Meeting the Sphere Standards: an analysis of earthquake response in China

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ABSTRACT

As a country which frequently suffers from natural disasters, especially earthquakes, China has implemented its own disaster management system to respond to them. The Chinese government gained practical experiences on how to respond to severe earthquakes after the 2008 Wenchuan Earthquake and 2010 Yushu Earthquake. Although China has done a lot to improve its response operations, challenges remain. This paper analyses what these challenges are by using the Sphere Standard as a benchmark to measure the Chinese response operations. The Sphere project was launched in 1997 by Non-Government Organizations (NGOs), the International Federation of Red Cross and Red Crescent Societies. It framed a Humanitarian Charter and established the Minimum Standards for response which emphasize meeting the urgent survival needs of people in the affected regions, while asserting their basic human right to a life with dignity. Based on this analysis, suggestions are provided to improve China's earthquake response operations.

Keywords

Earthquake response, Sphere Standards, China.

INTRODUCTION

In the past decade, humanity has suffered from a number of exceptionally devastating earthquakes: the Indian Ocean tsunami on December 26th 2004, the Wenchuan Earthquake on May 12th 2008, the Haiti Earthquake on January 13th 2010, the Yushu Earthquake on April 4th 2010, and the Japan Earthquake on March 11th 2011. According to the International Disaster Database provided by the Center for Research on the Epidemiology of Disaster (CRED), there is an increasing trend of natural disasters. While the cause for the increase is not clear, the need for more effective and efficient disaster relief operations is beyond reasonable doubt.

Chinese Vice Premier Hui Liangyu stressed during a meeting on earthquake safety and disaster mitigation held on Jan 4th 2011 in Beijing that China must apply more effort to improve its earthquake response system. He pointed out that the work of disaster mitigation was important for the safety of people's lives and property, as well as the country's economic development and social stability.

The International Federation of Red Cross and Red Crescent Societies (IFRC) define the disaster response phase as the first phase after a disaster. During this phase, basic and emergency relief needs such as food, shelters and some medical services have to be provided (Thomas & Kopczak, 2005). It is crucial for relief operations to be effective because this can save lives, especially within the first 72 hours, the so-called "golden hours" after the disaster.

The Sphere Standard introduces considerations of quality and accountability to humanitarian response (Sphere, 2011). It can be useful in guiding response operations for participants in disaster relief. The Chinese government has the goal to save lives, which in line with the Sphere Standard requires the relief program to prioritize life-saving actions (Sphere, 2011). The Sphere Standard is endorsed by humanitarian organizations from all over the world, and can therefore serve as a benchmark for Chinese response systems and operations.

Our research analyses the current Chinese response system in the recent cases of the Wenchuan Earthquake response and the Yushu Earthquake response, and provides suggestions for future improvement after comparing with the Sphere Standard, especially Core standard 4, which is related to the response procedure mostly.

CHINA'S EARTHQUAKE EMERGENCY SYSTEM

China is located in two of the world's most active seismic areas: the circum-Pacific seismic belt and the Eurasian seismic zone. As a large country suffering a lot from earthquakes, China has put its considerable experience during the past 50 years to use in developing a comprehensive earthquake emergency system. At present, the China earthquake emergency system contains five key factors: the law, the preplan, the emergency command institutions, the technical support platform and the rescue team.

1.The law

In China, the law related to Earthquake emergency is called "The Law of the People's Republic of China on Protecting Against and Mitigating Earthquake Disasters" (2008). This law includes the Blueprint for Protecting against and Mitigating Earthquake, Disasters Earthquake Monitoring and Forecasting, Protection against Earthquake Disasters, Earthquake Emergency Rescue, Post-Earthquake Transitional Resettlement, Rehabilitation and Reconstruction.

2.The preplan

The National Earthquake Emergency Preplan, which was formulated on the foundation of "The Law of the People's Republic of China on Protecting Against and Mitigating Earthquake Disasters", "The devastating earthquake emergency regulations" and" National public emergencies overall plan", is aimed to make the earthquake emergency orderly and efficient, minimize casualties, and to reduce economic loss and social influence.

