Emergency Relief System of Typhoon Disaster in China

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China is one of the countries most severely afflicted by natural disasters in the world. Especially, the frequent and severe typhoon disasters have resulted in huge losses of life and property in China. In recent years, China's emergency management system of disaster relief is gradually set up and reinforced. Meanwhile, the emergency operational mechanisms of disaster relief are successively established and enhanced, which cover the disaster situation monitoring and joint consulting mechanism, the early warnings releasing mechanism, the pre-disaster emergency evacuation mechanism, the emergency response mechanism for disaster relief, the disaster relief funds appropriation mechanism, the disaster relief goods supply mechanism, and the disaster relief performance assessment mechanism. Some latest technologies are initially applied to disaster relief efforts so as to further improve the national capacity of emergency response.

Key Words: Typhoon, Disaster relief, Emergency response, China

1. General Situation of Typhoon Disaster in China

China is one of the countries most severely afflicted by natural disasters in the world. China's natural disasters are featured by the multi-diversity, high frequency, wide coverage and grave losses. The most frequent nature disasters in China include flood, typhoon, drought, earthquake, hailstorm, tornado, landslide, mud-rock flows, and forest fire. Since the year of 2000, on average, about 200 million people are annually affected by natural disasters, among which more than 2000 dead every year. Meanwhile, about 7 million people need to be urgently evacuated, more than 40 million hectares of crops are afflicted by disasters, and about 2 million dwelling houses are destroyed. The annual direct economic loss is above 200 billion yuan RMB due to natural disasters since 2000, in which the loss caused by typhoon disaster accounts for above 50%.

Typhoon disaster is one of natural disasters which most frequently and severely affect China. Every year, nearly 6-8 typhoons will land in China's eastern and southern coastal areas which cover Fujian, Zhejiang, Jiangsu, Guangdong, Guangxi, Hainan Provinces and Shanghai Municipality, as well as Taiwan Province. Particularly, central China's several Provinces are prone to the secondary disasters (such as floods,

landslides,and mud-rock flows) triggered by typhoon after it lands and moves into the inland regions which cover Jiangxi, Hunan, Hubei, Henan, and Anhui Provinces. In the above regions, typhoons often result in huge losses of life and property due to the high population density and large economic gross. Since 2004, China has been severely struck by some severe typhoons such as Rananim, Talim, Longwang, Bilis, and Saomai(Tab.1), among which the typhoon Bilis (No.200604) killed 843 people and the typhoon Saomai (No.200608) killed 483 people.

In July 2006, China was severely struck by the No. 4 typhoon Bilis which resulted in huge losses of life and property due to floods, landslides, and mud-rock flows triggered by Bilis. According to the statistics, 31.94 million people were afflicted by Bilis, and the death toll amounted to 843, among which 531 were killed only in central China's Hunan Province due to mud-rock flows and flash floods triggered by Bilis. In addition, 3.36 million people were evacuated, and 391 thousand dwelling houses collapsed. The direct economic loss was up to 34.82 billion yuan RMB. As far as the death toll was concerned, the typhoon Bilis was considered as the severest natural disaster in China since 2000. Bilis accounted for 26% of the annual total (3186 dead) of death toll due to natural disasters in 2006. In fact, the maximum wind intensity of Bilis was only 11th grade and the maximum wind speed near the center was only 30 m/s, which means Bilis is just considered as a strong tropical storm according to the grading standards promulgated by China Meteorological Administration(CMA). But Bilis brought huge rainfall precipitation which eventually resulted in the grave disaster losses.

In August 2006, the No.8 super typhoon Saomai severely struck east China's Fujian and Zhejiang Provinces. Especially, ShachengPort ruined in this catastrophe regardless of the consideration of an excellent lee port, which locates at the northeastern most corner of Fujian Province and borders with Zhejiang Province. More than 900 fishing vessels capsized and sank down due to the extreme strong storm, and more than 300 fishermen were killed in this lee port. Saomai is recorded as the strongest typhoon which has ever landed in the Chinese mainland since 1949. According to the records, the central pressure of Saomai wasonly 92000 Pa., the maximum wind intensity of Saomai was up to 17th grade, and the maximum wind speed near the center of Saomai was uncommonly up to 68 m/s.

