and other basic public services; (4) restoring and upgrading public facilities and infrastructures; (5) further developing the economy of earthquake stricken area; (6) improving the ecological environment with enhancements in ecology, environment, disaster mitigation and preparedness capacities (State Council of the PRC 2008b; Zuo 2010). Two characteristics of the *Master Plan* stood out in facilitating the development of the disaster hit region, the counterpart assistance program and the emphasis of sustainable development.

[5] China has a top-down unitary government system; therefore, the Chinese central government has the ultimate power of directing sub-national governments. Since the earthquake impacted multiple provinces and the reconstruction required participation by stakeholders from governments at different levels, it naturally became the central government's call to make the reconstruction guidelines.

24.3.1 The Counterpart-Assistance Program

Counterpart assistance is a resource allocation mechanism that promotes fast development in one area or one policy domain by devoting resources from other areas or policy domains. It existed in China before the Wenchuan Earthquake and had been used in three manners: assisting the development of border areas and minority areas, supporting key infrastructure projects (such as the Three Gorges Dam), and supporting disaster response and reconstruction (Wang and Dong 2010).

The use of the counterpart assistance program in disaster reconstruction started in the 1950s and became salient in responding to the 1978 drought disaster in Hubei Province (Zhong 2011).[6] In the 1980s, central ministries and local disaster stricken areas were paired up in the counterpart assistance practice. For instance, after the 1991 Tai Lake flood, the central government instructed ministries to counterpart-assist disaster stricken areas in Anhui province. In 2007, the administrative procedure of using counterpart assistance in disasters was specified in the *Emergency Response Law*. When an area is affected by an emergent incident and support in rehabilitation and reconstruction from the higher level is needed, the local government can submit a request to the government at the next higher level for support. According to the losses suffered by the affected area and its actual condition, the governing authority at the next higher level shall provide financial and material support, technical guidance, and mobilize other regions to provide support in terms of external funding, materials, and human resource (Emergency Response Law of the People's Republic of China 2007).

After the 2008 Wenchuan Earthquake, the central government decided to mobilize the counterpart assistance program (2006). The details of the practice were explained in the *Master Plan* and *Post-Wenchuan Earthquake Recovery and Reconstruction Counterpart Assistance Program*. In this practice, 20 economically developed provinces, unaffected by the earthquake, were assigned to assist 18 counties and severely afflicted areas in Gansu and Shaanxi Provinces. Table 24.1 shows the list of donor counterpart provinces and their paired-up disaster hit counties. For example, Shandong province was paired up with Beichuan County, and Guangdong province was paired up with Wenchuan County.

In the counterpart assistance practice, the donor provinces were required to spend at least 1% of the governmental revenue from the previous year to assist their paired-up disaster-hit areas for three consecutive years. The donor provinces should provide assistance in a full range of services, which include: (1) planning and designing, construction, expert consulting, project construction, inspection, (2) renovation of residential communities, (3) restoring and upgrading public facilities and infrastructures, such as schools, hospitals, roads, water, gas, disposal and

[6] In 1950s, counterpart assistance in disaster reconstruction was on a small scale (scattered mutual assistance occurred between military and communities, and between different areas). In the 1978 drought disaster in Hubei Province, counterpart assistance was applied on a much larger scale (major state-owned enterprises and non-disasters stricken areas provided counterpart assistance to disaster stricken areas).

Table 24.1 The counterpart assistance programs. (Source: State Council 2008a)