According to the earthquake Preplan, the deployment of responsibilities, human resources, technology, equipment, infrastructure, supplies, relief operations, and the coordination in advance is to decided , based on the disaster type, the underlying risks, the possibilities of occurrence, and the severity of impact (Wang, 2008).

3.The emergency command institutions

In 2000, the State Council set up the earthquake disaster relief headquarter, which is a head department during an emergency. The local government will organize response and rescue team during the emergency and report to the headquarter.

4.The technical support platform

The earthquake technical support platform that consists of a video conference system, rapid assessment system, decision support system and information publish system, gives the decision-making support during the earthquake emergency.

5.The rescue team

In 2001, CHINA RESCUE, the first professional earthquake rescue team in China, was established. During the past few years it has played a very important role during earthquakes in China and abroad. It has participated in the response to the 2004 Indian Ocean Tsunami, 2005 Pakistan Earthquake, 2008 Wenchuan Earthquake, 2010 Haiti Earthquake and 2011 Japan Earthquake, involved in search and rescue, hazard assessment, information security, scientific investigation and medical care. In addition, there are also many rescue teams in local level.

Chinese earthquake response mechanism

The National Preplan put earthquake response operations into four levels: especially important, important, comparatively important, and ordinary important, labeled from Level I to IV. In the case of an earthquake, the classification will be based on three main indexes: (1) the number of people's deaths; (2) the magnitude in the populous region; (3)the economic loss. Table 1 shows the corresponding activation conditions, the relationship between each condition is "or", which means that once one factor is met the response level will be activated.

Level of Earthquake	Three Initial Conditions			
	Death number S	Magnitude M	Economic loss	
Especially important earthquake	S>300	M>7.0 (populous region)	Direct economic seismic loss larger than 1% of the GDP in the earthquake province (or county, district.)	Level I
Important earthquake	50≦S＜300	6.5≦M＜7.0 (populous region)	Certain economic loss	Level II
Comparatively important earthquake	20≦S＜50	6.0≦M＜6.5 (populous region)	Certain economic loss	Level III
Ordinary important earthquake	S＜20	5.0≦M＜6.0 (populous region)	Certain economic loss	Level IV

Table 1. Earthquake response levels and activation conditions

According to the National Earthquake Emergency Preplan, the State Council is the top administrative organization led by the Prime Minister, who assigns specific working groups to directly control the emergency response operations. The Executive Meeting of the State Council and Office of Emergency Response are in charge of the emergency response operations. The General Office of State Council establishes the Office of Emergency Management, which is responsible for gathering information and coordinating the resource allocation, and performs as a coordination center among all relevant departments. The local governments are the administrative organizations controlling the emergency response, and are in charge of the response operations towards emergency events occurring in their administrative regions.

After the occurrence of an earthquake, the earthquake administration of the affected region has to report to the government at and/or above county-level, and also report to China Earthquake Administration (CEA). At the same time, the China Earthquake Network Center (CENC) has to report the three elements (origin time of earthquake, epicenter and magnitude) to CEA. Based upon these data and the rapid assessment result, the CEA makes suggestions for decisions of the response level at the national level and at province or county level. The actual decision of the adequate response level will be made by the State Council Earthquake Disaster Relief Headquarter. The State Council Earthquake Disaster Relief Headquarter should consider the three initial conditions (mentioned in Table 1) and upgrade the level if necessary. The data of number of deaths or economic losses will change as time goes on, and the assessment of the earthquake impact has to be adjusted according to the building quality, the geographical situations and the population in the affected region if it is located at the border of the country or if it is a minority autonomous region. The response level will then be activated according to the regional and national Preplans for earthquakes. Figure 1 illustrates the earthquake response mechanism.

THE SPHERE PROJECT AND THE CORE STANDARDS

The Sphere project was launched in 1997 by NGOs, the International Federation of Red Cross and Red Crescent Societies (IFRC), it framed a Humanitarian Charter and established the Minimum Standards, which aims to improve the quality of aid provided to people in affected regions and to enhance the accountability of the humanitarian relief system in disaster response (Sphere, 1997). The emphasis throughout is on meeting the urgent survival needs of people in the affected regions, while asserting their basic human right to a life with dignity.