Tab. 1 Records of China's Severe Typhoon Disasters in 2004-2006

Typhoon Number	Typhoon Name	Affected Regions	Affected Population (×1 million persons)	Death Toll (×1 person)	Evacuated Population (×1 million persons)	Collapsed Houses (×1 thousand rooms)	Economic Losses (×1 billion yuan RMB)
200608*	Saomai	Zhejiang, Fujian, Jiangxi	6.65	483	1.80	137.2	19.65
200604	Bilis	Fujian, Hunan, Zhejiang	31.94	843	3.36	391.0	34.82
200519	Longwang	Fujian, Zhejiang, Jiangxi	4.36	159	0.75	9.0	7.80
200513	Talim	Fujian, Zhejiang, Anhui	16.12	145	1.92	139.0	15.30
200414*	Ranamim	Zhejiang, Fujian, Anhui	16.47	167	0.66	72.2	19.89

* represents the Super Typhoon (Maximum wind speed near the center >51.0 m/s)

Notes: The data of disaster information mentioned in this article only cover the Chinese mainland, and all of the data are provided by NDRCC.

In 2007, uncommonly, China successively suffered 3 super typhoons of Sepat (No.200709), Wipha (No.200713), and Krosa (No.200716). In Zhejiang Province alone, 1.79 million people were evacuated before the typhoon Wipha made landfall in September 2007, the largest mass evacuation in the history of the province. More than half a million people were evacuated because their dwelling houses were in poor condition. As listed in Tab.2, it is very lucky that the casualties caused by these 3 super typhoons markedly decreased as compared with the recent records, though the maximum wind intensity of these typhoons was close to that of the super typhoon Saomai (No.200608) which claimed more than 400 lives in August 2006.

Tab. 2 List of Super Typhoons which Landed in the Chinese Mainland in 2007

Typhoon Number	Typhoon Name	Affected Regions	Affected Population (×1 million persons)	Death Toll (×1 person)	Evacuated Population (×1 million persons)	Collapsed Houses (×1 thousand rooms)	Economic Losses (×1 billion yuan RMB)
200716*	Krosa	Zhejiang, Fujian Anhui	9.83	0	1.57	5.42	9.68
200713*	Wipha	Zhejiang, Fujian, Jiangsu	13.56	10	2.81	16.1	8.33
200709*	Sepat	Fujian, Zhejiang, Hunan	13.33	63	1.97	36.5	8.39

* represents the Super Typhoon (Maximum wind speed near the center >51.0 m/s).

2. Emergency Management System of Disaster Relief

Since the shock of SARS in 2003, China's emergency management system has been gradually set up and reinforced. Especially, the disaster relief management system has been markedly enhanced. China's disaster relief work is led by the government with different

departments involved. Disasters are divided into different categories for management. Disaster relief funds come from various levels of government. China has regulated disaster management system at central and local governments through setting up good operational mechanism.

At the central level, National Commission for Disaster Reduction (NCDR) is the highest coordination agency for disaster relief, which is composed of 34 disaster-related ministries or agencies (Fig.1), and one of Vice-Premiers of the State Council is appointed as the Director-general of NCDR. Ministry of Civil Affairs (MCA) is responsible for the regular management of disaster relief work in China. Two key offices, that is, the Office of NCDR and the General Coordination Office for National Disaster Resistance and Relief, are set up in MCA. Committee of Experts of NCDR provides brainpower support for government's decision-making. National Disaster Reduction Center of China (NDRCC) was set up in April 2002, which aimed to provide relevant services for national disaster reduction and relief work through information exchange, technical support, policy consultancy, personnel training, and basic research.

At the local level, under the unitary leadership of government, the local general coordination agencies for disaster reduction and relief have been successively set up. Local civil affairs departments at various levels are in charge of local disaster relief work.

Fig. 1 The illustration of organizational structure of National Commission for Disaster Reduction

In December 2006, the Chinese government revised and identified the new national guideline of disaster relief work as follows: governments take the major responsibilities of disaster relief work; various levels of governments carry out disaster relief efforts under the

mode of grading management; governments encourage social participation in disaster relief work; post-disaster reproduction is an important access for victims to recover from natural disasters.

In August 2007, the State Council promulgated the National Comprehensive Disaster Reduction Plan in 2006-2010. The Plan has put forward the major tasks and key projects in the coming years. Disaster reduction and relief have been integrated into the national socio-economic development plan.

