



**COORDINATING COMMITTEE FOR GEOSCIENCE PROGRAMMES  
IN EAST AND SOUTHEAST ASIA (CCOP)**

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# **Member Country Report of China**

**Submitted by**

**China Delegation**

**(For Agenda Item 3)**





**COORDINATING COMMITTEE FOR GEOSCIENCE PROGRAMMES  
IN EAST AND SOUTHEAST ASIA (CCOP)**

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## ANNUAL MEMBER COUNTRY REPORT

**Country:**

**CHINA**

**Period:**

**1 July 2007 - 30 June 2008**

### GEO-RESOURCES SECTOR

#### 1. MINERAL PROGRAMME

##### 1.1 Summary

Mineral exploration in China remains active in 2007, the investment for mineral prospecting were increasing fast. The exploration situation appears as “demand blooming, market flourishing, capital abundance, and operation smooth”. 12,136 exploration projects were carried in the whole year, and total invest RMB16.537 billion, increasing 32% than last year; and the drilling amounts 11.6 million meters, increasing 34%. The Central Government financial supporting projects include: Investigation and Evaluation of Mineral Resources with the support of National Land and Resource Assessment Project (NLRAP); Succeeding Resources Exploration Projects for National Depletion Mines; Central Geological Exploration Fund.

##### 1.2 Annual Review of Activities

The exploring investment patterns are gradually diversified. Social investment is dominant in market, accounts of 70% for prospecting some major commodities as nickel, tin, platinum, lead and zinc, manganese. At the same time, provincial government increased capital input for the regional exploration, like Inner Mongolia and Qinghai. The first ten capital investment provinces are: Inner Mongolia, Shanxi, Henan, Yunnan, Xinjiang, Hebei, Shandong, Shaanxi, Sichuan, and Guizhou. Some minerals with more investment and drilling such as: coal, RMB 6.8 billion investment and 6.32 million meters drilling; iron, RMB 1.347 billion investment and 0.86 million meters drilling; copper, RMB 1.173 billion investment and 0.639 million meters drilling; gold, RMB 1.711 billion investment and 1.03 million meters drilling.

The exploration in some major metallogenic belts has been steadily making headway, and so did the deep and periphery parts of some old mines. Increased reserves of major minerals grew fast, such as coal, iron, copper, lead, zinc, aluminum, etc. The newly found mineral occurrences are 588, among which 93 are large-scale, 120 middle-scale, 375 small-scale. The increasing reserves: coal, 88.83 billion tons, iron ore, 1.01 billion tons, manganese ore: 38.75 million tons, and copper, 3.455 million tons.

##### 1.2.1 Major minerals exploration

Some mineral resources base were rapidly taking shape, like Gangdese, Nyainqentanglha, Northwest Yunnan, Luobupo, Wulagen, Qitianling, Southwest Henan, and also some new founds in deeper part of old mines.

**Gas hydrate:** The gas hydrate samples were collected by drilling in 2007, China became the fourth country collected real samples after the United States, Japan and India.

**Coal:** Newly found occurrences were 109, among which 53 were large-scale, 8 middle-scale, 48 small-scale, and 404 occurrences were the exploration stage. New progress was achieved in geological prospecting for coal in Inner Mongolia, Shanxi, Shaanxi, and Xinjiang Provinces, one of them is the exploration of the west part of Dongsheng coal mine, which were executed by the Central Geological Exploration Fund, and the controlled reserves were 19.5 billion tons, with a large-scale potential. The exploration results of Heishan coal mine in Qitai County, Xinjiang confirmed 12.6 billion tons reserves. In the deeper part of Liuqiao coal mine, controlled the reserves were 0.18 billion tons.

**Iron deposit:** Newly found occurrences were 92, among which 1 were large-scale, 16 middle-scale, 75 small-scale, and 182 occurrences were the exploration stage. New progress was achieved in geological prospecting for iron ore in Liaoning, Hebei, Shandong, Xinjiang and Xizang Provinces, and a series of large or super-large iron backup base were found. The iron exploration in China has reached a new peak. In North-China Masses and lower-middle reaches of the Yangtze River, the sediment origin metamorphic type rich iron deposit has been evaluated. One of them was Gongchangling iron deposit in Liaoning Province, the rich iron reserves reached 50 million tons; and Longzong basin in Anhui Province, with the thickness of 250 meters, average grade of 40%; other achievements like Jining, Shandong Province, Qiaotou in Liaoning Province, etc.

**Copper deposit:** Newly found occurrences were 39, among which 6 were middle-scale, 33 small-scale, and 85 occurrences were reached the exploration stage. New progress was achieved in geological prospecting for copper in Gangdese metallogenic belt, and a series of large or super-large copper backup base were found, among which the reserves of Qulong copper deposit reached 10 million tons, and become the biggest copper deposit in China; and Duolong deposit, the potential reserves were 5 million tons.

