

**ANALYSIS OF RMB 167 BILLION (USD 25 BILLION) BUDGET  
ON THE CRITICAL INFRASTRUCTURE PROTECTION AND  
RECONSTRUCTION FOR THE CHINA 5-12 WENCHUAN  
EARTHQUAKE EMERGENCY RECOVERY**

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**Abstract**

The critical infrastructure protection is vital to the national security, emergency management, and disaster recovery and reconstruction work. Keeping the stability and availability of the critical infrastructures is the symbol of a nation's civilization, public services and catastrophe management. China encountered a number of severe natural disasters in the year of 2008 including the once-half-century snow storm in South China and the once-a-hundred-year earthquake in Wenchuan of Sichuan province.

After these disasters, China's critical infrastructures damaged extremely in the transportation, energy supply, communication, and computer network. Discussions on how to protect critical infrastructures and key resources before, during, and after emergencies and catastrophes become important part of emergency management work of central and local government of China.

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Five months after the Wenchuan Earthquake in October 2008, China government announced a RMB 167 billion (US\$25 billion) budget especially used for the local area critical infrastructures recovery and reconstruction. According to “The Overall Planning for Post-Wenchuan Earthquake Restoration(PLAN)”, jointly released by the China National Development and Reform Commission, Department of Transportation, Ministry of Railways, Ministry of Water Resources, Ministry of Industry and Information Technology , and the Bureau of National Energy Administration. The “PLAN” issued focused on the reconstruction of transportation, communications, energy supply and water facilities, covering 51 severely affected counties of Sichuan, Gansu, and Shanxi provinces.

In this paper, the emergency plan and mechanism of national critical infrastructures protection are discussed and compared between samples of developed countries and developing countries. Key points such as taking the example of emergency recovery of critical infrastructures of the 5-12 Wenchuan Earthquake list below:

1. Brief introduction of critical infrastructure protection in the US, Great Britain, and China;
2. China’s special character of the National critical infrastructure protection;
3. Co-operation and joint mechanism among Infrastructure-Specific Departments;
4. Analysis of the China’s budget of US\$25billion for the Wenchuan earth-quake recovery of critical infrastructures.

## **Part 1. Brief introduction of critical infrastructure protection in the US and Great Britain**

The critical infrastructure protection is vital to the national security, emergency management, and disaster recovery and reconstruction work. Keeping the stability and availability of the critical infrastructures is the symbol of a country’s standard of civilization, public services and catastrophe mitigation. The global influence brought by the damage of the national infrastructure became more and more recognized.

However, the increasing number of huge disasters in recent years, poses a considerable challenge regarding the vulnerability of the critical infrastructures and key resources in China. China encountered several unusual natural disasters in the year of 2008 including the snow storm in South China in the early year and the earthquake in Wenchuan of Sichuan province in the middle of the year. The Wenchuan earthquake with the magnitude of 8.0 which killed nearly 90,000 lives, also caused severe damage to the infrastructures such as the transportation, power supply, communication, water resource, municipal service and government IT network and database. How to protect critical infrastructures and key resources before, during, and after emergencies and catastrophes becomes an important part of emergency management work for central and local governments of China.

In October 2008, China government has approved a RMB 1,000 billion (US\$150 billion) budget for the Wenchuan (quake areas) recovery and reconstruction according to “The Overall

Planning for Post-Wenchuan Earthquake Restoration”, and the infrastructure reconstruction accounted for major portion of the budget. On October 17, 2008, China government announced the "Wenchuan Earthquake Reconstruction Plan for the National Infrastructure Recovery (PLAN)". The 3-year PLAN focuses on the reconstruction of four infrastructures of transportation, communication, energy supply and water facilities. There are totally 51 severely affected counties from Sichuan, Gansu, and Shanxi provinces in the infrastructure recovery PLAN. The total infrastructure recovery investment is RMB 167 billion (US\$25 billion), which is 16.7% of the overall post-Wenchuan earthquake recovery investment.

Before giving the analysis of the emergency PLAN for the critical infrastructure recovery after the 5-12 Wenchuan Earthquake, I would like to firstly give brief introduction about the emergency plan and mechanism of national critical infrastructure protection in developed countries like the United Kingdom and the US.

#### The introduction of the *National Infrastructure Protection Plan (NIPP)* of the US

The US government has defined exactly the importance to protect national Critical Infrastructure (CI) and Key Resource (KR) as “attacks on CI/KR could significantly disrupt the functioning of government and business alike and produce cascading effects far beyond the targeted sector and physical location of the incident, so much as producing catastrophic losses in terms of human casualties, property destruction, and economic effects, as well as profound damage to public morale and confidence.”