Since 2004, the emergency plan system of disaster relief has been established in China. The State Council promulgated the National Emergency Relief Plan on Natural Disasters in 2005. So far, all of the provincial governments and most of county governments have promulgated the emergency plans of disaster relief. The various levels of emergency plans identify the basic operational procedures and major responsibilities during the emergency relief phase for governments at various levels.

3. Emergency Operational Mechanisms of Disaster Relief

3.1 Disaster Situation Monitoring and Joint ConsultingMechanism

NDRCC has established 24-hour disaster information dynamic monitoring mechanism, which provides Chinese relevant disaster-management departments with timely and reliable disaster information throughout the country. Especially, before landfall of typhoons, all of related departments of NDRCC are required to have personnel on duty 24 hours a day, and the latest track of typhoon will be timely reported to the Director-general so as to reinforce disaster preparedness at central and local level.

Emergency liaison system for disaster relief has been well established in China. National emergency telephone service at 83559999 for disaster relief is the core of this liaison system. According to the Working Regulation on Disaster Emergency Relief promulgated by MCA, civil affairs departments at county level are required to report disaster information within two hours after it occurs. Disaster information reporting mechanism has been established, which ensures disaster information can reach the decision-makers at the first time.

At the central level, NCDR has established the disaster situation joint consulting mechanism. The annual and monthly consulting meetings are held in NDRCC. Officials and experts from the relevant ministries are involved in these meetings, which aim at analyzing major natural disasters process and judging its trend. The joint meeting bulletin will be reported to the State Council, and released to the local governments, the relevant departments, and the general public so as to guide the disaster prevention and preparedness at central and local level.

3.2 Early Warnings Releasing Mechanism

Effective preparations and accurate forecasts will greatly reduce the casualties caused by typhoons. The disaster early warning systems have been established in China, especially focus on the monitoring and prediction of typhoon and floods. As mentioned, at the beginning of each month, a monthly consulting meeting on natural-disasters will be held, and disaster trend will be analyzed. In the typhoon season, early warnings will be released in accordance with the weather forecast, flood and geological disaster risk information from relevant ministries or agencies such

as China Meteorological Administration (CMA), Ministry of Water Resources (MWR), and Ministry of Land & Resources (MLR). These departments are in charge of monitoring the disaster-prone regions and analyzing the development of hazards so as to guide local governments to reinforce disaster preparedness. CMA is responsible for the nationwide meteorological services, especially for typhoon monitoring and forecasting, as well as the issuance of typhoon early warnings. MWR is responsible for the nationwide floods monitoring, prevention and control, including the floods triggered by typhoons. MLR is responsible for the nationwide monitoring and control of geological disasters which are often triggered by typhoon and rainstorms.

At the local level, the meteorological bureaus also engage in typhoon monitoring. Especially, the mobile short-message dissemination mechanism has been widely established as a rapid and effective information releasing channel of early warnings. For instance, Fujian Province sent out 1.41 million text messages to warn the general public of the upcoming typhoon before the landfall of the typhoon Wipha in September 2007. On receiving the typhoon alarm, troops from the People's Liberation Army and Armed Police Forces garrisoned in east China's Zhejiang and Fujian Provinces are called into action. Generally, a large number of military troops and reservists are mobilized to assist local governments to fight typhoonsby reinforcing flood barriers along the main rivers before landfall of typhoons.

3.3 Pre-disaster Emergency Evacuation Mechanism

In China, human-centered first is a basic principle for governments to carry out disaster relief efforts, which means human's life is the most important factor and the prior consideration for disaster relief. Before landfall of typhoons, the local governments require closing all schools, shops, and factories. Meanwhile, the general public is advised to stay indoors in the most likely typhoon-hit areas. According to the early warnings released by meteorological bureaus, local governments at all levels must evacuate all of the disaster-prone people to safe shelters in order to maximally reduce the losses of life. Especially, all of fishermen are requested to evacuate to land, and vessels are recalled to lee ports. East China's Zhejiang Province has promulgated the Evacuation Regulation for Typhoon Prevention in order to consolidate the legislation system for evacuation efforts implemented by government. Thus, the residents and migrant workers in disaster-prone areas must seriously comply with this regulation and timely evacuate to shelters before landfall of typhoon. Meanwhile, during the period of disaster situation triggered by typhoon, governments must urgently transfer the disaster victims to safe shelters. Local civil affairs departments will provide the displaced people with the basic living requisites such as foods, drinking-water, clothes, quilts, and blankets. Local health departments will dispatch medical teams to shelters for epidemic prevention and emergency treatments. Local public security departments will deploy police forces to ensure shelters in a good order in combination with the victims' self-management. Local maritime authorities will put search boats on stand-by and increase patrols of offshore waters to ensure all vessels are properly docked.