Disaster Hit counties	Counterpart provinces	Disaster Hit counties	Counterpart provinces
Beichuan county	Shandong	Maoxian county	Shanxi
Wenchuan county	Guangdong	Lixian county	Hunan
Qingchuan	Zhejiang	Heishui county	Jilin
Mianzhu city	Jiangsu	Songpan county	Anhui
Shifang city	Beijing	Xiaojin county	Jiangxi
Dujiangyan city	Shanghai	Hanyuan county	Hubei
Pingwu county	Hebei	Chongzhou city	Chongqing
Anxian county	Liaoning	Jiange county	Heilongjiang
Jiangyou city	Henan	Severely afflicted area in Gansu province	Guangdong (mainly Shenzhen)
Pengzhou city	Fujian	Severely afflicted area in Shaanxi province	Tianjin

sewage, social welfare, and other public services, (4) selecting and sending doctors and teachers to assist hospitals and schools in the disaster hit areas, and providing equipment, tools and facilities, construction materials to help the reconstruction, (5) providing training services, education and schooling to students who cannot go back to school at home, and (6) restoring basic infrastructure for trading and operational centers (State Council of the PRC 2008a).

Counterpart assistance served as one of the key financial sources for post catastrophe reconstruction and recovery in China.[7] During the reconstruction after the Wenchuan Earthquake, donor provinces provided over 80 billion RMB via counterpart assistance service by the end of September in 2011. Funds from assisting counterparts were used in 3,668 reconstruction projects, 3,662 of which were completed by 2011 (Sichuan Provincial Government 2011). After the Wenchuan Earthquake, the counterpart assistance in catastrophe reconstruction has been institutionalized as a reconstruction assistance model and was written in the revision of the *Law of the People's Republic of China on Protecting against and Mitigating Earthquake Disasters* in 2008. After 2008, counterpart assistance in disasters was used in other major catastrophe reconstruction in China.[8]

The benefits of a counterpart assistance program lie in the following aspects. First of all, counterpart assistance could mobilize resources quickly, and expedites the process of recovery and reconstructions in targeted disaster-impacted areas. Secondly, the command and coordination from the higher level (i.e., the central government in the Wenchuan case) under the counterpart assistance mechanism could balance available resources out evenly to the disaster region, and therefore reduce the resource convergence in some disaster-impacted areas with more public

[7] The other channels of funding for recovery and reconstruction included budget allocation of local government, social donations, domestic bank loans, capital market financing, foreign emergency loans, urban and rural self-possessed and self-collected funds, self-possessed and self-collected funds of enterprises, and innovation financing.

[8] Counterpart assistance in disasters was soon applied in the reconstruction of Yushu Earthquake in Qinghai Province in 2010.

attention. Thirdly, counterpart assistance can potentially help bring in advanced technology and quality services from the economically developed provinces to the affected areas. For instance, in the counterpart assistance between Beijing and Shifang, education institutions in Beijing signed an agreement with 35 schools in Shifang to help improve teaching and research quality (Sichuan Government Website 2009). Fourthly, in order to sustain local development after the 3-year counterpart assistance, some donor provinces created job opportunities for disaster survivors in the disaster-affected areas. For instance, Shanxi Province provided 4,000 jobs for Maoxian County and helped 482 local residents to work in other parts of the country through the counterpart assistance program in the first year after the earthquake (Zhang 2009). Last but not the least, in practice, the counterpart assistance program extended beyond the disaster recovery time period. Some donor provinces even built up long-term cooperation relationships with the recipient local governments regarding future local development. For instance, Guangdong province signed a long-term agreement with Wenchuan county, named "*Guangdong Wenchuan Long Term Cooperation Framework Agreement,*" to assist Wenchuan's long-term development after the recovery and reconstruction time period. Under the framework, Guangdong will continue to assist Wenchuan county in areas such as labor migration and tourism development (Li 2010).

Nonetheless, the counterpart assistance program has some flaws in its design and could be problematic during its implementation. First of all, the central government's regulation that donor provinces must allocate 1 % of last year's revenue to disaster-hit areas was at odds with the *Budget Law*. Article 13 of the *Budget Law* specifies that the budget can only be approved by People's Congress at the corresponding level, yet there was no specification in the budget law to allocate funding for disaster assistance in other areas (Wang and Dong 2010).[9] In its implementation, the absolute allocation of 1 % revenue exerted financial burdens to some relatively underdeveloped donor provinces. Moreover, the political mobilization in counterpart assistance programs could easily trigger competition between donor provinces/cities, sometimes causing unnecessary wasteful investment. Thirdly, the donor counterparts could sometimes dominate the reconstruction process because they have more financial and human resources, as well as expertise. The disaster-hit regions, however, often times lose most of its capacities during the earthquake. Therefore, it could be a common phenomenon that reconstruction designs lack considerations of local conditions.