**Bauxite:** Newly found mineral occurrences were 18, among which 7 were large-scale, 6 middle-scale, 5 small-scale, and 48 occurrences were the exploration stage. New progress was achieved in geological prospecting for bauxite in Guangxi, Henan Province, and a series of large bauxite backup base were found, among which Caoyao bauxite deposit in Yingci county, Henan Province, Xinhao bauxite deposit in Jingxi county, Guangxi Province, and Longhe bauxite deposit in Napo county, Guangxi Province, were the large scale by further work, others like Chang'an bauxite in Wuming county of Guangxi, Yinzu-shika bauxite in Guigang city of Guangxi were with the great potential.

**Lead and Zinc deposit:** Newly found occurrences are 92, among which 2 were large-scale, 20 middle-scale, 70 small-scale, and 167 occurrences were the exploration stage. New progress was achieved in geological prospecting for lead and zinc in Tongkeng tin deposit in Nandan County, Guangxi Province, and with the zinc reserves 1.73 million tons. In the periphery part of upper Yangtze River belts, a series of the "layer-controlled and rebuilt" lead and zinc deposit have been found by the execution of the NLRAP, like Longshan-Baojing in Hunan Province, the reserves are 2 million tons, and Mayuan deposit in Shanxi Province, 3 million tons.

### 1.2.2 Standardizing the Mining Claim Market

By the end of 2007, the amounts of valid exploration claims were 29,191, including 1,153 for oil and natural gas; and the amounts of mining claims are 106,202, including 617 for oil and natural gas. 541 exploration claims has been sold off with the total price RMB 1.798 billion, and 9,965 mining claims with price RMB 3.285 billion.

### 1.2.3 Mineral Resources Conditions investigation.

The assessment nationwide of mineral resources potential and the examination of the utilization of mineral resources has been carried out since 2007, which include 25 key minerals, such as coal, iron, copper, aluminum, lead, zinc, and potash, and conclude geological rules of the region in order to guide commercial geological investigation.

### 1.3 Proposed Future Activities and Assistance Required from CCOP in Support of Future Activities

Experiences of deep mineral exploration of 500-2,000 meters underground, and the methodology of mineral exploration in some special landscape areas such as in the areas of deserts, forests cover, and swamps.

## 2. ENERGY PROGRAMME

### 2.1 Summary

By the end of 2007, the accumulative oil reserves in place were 27.74 billion tons, and the nature gas 7.39 trillion cubic meters in China. The remaining oil reserves were 2.095 billion tons and the nature gas 2.56 trillion cubic meters.

There were 1,231 million tons of oil in newly found proved geological reserves in China in 2007, increasing 29.8 %; and it was the 5<sup>th</sup> to over billion tons from year of 1949. Three fields reported more than hundred million tons of oil in newly found proved geological reserves, and these fields are Ji Dong Field, Chang Qing Field, Da Qing Field. Five basins reported more than 50 million tons of oil in newly found proved geological reserves, and these basins are Bohai Bay, Songliao, Bohai Bay, Ordos, Tarim, Jungar (Table 1).

Table 1. The basins of newly proven geological reserves with 50 million tons

No.	Basin	Newly proved geological reserves (million tons)	Newly proven commercial recoverable reserves (million tons)
1	Bohai Bay	651.03	130.98
2	Songliao	147.78	23.44
3	Bohai offshore	126.37	23.58
4	Ordos	117.56	20.31
5	Tarim	95.02	9.99

In 2007, China registered 654.51 billion cubic meters of natural gas in newly found proven measured petroleum initially in place, increase 14.2 % year to year; and 2,563.37 billion cubic meters of natural gas in remaining commercial recoverable reserves. Five basins reported more than 50 billion cubic meters of natural gas in newly found proved geological reserves (Table 2).

Table 2. The basins of newly proved geological reserves with 50 billion cubic meters

No.	Basin	Newly proved geological reserves (billion cubic meters)	Newly proven technical recoverable reserves (billion cubic meters)
1	Songliao	201.20	98.93
2	Sichuan	131.40	69.56
3	Ordos	126.51	60.36
4	Tarim	66.14	39.29
5	Bohai Bay	64.99	14.95

Crude oil production in China in 2007 was 187 million tons, up 1.6%; and gas production was 69.31 billion cubic meters, up 18.6 %.