On average, annually, about 7 million people have been evacuated by local governments since 2000, 50% of

which were related to typhoon disasters. Most of displaced people are received by their relatives or neighbors. In addition, some displaced people are resettled in public buildings such as schools, theaters, hospitals, stadiums, and governmental offices others are resettled in tents provided by governments.

3.4 Emergency Response Mechanism for Disaster Relief

Emergency response mechanism is the focal point of disaster relief system in China. Whenever nature disaster occurs, various levels of governments must carry out efficient relief efforts at the first time. As mentioned, MCA has promulgated and implemented the Working Regulation on Disaster Emergency Relief. According to the regulation, within 24 hours after disaster occurs, relief supplies from the county governments should reach the disaster-affected people and meet their basic survival demands.

In case of severe natural disasters, a series of emergency response procedures will be launched in accordance with the National Emergency Relief Plan on Natural Disasters, in which the grading response criteria are involved. National criteria on emergency response for disaster relief have been identified in 2005. There are totally four levels of emergency response as listed in Tab.3, among which each response level matches with the relevant grading standard of disaster losses. I-level response is the highest response, and IV-level response is the lowest response. There are three key statistic items of disaster losses, that is, death toll, evacuated population and collapsed houses. According to these three items, NCDR and MCA determine which level of emergency responses will be launched. As listed in Tab. 4, commanders at various levels of governments are responsible for the relevant emergency responses. Vice-Premier of State Council is the highest commander for disaster relief work, who takes charge of I-level emergency response the Minister of Civil Affairs takes charge of II-Level emergency response; the Vice-Minister of Civil Affairs takes charge of III-Level emergency response; and the Director-general of Department of Disaster and Social Relief of MCA takes charge of IV-Level emergency response.

In 2006, the typhoon Bilis resulted in huge losses of life and property at large-scale areas. According to the impacts in typhoon-hit areas which covered Hunan, Fujian, Zhejiang, Guangxi, and Guangdong Provinces, NCDR and MCA successively launched 9 times emergency responses, among which 4 III-Grade responses and 5 IV-level responses were involved.

According to the National Emergency Relief Plan on Natural Disasters, up to 24 October 2007, NCDR and MCA have launched 49 times emergency responses of disaster relief in 2007, among which one II-Level emergency response, 6 III-Level emergency responses, and 42 IV-Level emergency responses were involved. There are totally 8 emergency responses related to typhoon disasters in 2007, and four provinces (Zhejiang, Fujian, Hunan, and Jiangxi provinces) were most severely afflicted.

Tab. 3 Hierarchical List of National Criteria on Emergency Response of Disaster Relief

Response Level	Death Toll (×1 person)	Evacuated Population (×10000 persons)	Collapsed Houses (×10000 rooms)
I – Level	> 200	> 100	> 20
II – Level	100–200	80–100	15–20
III – Level	50–100	30–80	10–15
IV – Level	30–50	10–30	1–10

Tab. 4 List of Commanders for 4 Levels Emergency Responses of Disaster Relief

Response Level	Commander of Emergency Response
I – Level	Vice-Premier of the State Council, Director-general of NCDR
II – Level	Minister of Civil Affairs
III – Level	Vice-Minister of Civil Affairs
IV – Level	Director-general of Department of Disaster and Social Relief, MCA

Under the unitary leadership of the State Council, the central government has set up the general coordination mechanism in which 34 ministries or agencies are involved. The People's Liberation Army, Armed Police Force, police forces and militias are closely involved in disaster rescue and relief efforts. Once a severe typhoon disaster occurs, and III-Level emergency response or higher-level responses are launched, a joint work team will be dispatched to typhoon-hit areas by the State Council, which members are generally composed of typhoon-related ministries or agencies such as MCA, MWR, MLR, CMA, Ministry of Finance (MOF), Ministry of Communications (MOC), Ministry of Agriculture (MOA), and Ministry of Health (MOH). If the disaster loss is just up to the criteria of IV-Level emergency response, a work team from MCA will be dispatched to disaster-hit areas, which is composed of MCA senior officials and NDRCC staff, who are on permanent stand-by. The major responsibilities of work team focus on the following fields: carrying out on-site surveys in disaster-hit areas; collecting the latest disaster information; carrying out assessments on disaster losses and relief needs assisting the local governments to implement disaster relief efforts; establishing the emergency communication connection between work teams and the headquarter of MCA.