[9] Article 32 of the *Budget Law* specifies: "Reserve funds in government budgets at various levels shall be established at a ratio of 1–3 % of the budgetary expenditures at the corresponding level for coping with the relief for natural calamities and other unexpected expenditures in the implementation of the current year's budgets." This budget for disaster relief did not mention that it could be used in other areas. Article 31 writes on funds for assisting other areas: "Necessary funds shall be arranged in the central and relevant local budgets to assist the developing areas such as areas of regional national autonomy, old revolutionary bases and outlying and poverty-stricken areas, in developing undertakings of economy and culture." However, it did not mention that these funds could be used to assist disaster reconstruction in other areas.

24.3.2 Emphasis of Sustainable Development

The other positive element of the *Master Plan* was its emphasis of sustainable development models in various phases of the reconstruction process. First and foremost, the *Master Plan* required the reconstruction teams to consider the sustainability of the industry as a top priority to town/cities reconstructions when they design reconstruction plans. As mentioned, historically, many highly energy-consuming and highly polluting enterprises were relocated to West China from East Coast area. The *Master Plan,* therefore, encouraged towns/cities under reconstruction to phase out the highly polluting and high-energy-consumption industry and to eliminate mineral mining enterprises that are not in compliance with safety requirements as well as the enterprises that contaminate drinking water sources. Considering that the slow recovery of the agricultural sector due to the destruction of large areas of farmland, the *Master Plan* required the government to rearrange and optimize the industry structure. This shifted the focus from agriculture to other industries, such as manufacturing, education, and tourism (Disaster Relief Expert Panel 2008).

Secondly, the *Master Plan* emphasized environmental protection and preservation of historical and cultural heritages. Based on the *Master Plan,* the reconstruction team was required to "respect" nature, to fully consider the environmental and resource capacity, as well as exposure to potential hazards and other risks when choosing reconstruction sites and considering their functions (i.e., population distribution, industry structure and productivity). The *Master Plan* also required stakeholders involved in the reconstruction process to protect ethnic and traditional cultures and heritages, protect valuable historical and ethnic architectures, and preserve traditional appearances of cities, towns and villages. For instance, reconstruction sites should be selected away from all natural reserves, historical and cultural sites, and water source protection sites. Stakeholders involved in reconstruction processes should be strictly required to protect farmland, forests, and be environmental friendly. Simultaneously, reconstruction units should establish environment protection facilities as soon as possible. At the same time, the *Master Plan* highly encourages enterprises to recycle and reuse various construction materials, industrial solid waste, and develop new environmental friendly wall materials. It also called for everyone to save resources and avoid extravagant and wasteful development.

Thirdly, the disaster stricken areas were encouraged to lead their own development, instead of relying on external assistance in the long run. The *Master Plan* prioritized the restoration of capabilities of local government agencies so that they could actively participate in the reconstruction process. It also encouraged the local governments and residents to take an active role in the decision-making process, to determine the distribution of resources, as well as to suggest solutions to problems encountered in the process. Local governments and residents were also encouraged to be self-reliant. In contrast, over reliance on superior government agencies or external help was highly discouraged.

Last but not the least, in order to build up a more resilient system, local governments were required to develop their capacities in identifying and coping with

future potential hazards. Natural hazard observing centers, disaster prediction and information centers, disaster reduction and mitigation centers, shelters and disaster education centers were required to be set up in the disaster areas.