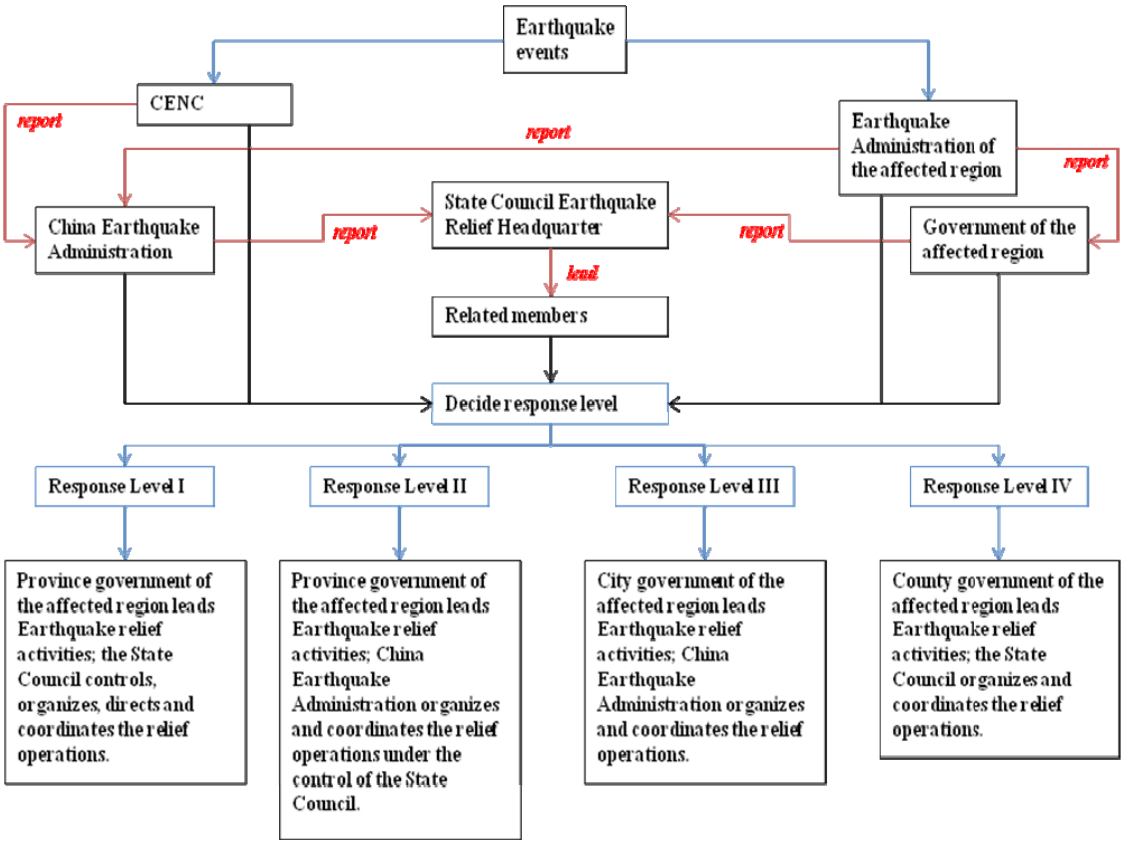

Figure 1. Earthquake response mechanism

In order to achieve this goal, the Sphere Handbook was published, in which minimum standards and indicators for disaster response were established, introducing considerations of quality and accountability to humanitarian response (Sphere, 2011). The Sphere Handbook is designed for use in disaster response and is applicable in a range of situations where relief is required, including natural disasters as well as man-made disasters. In 2006, the Sphere Handbook was introduced to the Chinese government and NGOs in China. From their origin in 1997, the Sphere Standards are now applied as the de facto standards in humanitarian response. The Sphere Handbook's primary users are individuals and groups who participate in planning, managing or implementing a humanitarian response. Furthermore, the government and local authorities or the military are encouraged to use the Sphere Handbook, which could be useful in guiding their own actions. The structure of the 2011 version of the Sphere Handbook is shown in Figure 2.