3.5 Disaster Relief Funds Appropriation Mechanism

In the initial stage of each year, the budget of disaster relief fund will be identified by the governments at various levels. In recent years, annually, more than 4-5 billion yuan RMB of central-level disaster relief fund will be arranged to ensure the basic survival needs of disaster-affected people. The governments at provincial and county level must also arrange and match the disaster relief fund in accordance with the relevant financial regulations and local emergency plans for disaster relief.

In and after the emergency relief phase, MCA will promptly deploy work teams to assess the disaster situation and relief needs. On the basis of assessment reports provided by the field work teams, the central government will appropriate disaster relief funds and goods to disaster-hit areas so as to assist the local governments to carry out disaster relief efforts. MOF and MCA are in charge of disaster relief funds appropriation and management at central level. The central-level natural disaster relief fund is composed of the following 4 kinds of funds: emergency relief fund, dwelling reconstruction fund, drought relief fund, and food relief fund, among which emergency relief fund aims to assist the local governments to evacuate and

resettle disaster-affected people and provide them with the prompt relief. In 2006, the central-level disaster relief fund was about 11 billion yuan RMB, 50% of which was used to guarantee victims' basic living needs, the other was used to recover infrastructure and production. For instance, during the emergency response to the typhoon Bilis in July 2006, the central government appropriated 299 million yuan RMB of emergency funds to disaster-hit areas. Meanwhile, various levels of local governments also raised and appropriated lots of relief funds and goods for disaster resistance and relief.

Social participation is an important supplement in combination with governmental relief efforts. Chinese government encourages the suitable social participation in disaster relief work, in which social sectors, NGOs, and individuals are involved. For instance, during the emergency response to typhoon Bilis, besides the emergency relief funds provided by governments at various levels, disaster-hit areas also received lots of donated funds and goods from enterprises, social sectors, NGOs, and individuals, including 210 million yuan RMB of donated funds and 2.1 million pieces of clothes, blankets, and quilts. In order to respond to Bilis, central China's Hunan Province received 100 million yuan RMB of emergency relief fund from the central government, meanwhile, appropriated 11 million yuan RMB of emergency relief fund from provincial finance. Moreover, Hunan Province also received 13.1 million yuan RMB of donated funds and 2.3 million yuan RMB of donated goods from social sectors, NGOs and individuals.

In August 2007, the Chinese central government improved and revised the national criteria on disaster relief as listed in Tab.5. In the national relief criteria, the central government appropriate disaster relief funds to local governments according to the following basic relief standards: (1) 150 yuan RMB per person who is evacuated by the local governments due to natural disasters separately, 70 yuan RMB per person for typhoon disasters because most of typhoon-affected people only need temporary evacuation before typhoon lands in the Chinese mainland, and they could go back to their houses after typhoon goes by in 1-2 days (2) 1500 yuan RMB per room which is destroyed by natural disasters, and 200 yuan RMB per room which is damaged by earthquake (3) 50 yuan RMB per person who needs governmental food assistances due to the lack of enough foods and other basic survival requisites in winter and spring after croplands are destroyed by natural disasters (4) 30 yuan RMB per person who needs drinking-water assistance from governments due to long-term severe drought.

At the provincial level, the local criteria on disaster relief fund are different from each other among the Chinese provinces due to the distinct imbalance of development of regional economy. Generally, the local criteria are much higher than the central one in east China due to the prosperous economic development, especially in the coastal provinces. In west China, the local criteria on disaster relief are much lower than the central one due to the local insufficient financial resources, and the local governments extremely depend on the central-level disaster relief funds.