Even though sustainable development models were emphasized throughout the *Master Plan*, they were not always taken into consideration in the reconstruction process due to the time constraints. The government set 3 years as the time frame to finish the reconstruction, which evolved into a political task. All reconstruction teams were trying to rush through and meet up with the time requirement set by the *Master Plan*. As a result, the goal simply shifted to building up a new town or city that can quickly resume its own economic production. It was very typical for reconstruction teams in different areas to develop one standard model, and reconstruct different towns with different geographic features and historical backgrounds into one uniform style. The designs were often detached from the region's original cultural and social backgrounds and broke up the continuity of the regional development (Jin 2008). The counterpart assistance program some-times a counter factor of sustainable development. Since the donor counterparts were from a more developed region, they had more developmental experience and could dominate the reconstruction process. They did not always fully understand local conditions, and therefore were often reluctant to incorporate suggestions from local residents and governments.

24.4 The Post-earthquake Reconstruction of Shuimo Township: A Case Study

The reconstruction of Shuimo Town is a relatively successful post-disaster development case. The post-disaster reconstruction has transformed Shuimo into a modern artistic and sustainable town. According to a former United Nations Environment Program official, Shuimo "highlighted ecologically-friendly and low-carbon concepts," and featured "reconstruction projects that were well-integrated with people's lives" (Xinhua News 2012). In 2011, Shuimo Town received the "Best Global Implementation of Post-Disaster Reconstruction" award from the Sixth Global Forum on Human Settlements of the United Nations (Xinhua English News 2011). This section explores how the counterpart assistance program and the emphasis of sustainable development have contributed to such positive outcomes of the post-disaster reconstruction.

Before the earthquake, Shuimo Town was a mountainous small town with a population of approximately 15,000. It had the only high-energy-consumption industrial zone in the Aba Tibetan and Qiang Autonomous Prefecture, with 63 high-energy-consuming and high-polluting enterprises discharging wastewater and emissions year round. Due to the fact that the township boasted abundant hydropower resources that provided low-price electricity, numerous family-run or village-run small businesses mushroomed in service of these large enterprises, exacerbating

the pollution. Seriously polluted air and water in Shuimo not only disrupted local agricultural production, but also impacted health conditions of local residents.[10]

Shuimo was only about 10 km from the epicenter, Yingxiu Town in Wenchuan County. During the earthquake, 20% of the local residential houses collapsed and another 55% were severely damaged. Most local public service facilities and infrastructures were wiped out (Liu 2011, p. 170). The earthquake also ruined critical transportation infrastructure -destroying the only highway and leaving the partially damaged Shuimo Bridge as the only connection to the outside world. After the earthquake, traffic jams often stretched as long as 30–40 km on the bridge (Liu 2011, p. 15).[11]

24.4.1 The Counterpart Assistance Program in Shuimo

Under the counterpart-assistance program, Guangdong province, paired up with Wenchuan County, further broke down the assistance task and paired its 13 prefecture cities up with 13 townships in Wenchuan County. In this practice, Shuimo Township was paired up with Foshan City[12]. Assistance provided by Foshan was crucial to Shuimo's successful transformation in the reconstruction process. Foshan City not only helped raising a total of 3 billion RMB for Shuimo's reconstruction, but also actively participated in the actual design and reconstruction process. The assistance team from Foshan City had a wealth of urban development experience. Its leader, Dr. Liu Hongbao, former Director and Party Secretary of the Foshan Development and Reform Bureau, holds a doctorate degree in engineering and has extensive experience in regional economic development and transition.

First and foremost, the counterpart assistance program played a crucial role in raising funds for the reconstruction of Shuimo. Initially, Foshan City itself made a preliminary pledge to commit RMB 640 million to the reconstruction of Shuimo Town, a figure exceeding Shuimo's 60 years'annual revenue before the year 2008 (Liu 2011, p. 33). During the process of reconstruction, the reconstruction team realized that 640 million was far from enough so that they decided to raise funds from other sources. They soon found out that their home province, Guangdong Province, had set up a separate provincial assistance fund to support the reconstruction of key townships. By presenting their well-designed reconstruction plan to Guangdong province, Foshan reconstruction team successfully made Shuimo a third key

[10] According to relevant surveys conducted by the Foshan medical assistance team, more than 300 children of the small township with a population of less than 20,000 suffer from congenital heart diseases (Liu 2011, p. 18).