The Core Standards

The Core Standards describe how the processes and approaches taken during a humanitarian response would contribute to an effective response. It provides a single reference point for approaches that support all the standards in the Handbook.

The Handbook defines the following six Core Standards: (1) People-centered humanitarian response; (2) Coordination and collaboration; (3) Assessment; (4) Design and response; (5) Performance, transparency and learning; (6) Aid worker performance.

The Core Standards are qualitative in nature and specify the minimum levels to be attained in humanitarian response. Moreover, practical key actions and input are suggested, which can help to meet the standards. Then, a set of key indicators is established as "signals" that show whether a standard has been attained, which provides a way of measuring and communicating the processes and results of key actions (Sphere, 2011). Finally, guidance notes are given including specific points to consider when applying the Core Standards, key actions and key indicators under different conditions.

In this paper, we focus on Core Standard 4: Design and response, which presents standards towards a well designed response system. The Handbook presents 12 key actions and four key indicators for this standard.

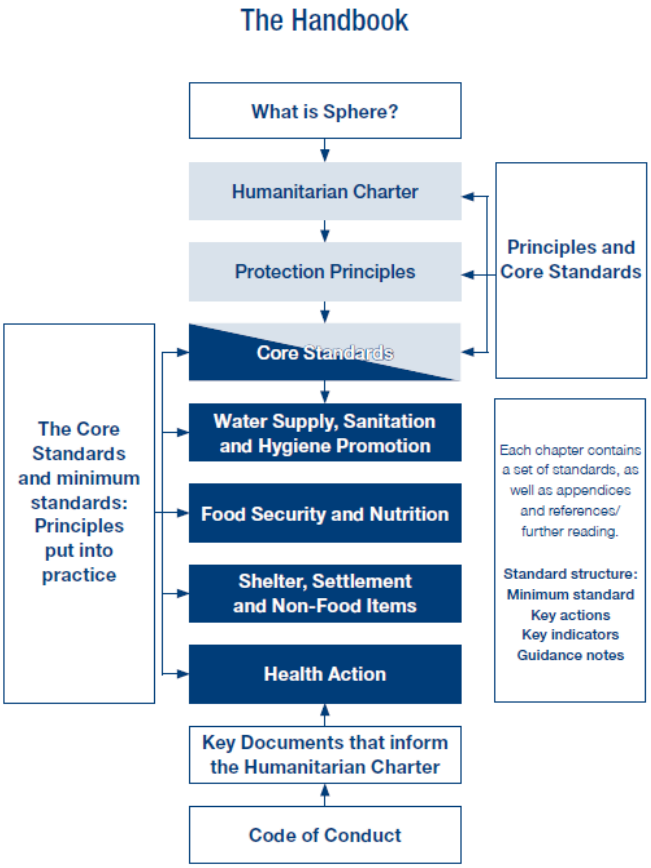

Figure 2. Structure of the Sphere Handbook 3rd edition (Sphere, 2011)

CASE STUDY

Case of Wenchuan earthquake

The Wenchuan Earthquake was a magnitude 8.0 earthquake that occurred at 14:28:01 China Standard Time (CST) on Monday, May 12th 2008 in the Sichuan province of China. Official figures from the Ministry of Civil Affairs (as of July 5th, 2008 12:00 CST) state that 69,196 people were confirmed dead, 18,381 listed missing, and 374,176 people injured. The earthquake left about 4.8 million people homeless. It was the deadliest earthquake to hit China since the 1976 Tangshan earthquake, which killed at least 240,000 people. The government stated that the direct economic loss reached 845.14 billion Yuan (Wang, 2008). Strong aftershocks, some exceeding magnitude 6, continued to hit the area even months after the main quake, causing new casualties and damage. The transport and communication network was totally destroyed, which made the communication with Chengdu, the capital city of Sichuan province, unavailable for a few hours.