Tab. 5 The Criteria of Central-level Disaster Relief Funds in China

Items	Criteria of Relief Fund	Notes
Evacuated People	150 yuan RMB/person	Separately, typhoon disaster is 70 yuan RMB/person
Destroyed House	1500 yuan RMB/room	Only for dwelling houses
Damaged House	200 yuan RMB/room	Only for earthquake disaster
Food assistance	50 yuan RMB/person	Only in winter and spring
Drought relief	30 yuan RMB/person	For drinking-water assistance

3.6 Disaster Relief Goods Supply Mechanism

Since 1989, China has started to establish the national material reserve system for disaster relief. At present, as showed in Fig. 2, ten central-level disaster relief material reserve depots have been set up in ten big cities such as Harbin, Shenyang, Tianjin, Zhengzhou, Xi'an, Hefei, Wuhan, Chengdu, Changsha, and Nanning. The 11th central-level depot will be established in northwest China's Urumchi City, Xinjiang Uygur Autonomous Region. Meanwhile, a number of provincial-level depots have been also set up throughout the country. A large amount of relief materials (non-food, non-medical items, such as tents, overcoats, quilts, blankets, generators, boats, and buoys) are stored so as to fulfill the basic survival needs of disaster-affected people during the initial relief phase. Food will be immediately supplied to disaster-hit areas straight from the local supermarkets and manufactories according to the agreements signed between the local governments and suppliers. Medical items will be timely provided by the local hospitals, Red Cross organizations, and medical teams. Once a severe disaster occurs, the first batch of disaster relief goods must be supplied to the disaster-affected people within 24 hours, which is vital to rehabilitate the victims and give them the immediate comfort from government. In 2007, the central government has distributed more than 40 thousand tents to local governments so as to resettle the disaster-affected people who were most vulnerable during emergency phase. Particularly, in the typhoon-hit areas, the local inshore governments have built a number of lee buildings in coastland in order to provide the evacuated people with safe shelters.

Fig. 2 The distribution map of 10 central-level disaster relief material reserve depots in China

3.7 Disaster Relief Performance Assessment Mechanism of Disaster Relief

During the emergency relief phase, disaster-affected people are given relief cards on the household basis by the civil affairs agencies at the county level, and they will receive disaster relief funds and goods based on the cards. This working mechanism can ensure the

relief funds and goods to be distributed to victims transparently and fairly. In the post-disaster, according to the Management Regulation of Dwelling Recovery and Reconstruction promulgated by MCA, the various levels of local civil affairs departments are requested to draft reconstruction plans, which should cover the basic information such as project managers, time frame, and quality supervision so as to ensure the successful completion of dwelling reconstruction project. As one of key cycles of disaster management, MCA will termly dispatch assessment teams to disaster-hit areas so as to supervise and inspect the appropriation and use of disaster relief funds and goods, as well as the implementation of reconstruction project. Then, the performance assessment reports will be completed and reported to MCA. On the basis of performance assessment reports, experiences and lessons will be timely summarized; finally, the national emergency relief system will be further consolidated and enhanced in China.

4. Emergency Technology Application in Disaster Relief Efforts

In recent years, the latest emergency communication technologies and equipments have been initially applied in China's disaster relief efforts. For instance, the homemade Beidou Positioning & Navigation System provides the field work teams with the real-time positioning and message communication services as an effective tool of on-site emergency communication. The headquarter can real-time track the activities of field work teams so as to ensure the safety of members of work teams. The Beidou system will be further consolidated and enhanced after the latest 5th BeidouNavigation Satellite was launched on 14 April 2007. Furthermore, the Beidou system will be provided to the local disaster relief sectors in the coming years so as to improve the capacity of emergency communication at local level.

Broadband Global Area Network (BGAN) has been also used in China's disaster relief efforts, which can ensure the communication connection 100% of availability between the field work teams and the headquarter. With BGAN system, both the internet links and audio communication are available at anytime and anywhere during emergency relief phase. In addition, NDRCC has test the pilotless aircraft system which will be used in the coming disaster relief efforts so as to monitor disaster situation and collect information at larger-scale areas.

In China, the Remote Sensing (RS) and Geographical Information System (GIS) have been developed and used in disaster monitoring and assessment, which have provided the decision-makers with the technical support in the field of comprehensive disaster reduction, emergency relief, and post-disaster reconstruction. China plans to launch two small optical satellites and one small SAR satellite in 2008. Moreover, another 4 optical satellites and 4 SAR satellites will be also launched so as to complete the construction of Small Satellite Constellation for Environmental and Disaster Monitoring and Prediction.

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