[11] Shuimo town was connected to the outside world only through a secluded mountainous road and a 5-meter-wide bridge called "Shuimo Bridge."

[12] Foshan City, located in central Guangdong, was the third largest industrial and manufacturing base in the Pearl River Delta. It benefited tremendously from the open-up policy and enjoyed a per capital GDP of 80,579 RMB (equivalent of about $ 13.000) in 2009.

township and was awarded around 200 million RMB provincial assistance.[13] In addition, Foshan City also raised nearly 200 million RMB of public donations from various sources in Foshan. The overall assistance funding contributed by Foshan towards Shuimo's reconstruction reached 1.07 billion RMB.

Secondly, Foshan assistance team helped bring resources and ideas to create a reconstruction plan. The goal of the reconstruction was to shift Shuimo from a high-energy-consuming and polluting industrial little town to an ecological town with a cultural identity. The Foshan assistance team attached great importance to a suitable reconstruction plan and design. However, when they first arrived at Shuimo, they found that many of the local residents and cadres still lived in tents or temporary housing, and local students yearned to get back to school as soon as possible. Therefore, local people were eager to kick off the reconstruction process. The Foshan assistance team had contradictory opinions with local cadres on another matter. While the local cadres believed that Shuimo should orient its development toward the center of the Wenchuan County, and therefore adopt a strategy "to grow northward," Foshan assistance team suggested a different developmental strategy to "grow southward." Their argument was that among all townships in Wenchuan, Shuimo is the furthest from the center of Wenchuan County, but the closest to the provincial capital Chengdu and a UNESCO World Heritage Site Dujiangyan. By growing southward, Shuimo could be easily integrated into the Chengdu Economic Circle. The Foshan assistance team made great efforts to persuade local residents and cadres that priority should be given to a strategic reconstruction plan and also persuaded that "growing southward" could make Shuimo unique from other towns in Wenchuan (Liu 2011, p. 32).

Experts and professionals brought by the Foshan assistance team designed an initial reconstruction plan. However, they soon found that the plan lacked its own characteristics and resembled other townships' plans. Additionally, they realized that the plan was supposed to function best on relatively flat terrain, yet Shuimo Township was a mountainous town. The Foshan assistance team chose to conduct more research and eventually decided to introduce a bid for a better reconstruction plan of Shuimo. Among numerous proposals sent for the bid, the proposal led by Professor Chen Keshi, Director of Chinese Urban Design Research Center of Peking University and another prestigious urban planning expert, won out (Liu 2011, p. 37).[14] Different from the original plan, Professor Chen's plan was characterized as "One Lake, Two Shores and Four Zones", with the lake as the township center and the bridge as its framework (Liu 2011, p. 172).

This awarded bid outweighed the original plan in many ways. It not only innovatively enriched the historical and cultural nature of Shuimo, but also respected

[13] On March 17, 2009, in the "Outstanding Achievements in Planning and Design During Post-Earthquake Reconstruction in Wenchuan" contest organized by the Guangdong Province Assistance Team and Wenchuan County government, the Foshan assistance team won 6 awards including an award in "urban planning for post-earthquake reconstruction" (Liu 2011, p. 49).

[14] The team led by Prof. Chen is affiliated with Chinese Urban Design Research Center, Zhongying Urban and Architectural Design Center and China Southwest Architectural Design & Research Institute.

and improved its ecological environment. In addition, it optimized its industrial structure and created long-term employment opportunities in the tourism industry for local residents. It also combined residential settlements in the short term with the concept of sustainable development in the long run (Chen et al. 2011). The fact that the Foshan assistance team prioritized planning and spent time in selecting a most suitable plan rather than rushing through the reconstruction process provided a solid foundation for the reconstruction.