According to China Earthquake Network Center (CENC), at 14:38, May 12th 2008, China Earthquake Administration (CEA) received the report of the earthquake occurrence from the CENC, and immediately activated the earthquake Preplan. CEA sent the first group of rescue and aid teams to the affected regions, and the State Council Earthquake Disaster Relief Headquarter and small working groups were set up according to the Preplans. After a series of quick assessments of the number of the affected people and the economics loss, the State Council Earthquake Disaster Relief Headquarter initiated a Level II emergency response. The response rose to Level I at 22:15 CST, May 12.

The State Council Earthquake Relief Headquarter led by Premier Wen Jiabao set up 8 work groups including(1) Rescue and Relief; (2) Forecasts and Monitoring; (3) Medical and Health Services; (4) Resettlement; (5) Infrastructure; (6) Rehabilitations; (7) Public Order; (8) Publicity. The Ministry of Civil Affairs, the Ministry of Health, the Ministry of Finance, the Ministry of Transport, the Ministry of Railways, and all other related departments activated the earthquake Preplan, formed relevant working groups, and coordinated in the

earthquake rescue operations (Cheng, et al., 2010).

Immediately after the earthquake, the local police forces and rescue teams started the rescue operations. One hour later, the fire fighters team devoted to the rescue and the troops from Chengdu military region started out to the disaster areas. On the second day of the earthquake, rescue teams from other provinces also arrived at the affected region, and the National Emergency Rescue Team reached Dujiangyan, another severely affected area. Four days after the earthquake, the military rescued over 10,000 victims from the ruins, 3,024 of which survived. Over 40,000 trapped people were rescued and evacuated. In the entire earthquake relief operation, 146,000 army and armed policemen play a very important role. Furthermore, 75,000 paramilitary militias were mobilized. 9,670 vehicles and 193 airplanes and helicopters were put into use (UNDP, 2009).

Case of Yushu earthquake

At 7:49 a.m. CST on Wednesday, April 14th, 2010, an earthquake of magnitude 7.1 struck Yushu County in the Qinghai Province of China. According to the Xinhua News Agency, 2,064 people have been confirmed dead, 175 missing and 12,135 injured of which 1,434 are severely injured; Many residents fled with just the clothes they were wearing and had lost everything. The urgent humanitarian need was enormous. Yushu is located in a mountainous region at high altitude, and the temperature difference is great during day and night because of the complex climate. The overnight temperature drops below -5°C in April. The transport and communication system still worked, and the local Batang airport could also operate for the relief operations (Cheng, et al., 2010).

40 minutes after the Yushu earthquake occurred, Qinghai government and Earthquake Administration of Qinghai activated the earthquake Preplan. Within one hour after the occurrence of the earthquake, CEA initiated the emergency response system according to the response procedure. The State Council Earthquake Relief Headquarter was set up to control and direct the rescue operations. With the assessment of the death and the economic seismic loss, CEA and CENC suggested the Earthquake Disaster Relief Headquarter activate the Level II response (Cheng, et al., 2010). After specific analysis of the earthquake affected region, CEA found that most of the buildings are wooden structures that are not strong enough to withstand severe earthquakes. Furthermore, the epicenter locates at the Yushu-Garzê-Xianshuihe fault zone, one of the most active fault zones in eastern Tibet. At around 11 am, the data from the earthquake region showed that already more than 300 people are confirmed dead, thousands were injured and the numbers are still increasing. With these results, CEA suggested the Earthquake Disaster Relief Headquarter upgrade to Level I response three hours after the earthquake (Cheng, et al., 2010).

The military was unified commanded by Qinghai Response Headquarter, and 850 soldiers from the army in Yushu were assigned to the rescue operations ten minutes after the earthquake. The first disaster relief team of four thousand people started out from Xining, the capital city of Qinghai province, within three hours after the earthquake. The National Rescue Team also reached the affected region with professional equipment 11 hours after the Yushu earthquake. Within half a day after the earthquake occurrence, almost all the rescue and medical teams and resources had arrived at the epicenter area by air or road transport.