In 2006, the US Secretary of Department of Homeland Security (DHS) jointly with other 14 departments directly under the President of the US drafted and released the National Infrastructure Protection Plan (NIPP). The NIPP provides an overall framework for risk management, and clearly defines the concept of the Critical Infrastructure and Key Resources (CI/KR), as well as the recovery requirements on manpower, network and provision needed to effectively implement this plan. It also organizes the cooperation and responsibility role of the DHS, the specific-sectors and other federal departments. The NIPP classifies the protection principles based on the target(s) attacked with the basic concept that the government will take especial emergency measures and efforts to supervise, prevent, respond and reconstruct when the CI/KRs are likely to suffer from emergencies. The NIPP also provides a unified structure to integrate the critical infrastructure and key resource (CI/KR) protection forces into a single national program.

#### The introduction of the *Center for the Protection of National Infrastructure (CPNI)* in the UK

The Center for the Protection of National Infrastructure (CPNI) was founded by the British government on February 1st, 2007. CPNI provides integrated (combining information, personnel and physical) security advice to the businesses and organizations which make up the national infrastructure. Through the delivery of the advice, CPNI protects national security by helping to reduce the vulnerability of the national infrastructure to terrorism and other threats.

Advisers working for CPNI cover the full range of security disciplines and are highly experienced in providing advice to national infrastructure organizations over many years.

CPNI is an interdepartmental organization, with resources from a number of government departments and agencies. These include MI5, CESG (Communications Electronics Security Group) - the UK's National Technical Authority for Information Assurance and other Government departments responsible for national infrastructure sectors.

The CPNI covered 9 departments including the communication, the power supply, emergency management, the finance, the food administration, public services, the health, the transportation and the water supply. It makes certain concept of the "National Critical Infrastructure Protection Plan", confirms the plan to reduce the vulnerability of the national critical infrastructures facing security threats. The security standards of the national infrastructures measured by the CPNI decide the support level from the government.

## **Part2. China's special character of the National critical infrastructure protection**

The overall emergency response system (Called "one plan, three systems") in China has been developing rapidly since the outbreak of "SARS" in 2003. The "General Response Plan for Public Accidents of China"(called "one plan") which was made in 2005 gave a guideline for the implementation of the Chinese emergency response plans. The construction of the Chinese emergency response system of management, mechanism, and legislation (Called "three systems") is progressing at the same time. While, so far China does not consider the specific emergency response plan or specific emergency organization to protect critical infrastructures. For the CI/KRs like transportation, water conservancy, coal mining, electricity facilities, oil and gas facilities, municipal and other essential infrastructures, the governments adopt the "regular inspection and spot check" to guarantee the safety and functionality of the CI/KR operations. Usually the government will pay more attention to the tangible and practical value of the CI/KR facilities and ignore those that stand for the image and public confidence of the country.

China government is now summarizing the system of emergency response plans including "The General Response Plan for Public Accidents of China ", "The Emergency response plan for the related departments under the State Council of China", "The National Sector-Specific Response plans" and existing "Emergency response plans initiated by the enterprises and business units according to the related laws and regulations", and is trying to develop the national critical infrastructure protection strategy and tactics with the Chinese characteristics in the next five years.

## **Part3. The cooperation and interaction mechanism among the specific sectors for infrastructure protection**

The coordination and cooperation of sector-specific departments of US NIPP are implemented through the Special Coordinating Council (SCCs) and the Governmental Coordination Council (GCCs). Representatives of SCCs and GCCs could share the essential skills for critical infrastructure and key resource protection. The Councils effectively ensure the emergency response mechanisms of cooperation. The SCCs also deal with the issues of

cross-sector and cross-authority under the essential structure of the CI/KR security cooperation relationship.

The US Department of Homeland Security is authorized to coordinate, communicate and achieve cross-sector, cross-authority or important trans-regional CI/KR information-sharing. If necessary, the Department of Homeland Security may summon general meetings of the Council members to deal with the issues of cross-sector, cross-authority, and cross-region problems.

The China government is strengthening the further research of operational security on critical infrastructures. A systematic risk screening and risk assessment for China's national critical infrastructure is working out in some areas in the country. The comprehensive emergency response plans for CI/KR protection should consider the cooperation and interaction mechanism among these essential infrastructure departments to enhance the overall capacities to deal with natural, human, technical, and electronical threats and emergencies.

#### **Part 4. Analysis of the China's budget of US\$25billion for the Wenchuan earth-quake recovery of critical infrastructures**

According to the "Wenchuan Earthquake Reconstruction Plan for the National Infrastructure Recovery (PLAN)", there are four key national infrastructures (transportation, communication, energy, and water conservancy) under the investment name-list of the recovery budget, they are analyzed as below:

##### Transportation

The PLAN will speed up highway reconstruction; make good use of primary highway and road infrastructures. Connect country road with rural road, and expressway based on the main highway. Increase round lines as necessary, try best to establish a stronger multiple direction of lifeline roads in both urban and rural area.