Lastly, Foshan assistance team actively participated in the actual rebuilding process. The reconstruction of Shuimo relied heavily on the strenuous and painstaking efforts of external assistance, led by the Foshan assistance team. For instance, even though local residents were encouraged to participate in renovating their own residential houses, Foshan assistance team and outside workers were responsible for renovating the street-facing part within 5 m from the edge of the street.

24.4.2 Sustainability and Transforming the Development Models

The success of Shuimo's transformation was not merely due to the counterpart assistance program, but also the consistently emphasized concept of sustainable development. From the design to the actual reconstruction process, sustainability was a core concept of Shuimo's reconstruction. While designing the plan, the reconstruction team intentionally designed Shuimo into a modern ecological town with a sustainable tourism industry. The reconstruction team understood that maintaining a good environment was essential to the sustainable development of the town. Therefore, they made efforts to persuade local cadres and residents on this matter.

After the earthquake, most local high-polluting enterprises soon managed to resume their operation, which posed challenges to the goal of building a sustainable town set by the assistance team. Keeping these enterprises in the town, the reconstruction would only have restored Shuimo to be what it was before the disaster. If the reconstruction team decided to get rid of the polluting enterprises, they faced even bigger questions: how could Shuimo relocate or remove all those enterprises, and what new industries could sustain the local economy and employment? While local residents and cadres were terrified to lose all the jobs in the highly polluting industries, Foshan assistance team persuaded them that Shuimo should develop a more sustainable tourism-oriented economy and eliminate the polluting enterprises. They organized local residents and cadres to tour two successful tourism towns, Lijiang in Yunnan and Luodai in Sichuan. Lijiang was successfully reconstructed into a tourist destination after a 7.0-magnitude earthquake in 1996. These trips deeply impressed representatives of local residents and officials, who could visualize a similar future for Shuimo. Through continuous efforts, the reconstruction team obtained consent of every household in the town (Liu 2011, pp. 60–64). All stakeholders in Shuimo's reconstruction finally agreed that the priority should be given to optimizeing the local industrial structure and transforming the local economic model from a combination of high-energy-consuming industry and family-based agriculture to a modern service-based industry and urban ecological agriculture (Liu 2011, p. 172).

The leader of the reconstruction team, Dr. Liu, paid a visit to the party secretary of the Aba Prefecture in October 2008 and convinced him of a more sustainable development plan for Shuimo. The party secretary was impressed with the plan and eventually decided to officially fund the relocation of the polluting enterprises (Liu 2011, pp. 29–30).

After the removal of the high polluting enterprises, the reconstruction team discovered that the township enjoyed an advantageous geographical location. To its east lies Dujiangyan, a UNESCO World Heritage Site; to its southeast is the famous Qingcheng Mountain, a scenic spot of historic and cultural significance; to its west and north lies respectively the Wolong National Nature Reserve well known for its pandas, and Yingxiu Township, the epicenter of the Wenchuan earthquake, which attracted global attention after the earthquake. Therefore, they believed that Shuimo Township is well positioned to link all those neighboring scenic attractions and form a high-end tourist route. After studying the local historical records, they discovered that the township had been honored as a "longevity village" as early as the Han Dynasty and long hailed as a Shangri-Lain western Sichuan Province (Liu 2011, p. 21).

The reconstruction team also decided that Shuimo would promote the Qiang minority culture instead of Tibetan culture. Even though Tibetans were the largest minority group in Shuimo and Qiang only accounted for 4.19% of the local population, the reconstruction team found that numerous other townships in Wenchuan chose to promote Tibetan culture in the reconstruction plan. The reconstruction team realized that the value of Shuimo lay only in embracing a different culture, and that the Qiang culture should be celebrated as the soul of the township. Besides, the local existence of Qiang ethnic minority can be traced back a few thousand years. In drawing on its rich Qiang history and culture, Shuimo Township would emerge as a unique tourist destination lying in close proximity to Chengdu, the regional metropolis (Liu 2011, p. 30).