Two problems hampered this response operation, however. Firstly, many rescuers fell ill due to high altitude sickness. Secondly, the earthquake occurred in a Tibetan region in Qinghai province, where 93% of the local population is Tibetan, and many do not speak or understand Mandarin Chinese, which made it difficult for the relief teams to communicate with affected local people.

Comparison of response operations in two earthquakes

During the two years gap between the occurrence of Wenchuan Earthquake and Yushu Earthquake, China has improved some aspects of its emergency management. The government learned from Wenchuan Earthquake, making the response to Yushu Earthquake more rapid, ordered, institutionalized and standardized. Based on the experience from the Wenchuan Earthquake, the rescue teams were more professional and experienced. Chinese government also applied more advanced equipment during the rescue. The supplies were delivered and allocated to the affected regions as the government established new rules for supplies storage and allocation after the Wenchuan Earthquake (Cheng, et al., 2010). The communication and transportation network was partly recovered 79 hours after the Wenchuan earthquake, while within 24 hours after the Yushu earthquake the communication and transportation network had mostly recovered (Cheng, et al., 2010). This is partly because the impact of Yushu earthquake was not as severe as Wenchuan Earthquake, and also due to the improvement in communication techniques. More details about the improvements are described in Table 2.

	Wenchuan Earthquake	Yushu Earthquake
Air rescue	Rescue helicopters could not work due to weather; lack of the professional rescue helicopters	Air rescue at the early stage for a short while, but the capability was limited; the airport equipment was lagging, high requirement of the type of airplanes
Information disclosure	CEA published the earthquake information immediately, the State Council convened news conferences; the international press came to the affected regions for news reports of the earthquake; TV stations kept reporting the earthquake information for all day	CEA published the earthquake information immediately, the State Council convened news conferences; the international press came to the affected regions for news reports of the earthquake; public media published latest information on the internet
Psychological intervention	First time of mental intervention, only focusing on the affected people, and neglecting the rescue participants; some officers who joined the rescue or recovery operations committed suicide	Launched together with the rescue operations, including the affected people and rescue participants, establish long-term intervention
Transportation and communication	The destruction of the communication network made some regions "isolated islands" without rescue teams; the communication did not recover until one month after the earthquake	11 days after the earthquake, 45 counties in the affected region's transportation and communication recovered to the status before the earthquake
Technology	Lagging remote sensing techniques, there was no photo taken by plane on the first day, no photo in the second day because of bad weather; difficult to communicate among departments for relief information; many weak points arose during the response phase	Improved remote sensing techniques, the rescue equipment was much more professional and advanced
NGOs and volunteers	Volunteers and NGOs arrived at the affected regions participating in the rescue by means of donations of money and supplies; because of the limited information available volunteers and NGOs flocked together at the regions reported most by the public media	NGOs and volunteers were gathered right after the earthquake, but more focused on the recovery operations

Table 2. Comparison of response operations in the Wenchuan and Yushu earthquakes

Response operations and the Sphere standards

Core Standard 4 of the Sphere standards has 6 aspects. The first aspect is that the response should be designed according to the assessment of the earthquake impacts and the need of relief supplies and aid. The second aspect stresses that organizations should provide help when the government of a quake-hit region cannot deal with the disaster. The third aspect emphasizes that the life-saving actions should be prioritized. The fourth aspect states that all people should have access to assistance and aid, while the fifth aspect mentions aid operations should include factors besides the physical injuries. Finally, the last aspect calls attention to early recovery and states that the response should be improved continuously.

As stated above, the State Council Earthquake Disaster Relief Headquarter decides the response level depending on the information from the affected regions and quick assessment of the affected number of people as well as the economic losses. This is consistent with the first aspect of the Core Standard. The Chinese government however has to pay more attention to assessing the relief supplies. The current response system and operations include assessment of the general type of supplies, but more specific information can only be gained after the

rescue teams arrived at the affected regions.