It is important to examine, maintain and reinforce all damaged railways and operation equipments which were broken in main and branch railway road, and to improve external channel capability through fast-repair and to re-construct broken lines and operation equipments.

In order to greatly improve the transportation capability of civil aviation, there is an urgent demand for the prioritization work to clarify the vulnerability of the present civil aviation equipments and the capability of quick recovery and reconstruction.

The PLAN will request to establish and maintain a transportation emergency response system, a transportation emergency commanding system, as well as a rescue & support system.

The PLAN also included initiating, at a suitable time, the reconstruction on main highways and railways which play the role of guidance and support, which are especially beneficial to the social and economic development.

##### 1. Main highway reconstruction

To restore national express highways including No.108, 211,213,316,317,318 with the total distance of 1,910 kilometers;

To restore 22 provincial express highways (and 2 county-level highways) with the total distance of 3323 kilometers;

To restore other 12 important main highways with the total distance about 848 kilometers.

## 2. Railway reconstruction

To restore and reinforce the key railway roads like Baocheng, Chengkun, Chengyun and branch railway roads like Chengwen, Guangyue, Detian, Guangwang;

To rebuild or reconstruct No. 109 tunnel railway road of Baocheng and other severely damaged railway sections like Mianyang, Guangyuan, Jiangyou, Deyang;

To build new city-internal railway lines from Chendu to Dujiangyan, Passenger Dedicated Line (PDL) between Chengdu, Mianyang and Leshan, and other railways from Lanzhou to Chongqing, Chengdu to Lanzhou and Xian to Chengdu.

## 3. Civil Aviation reconstruction

To restore airports like Chengdu, Jiuhuang, Mianyang, Guangyuan, Kangding, Nanchong, Luzhou, Yinbin, Hanzhong, Xianyang, Ankang, Lanzhou and Qingyang;

To repair damaged equipments of civil aviation administrative agencies, the airline companies, and the air fuel supply companies.

## Communications

Based on the requirement of resource sharing, operability and security, the PLAN ask for the government to speed up the construction of public communications network, to enhance emergency communication capability, to establish a comprehensive network information platform, and to ultimately improve the capability for communication services and preparation for disaster response;

It is important to rebuild Post services according to Rural- Urban distribution;

### 1. Public Communication Network reconstruction

The PLAN will restore and rebuild 11.3 million fixed communication switches, 5.6 million broadband access equipments, 10.36 million mobile net switches, 7,809 base stations, fiber optics network about 70,775 kilometers, nearly 12,833 kilometers cable, 17,332 transmission equipments, and 687 thousand square meters communication centers;

### 2. Communicate Hub reconstruction

The PLAN will establish internet highway access port in Chengdu, as well as the dedicated data channel and data duplicate center for disaster recovery;

### 3. Emergency Communication reconstruction

To establish emergency communication commanding system and the emergency satellite

communication system;

#### 4. Post service reconstruction

To restore and re-construct 57 post service centers, , 385 post service branch offices, 2178 post service equipments and other post facilities and vehicles.

### Energy

The PLAN will restore the key electricity transmission facilities, the critical power and delivery channels, as well as low-voltage power network and last-one-mile facilities planning and constructing.

To strengthen the maintenance of the equipments for small hydropower stations, The PLAN required eliminating hidden dangers to keep the electricity generation safe in the flood season. According to the comprehensive investigation on the damage of water-electricity stations, detail plans for actively rebuilding the damaged hydropower stations will take action soon.

To review the equipments and hydropower station dams according to the new prevention standard, reinforce the facilities that are not meet the operation standard.

To support restoring the damaged coal mines, restart the normal production work quickly. The PLAN will not support the reconstruction for the coal mines which are damaged heavily, low stored, hard to mine and with poor security conditions.

To restore gas wells, purification plants, oil refineries, pipelines and protection facilities, the gas stations and oil depots etc.

To restore the production and transmission capacity of natural gas, restore the transmission capacity of refined oil.

#### 1. Power Grid

According to the PLAN, we will restore and reconstruct 324 substations of 35 KV, with transformer capacity of 18,090,000 KVA, across 7372 kilometers; with 10 KV or below substations capacity of 3,800,000 KVA, line across 92400 kilometers.

#### 2. Power Supply

To restore and reconstruct the electricity generating facilities in Jiangyou, Lueyang, Zipingpu, Yingxiu, Taipingyi, Futang, Zagunao River, Bikou, Hanpingzui, Hulutou, Dongfanghong, etc., there are 129 large and medium-sized hydropower stations to be reinforced, with the total capacity is more than 7 million kilowatts.