Based on numerous surveys and constant reflections on natural, geographic, historic and traditional features of Shuimo, the reconstruction team decided to transform Shuimo into "an ecological town featuring a famous Qiang culture in West China" (Liu 2011, pp. 29–30). The designing proposal that was finally adopted successfully integrated developing tourism as a more sustainable sector, creating employment opportunities, and improving residential settlements all together. For instance, in designing housing projects, this plan used the model of "store front and residence in the back" or "residence upstairs with store downstairs", integrating residential settlement, livelihood, and family business for the tourism together.

Drawing upon lessons learned from the Dujiangyan City, the design also utilized natural watercourses and created a lake called "Shouxi Lake."[15] Strategically, Shuimo would be made a lake-centered mountainous tourist township in Wenchuan County. The design featured local architecture with an extensive use of sloped roofs and traditional Tibetan and Qiang hues using cement, straw and iron circles.

[15] Dujiangyan City in Sichuan province used a similar strategy to dredge the sand deeper and build the dam lower, so that the lake could create a tourism site.

These designs not only promoted the Qiang and Tibetan cultures, but also created a sun-proof, water-resistant and durable mud-like effect on the façades of buildings. Qiang artists were also invited to make collages of all kinds of Qiang ethnical patterns to decorate the buildings, with the Qiang tradition and regional culture fully exploited and the traditional Qiang art brilliantly expressed in a modern way (Chen et al. 2011).

The reconstruction team also endeavored to introduce the educational industry to Shuimo. Initially, the Foshan assistance team had difficulties finding schools willing to relocate to Shuimo because of its remote location and heavy pollution. The Foshan assistance team decided to lobby Aba Normal College first, because its ethnic dancing programs, especially their Qiang dancing program, would be a good fit to Shuimo's Qiang cultural identity. The university administration was convinced by Shuimo's visionary development plan. Ma Hongjiang, President of Aba Normal College, remarked that, "Shuimo Town is located in close proximity to Chengdu, and lies in the key area wedged between two UNESCO World Heritage Sites. Besides, the new town has a strong Qiang cultural atmosphere and is therefore ideal for our school to grow" (Liu 2011, p. 53). After Aba Normal College decided to relocate to Shuimo, Sichuan Conservatory of Music soon followed, moving its Research Institute of Tibetan and Qiang Culture to Wenchuan and its School of Tibetan and Qiang Art to Shuimo. The two colleges were almost the only two high education institutions researching Qiang culture. Hosting them made Shuimo well positioned to become a "stronghold of Qiang culture" in West China.

The design of Shuimo's reconstruction plan took 7 months, during which reconstruction operations in other townships had already achieved significant progress.[16] In March 2009, after 7 months in design, the physical aspect of Shuimo's reconstruction finally kicked off and was completed in less than 2 years. Shuimo's reconstruction turned out to be a successful case. The reconstruction of Shuimo Town involved demolition and relocation of 722 households, with 2,520 people affected. This difficult task was nonetheless rapidly accomplished with minimal complaints. The newly built township is now the home for a few colleges and schools, namely, the Wenchuan No.2 Kindergarten, the Bayi Primary School and the Shuimo Middle School; as well as two tertiary education institutes, Aba Normal College and Sichuan Conservatory of Music. Shuimo is now recognized as an important cultural and education center in the Aba Prefecture. Its water-based scenic spots, such as the Shouxi Lake, have effectively restored the township's ecological system. The goal of Shuimo's future development is to achieve sustainable and harmonious coexistence of population, resource and the environment. The living conditions of local residents have improved as well: Shuimo has achieved a per capita annual income of $ 3,000 in 2010 and has become a wealthy township in western Sichuan. Within only 2 years, by taking advantage of external assistance, Shuimo has achieved the development level that might have previously taken 50 years.

[16] For instance, the Huizhou assistance team almost completed their reconstruction of the Sanjiang Township.