China has four levels of response, which are led by different levels of government and the operations are allocated to different levels of departments. The second aspect states that other organizations should provide help when the government of meizoseismal area cannot deal with the disaster. As the Chinese rescue operations are accomplished mainly by the military, the "other organizations" in aspect 2 are of a higher level military. For the response operations in Wenchuan and Yushu earthquakes, higher level military and rescue teams of other provinces governments arrived at the quake-hit region for the relief, which is consistent with the standard. UNDP (2009) states that rescuing trapped people with best efforts should be the first priority of the Chinese earthquake response operations. The Chinese government emphasized that to save lives is the top priority in the "Law on Earthquake Disaster Mitigation and Risk Reduction" (2005). This is in line with the third aspect.

The Chinese government restored the land communication lines and the railways damaged in the earthquakes immediately after the quakes to ensure the delivery of the relief supplies. The State Council resolved to give 500 grams food and 10 Yuan subsistence money to each impoverished person in the disaster areas each day for 3 months and 600 Yuan subsistence subsidies to the orphans, the elder and the disabled without life support due to the earthquake. For the rescue operations after Yushu earthquake, the government also focused on the cultural conflicts as most of the affected people are Tibetan Nationality. All these operations show the compatibility with the fourth aspect of the Core Standard 4.

While the Chinese response systems and operations are designed to guarantee the requirement during disaster response, there are always practical problems (Cheng, et al., 2010; UNDP, 2009). For instance, the storage of the types and quantities of disaster relief materials and goods was not sufficient. The improvement of the disaster relief materials and goods reserve system has become a key issue in improving the disaster relief capacity (UNDP, 2009). Moreover, the Chinese government introduced mental intervention after the Wenchuan earthquake occurred, which focused on the affected people but did not include the rescue or recovery workers. After the Yushu earthquake, the mental intervention program was launched at the same time as the rescue operations, and was directed at all groups of people related to the disaster. These operations have met the fifth aspect.

The Ministry of Health monitored the sanitarian and health conditions and launched epidemic prevention actions after the rescue. After the Wenchuan earthquake, some quake lakes arose and the Chinese government solved this problem scientifically which shows its focus on risk reduction. The exit strategies were decided after the quake lakes arose and the future restore places were decided after specific assessment and communication with local people.

While all the above operations show that the Chinese response operations conform to the Core Standard 4, there are still aspects that it has to improve with respect to all six Core Standards. First, the trapped people are lacking in self-help knowledge such as where to stay when an earthquake occurs and what to do if trapped in collapsed buildings. Furthermore, the capacity of the relief participants also needs improvements. Second, an information sharing center is required to improve coordination and collaboration among different departments. The response operations were more rapid and ordered on Yushu earthquake than Wenchuan earthquake, and the rescue teams are more experienced in Yushu earthquake, meeting the Core Standard 5 and 6.

To conclude our discussion on the adherence of the Chinese response system to Core Standard 4, we can fairly state that China has designed its response system based on the assessment of the disaster impacts and the adequate need of supplies of the affected people. It has also organized the rescue at different levels and upgraded the response level when necessary, and finally also introduced the mental intervention program to affected people as well as rescue participants. However, there remains the information sharing problem for the assessments after disasters, and the capacity of affected people to start self-relief can still be considered too low.

CONCLUSION

In this paper, we summarize the China earthquake emergency system and propose a case study of Wenchuan and Yushu Earthquake. After the evaluation with respect of the Sphere Standards, we can see there are still some challenges for China in the Earthquake response operation.

Firstly, the government should further promote earthquake safety and relief knowledge, especially in those rural areas that have been identified as high risk regions for natural disasters. The education at the school level also needs to be improved in the future. Earthquake drills will be a good opportunity to check the quality of human resources and also the storage levels of relief materials. Another great challenge to China's earthquake rescue operations is that the technology is lagging. More funding from the government for research of new technologies is needed.

The last challenge will be information sharing. Besides the traditional way of information transfer, social media will play a great important role in the emergency, which should be important for both the government and the researchers.

ACKNOWLEDGMENTS

The authors would like to thank Hao Lin, MSc, for her assistance in conducting this research. The first author acknowledges financial support from the China Scholarship Council.

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