#### 3. Coal Mine

To restore and reconstruct 164 coal mines and external mining infrastructures, including Tianchi, Hongxing, Dachanggou, Zhaojiaba, Rongshan, Kunda, Xipo.

#### 4. Oil and Gas

To restore and reconstruct 1176 gas wells, Zhongba purification plant, Nanchong oil refinery, Lanzhou-Chengdu-Chongqing oil pipeline and the protection of facilities, as well as more than 100 natural gas pipelines, 8 petroleum storage depots and 922 gas stations.

### Water Conservancy

To reinforce the damaged embankments and reservoir , dredge clogging rivers, restore the ability of flood preventing, eliminate the consequence of barrier lakes (dams), and reconstruct hydrological forecasting and early warning facilities;

To repair all the damaged dam facilities, to restore the capability of water supply combined with reinforcing damaged reservoir and rebuilding damaged irrigation areas;

To restore and reconstruct the farmland water conservancy infrastructures, as well as facilities for soil and water conservation and water resource monitoring.

#### 1. Flood Disaster Mitigation

To reinforce 1263 reservoirs, embankment 1199 kilometers, renovate 105 barrier lakes (dams), rebuilt 112 hydrological stations.

#### 2. Farmland and Water Conservancy

To restore and reconstruct 7 large irrigation areas and 1289 small or medium-sized irrigation areas, 55,498 independent micro-irrigation facilities.

#### 3. Monitoring Water Resources

To restore and reconstruct 4454 facilities for monitoring the critical rivers and water sources.

### **Summary:**

China takes function recovery of the critical infrastructure as the primary task of the 5-12 Wenchuan Earthquake reconstruction and recovery, and adjusts the layout according to geological and geographical condition and urban-rural distribution, linking up with local economic and social development plan, urban-rural plan and land use plan to optimize structure, then to make sure the construction standard to enhance the capability of security protection. Learning from the experience of Europe and the United States in the infrastructure protection, China government would do effort to make the infrastructure with the capability of emergency response and timely self-recovery.

The reconstruction fund will be raised from many ways, the state financial department sets up a fund for earthquake restoration and reconstruction, which is around 30% of the total reconstruction cost. Other fund will be raised from the local government, support from other cities, the society, loans from domestic banks, capital market, preferential loan from foreign countries, local resident, enterprises and innovative financing.

Up to now, about 700 infrastructure reconstruction projects has been started, covering the road, railway, civil-aviation, communication, energy and water conservancy, which accounts



for about 45% of the overall reconstruction task.

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### **Author Biography:**

Mr. Zhang has a Ph. D of management from China Academy of Sciences (CAS), a MBA from Peking University and a BE of Electrical Engineering & a BS of Applied Mathematics from Tsinghua University.

Dr. Zhang has abundant working experiences in IT industry for more than 16 years. He had worked for the well-known companies such as IBM, Lenovo, Netframe, and Micron Technology Inc (MTI) etc. His main areas of study focus on the government emergency management ICT systems, healthcare information technology (HIT), and data sharing and information integration of the eGovernment systems. Dr. Zhang worked for MTI in Boise, Idaho during 1997-2000 and came back China to setup Beijing Harmony Technologies Company (HARMONY) serving as the Chairman of the board and the President. HARMONY developed creatively the first domestic Government Emergency Management Information System (GEMIS) at a district-level and successfully applied it to fight against SARS in Beijing Haidian district in early 2003.

Being the undertaker and consulting member of the Emergency Management System (EMS) research project initiated by the Emergency Management Office (EMO) of the State Council

of China, the consulting member of Beijing EMS Research Group, the Chief architect for the EMS IT platform of the Beijing 2008 Olympic Games, Dr. Zhang is also the senior member of HIMSS, OASIS, EMTC and TIEMS. He is working on the Emergency Management ICT(EMICT) standard for China and believes that the EMICT industry has been promptly emerging in China and the whole world, which is very challenging.

With keen forward-looking vision, Dr. Zhang leads HARMONY tracking closely the trends of international emergency management development, participating in the research and cooperation in the field of public safety projects. HARMONY has grown to be the biggest IT solution provider in the EMS industry in China with 40 state-level, province-level, and city-level successful cases since 2007.

Headquartered in Beijing, HARMONY makes her appearance in provinces of Guangdong, Shanxi, Heilongjiang, Sichuan and Hainan in China. HARMONY will continue to participate actively in the construction of the emergency management ICT platforms for the government, making great efforts to spread the experiences accumulated in EMIS projects for governments, key infrastructure corporations, and SSAs (Sector Specific Agencies).