24.5 Conclusion

The success of Shuimo Town's reconstruction not only lies in the renewed small town's beautiful architecture, state-of-the-art infrastructures, and improved living conditions of local residents, but more importantly, in the sustainable development model that the town has embarked on. The two important pieces of experience that Shuimo can share with the rest of the world in post-disaster development are first of all, a good design bearing "sustainable development," and second, the counterpart assistance program that brought in a wealth of financial and human resources, as well as development expertise and experiences from developed regions.

Foshan City has contributed enormously to the reconstruction of Shuimo Township as a counterpart/donor. However, the post-disaster reconstruction of Shuimo would not be successful unless local residents, officials, and external aids also participated in the process. Foshan and the Guandong Province alone devoted 1.07 billion RMB to the reconstruction of Shuimo, and assisted a total of 78 projects. Instead of allocating billions of dollars directly to Shuimo, the Foshan assistance team integrated their own development experience with Shuimo's local culture and situations. They made sure that local residents and officials agreed upon the reconstruction plan and participated in the planning and reconstruction process. Local residents did not easily accept the new development ideas at first, because it changed their familiar ways of living. The Foshan assistance team's efforts to incorporate local residents in the process, i.e., organizing tours to the benchmark towns and encouraging residents to build up parts of their houses, turned out to be effective. The success of the reconstruction program also lies in recognizing limitations of the official assistance, using the assistance as a leverage to mobilize all possible resources, and involving different stakeholders into the reconstruction.

Many lessons could be drawn from the Shuimo case. First of all, development models pursuing economic growth at the expense of environment and health damages are not sustainable, and therefore should not be encouraged. Sustainability should be a crucial factor in future development. Secondly, a forward-looking, strategic plan that fits the region's cultural identity is important, and it should be agreed upon before any reconstruction starts. Even though post-disaster reconstruction is often under time pressure, the practice of simply copying other cities' planning without understanding one's own historical and cultural heritage should be avoided. Thirdly, the disaster-hit region should take advantage of global attention following major disasters to consolidate all possible external resources and facilitate an open and multi-players involved reconstruction campaign. Efforts should be made to establish governmental collaboration and seek help from more developed areas to the disaster zone (Kapucu 2011).

One should also bear in mind that the Shuimo reconstruction case is unique and not replicable in many ways. For instance, the amount of the planned assistance fund that had been injected into the Shuimo reconstruction was over 3 billion RMB, which is unprecedented and rare among all the 700 affected townships that received counterpart assistance during the post-Wenchuan reconstruction. In addition, Shuimo's reconstruction process also benefited from ambitious, responsible,

and competent assistance team leaders and an experienced and talented chief urban designer. Lastly, the counterpart assistance program was a unique Chinese disaster relief strategy, not necessarily universally replicable. In addition, the fact that the Chinese central government could potentially pair provincial governments with disaster-affected counties directly on such a large scale is not applicable to all regimes either.

Of course, the post-Wenchuan reconstruction is a large-scale and highly complex project. Shuimo was only one tip of the iceberg. Many cities and towns experienced dramatically different reconstruction experiences from that of Shuimo. Even though Shuimo's reconstruction has lent us successful post-disaster experience, lessons can also be drawn from other regions. For instance, since the *Master Plan* did not clearly specify the exact responsibilities of various stakeholders who had different interests and agendas to follow, a main dilemma was prioritizing interests and coordinating between different players. Lacking timely and accurate communications between different players became a common problem. Since the *Master Plan* did not stress the equity issue, inter-regional in equality turned out to be another problem when counties and towns tried to compare the allocated resources among themselves. Lastly and most importantly, as we mentioned, due to the time constraints set by the *Master Plan,* the post-Wenchuan reconstruction evolved into a political task. Reconstruction in many cities/towns was simply rushed through without enough deliberation on the designing plan. Many projects used one standard model to mold areas with different geographic and historical features into a uniform style.

We hope the post-Wenchuan reconstruction model in China could lend experience to post-disaster development in other regions of the world. At the same time, we hope that the lessons drawn from the Chinese experience could help prevent post-disaster recovery and development in other countries from falling into similar straps.

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