Table 3. The crude oil output of main basins in China

No.	Basin		2007 (million tons)	Percent year to year
1	Bohai Bay	Onshore	53.15	0.41
2		Offshore	14.17	0.66
3	Songliao		47.61	-2.91
4	Ordos		25.05	11.60
5	Tarim		11.79	9.46
6	Zhujiangkou		11.80	-3.24
7	Jungar		12.52	3.66
<b>Total</b>			176.10	1.47

Table 4. The natural gas output of main basins in China

No.	Basin	2007 (billion cubic meters)	Percent year to year
1	Songliao	3.049	10.99
2	Sichuan	17.23	10.77
3	Ordos	12.46	39.75
4	Tarim	16.36	37.69
5	Bohai Bay Onshore	4.37	1.77
6	Tsaidamen	3.402	39.86
<b>Total</b>		59.313	21.46

## 2.2 Annual Review of Activities

### 2.2.1 Exploration and Exploitation

China National Petroleum Corporation (CNPC) is the largest oil and gas producer and supplier in China. Its oil and gas exploration and development mainly focus on Northeastern China, North China, Northwestern China and Southwestern China.

CNPC had new oil and gas discoveries both in domestic and in overseas exploration in 2007. It discovered the Jidong Nanpu Oilfield which is with relatively high crude oil reserves. Moreover, significant progress was achieved during the oil and gas exploration in the Sichuan Basin, the Erdos Basin, the Songliao Basin and the Tarim Basin. New progress was also made with discovery of relatively high reserves in Chad and Kazakhstan.

The new Nanpu Oilfield is located in Tangshan City of Hebei Province (Caofeidian Harbor), and its geological location is in the Nanpu Sag which is at north of the Huanghua Depression in Bohai Bay Basin. The favorable exploration area of Jidong Oilfield Company is 1,570 km<sup>2</sup>, including the continent area 570 km<sup>2</sup> and tidal zone and shallow water area 1,000 km<sup>2</sup>. On the basis of the past work, 4 oil bearing structures were delineated in Nanpu Oilfield and fulfill 1.02 billion ton three-class oil geology reserves (equivalent), including the proven reserves is 405.07 million ton, the controlled reserves is 298.34 million ton, prospective reserves is 202.17 million ton, and the gas (solution gas) geological reserves is 140.1 billion cubic meter (converting the oil equivalent is 111.63 million ton).

Jidong Nanpu Oilfield is an uncompartimentalized, high-quality and effective oilfield. The reserves scale is large, the oil layer thickness is large, and oil layer average thickness of the single well meets up to 80-100m. The single well production and the reserves abundance are high, the single well daily output of completed vertical well is 80-100 ton, and the horizontal well is 200-500 ton. The abundance of oil reserves is 5.07 million ton/km<sup>2</sup>. The oil layer physical property is well, the oil quality is good and the producing test is pretty. The buried depth of main bed of interest is 1,800-2,800m.

The big progress of natural gas exploration was made in Kuque foreland of Tarim Basin, western China, three giant gas fields were discovered. The strata are Jurassic and Triassic clastic rocks interbedded with coal measures. Its source rocks are III-type kerogen mostly in which H/C is less than 0.8. The salt layers in Palaeogene are their good seals.

CNPC has extensively initiated works for the secondary recovery of mature oilfields so as to maintaining a steady oil and gas production through the deployment of various comprehensive measures including deepening fine reservoir characterisation, stabilizing oil production by water-cut control, tertiary oil recovery, as well as actively promoting sophisticated technologies such as horizontal application and under-balanced drilling. The foundation for oil stabilization in the mature oilfields has been consolidated. CNPC has also conducted overall assessment, planning and development building up the production capacity in new fields.

Total crude oil and natural gas output of CNPC in 2007 was 1,110 million barrels of oil equivalent, including 838.8 million barrels of crude oil and 1,627 billion cubic feet of marketable natural gas.

China Petroleum and Chemical Corporation (SINOPEC) made the significant breakthrough of exploration in Aiding block in Tahe Oil Field in the West and buried hill of Mesozoic Era of Dongpu in the East in 2007. SINOPEC completed 12,466 kilometers of 2D seismic and 9,317 square kilometers of 3D seismic and drilled 557 exploration wells with a total footage of 1,708 kilometers. The newly added proved reserve of oil and gas was 647 million barrels of oil equivalent. In terms of development, the construction of the Sichuan-East China Gas project broke a new ground for SINOPEC's fast development in the natural gas business. Meanwhile, the construction of production capacity in key production areas has been enhanced and the development scheme of reserve through enhanced efforts in developing low-yield reserves has been optimized, resulting in steady increase in oil and gas production.

In 2007, SINOPEC drilled 2,976 development wells, with total footage of 7,247 kilometers. The newly added crude oil capacity was 6.05 million tons per year and the newly added capacity of natural gas was 1.66billion cubic meters per year. On the basis of maintaining stable production in the eastern mature fields for several years, SINOPEC took a

faster pace in increasing production capacities in new blocks in the western area in 2007. The production in Tahe oil field has reached 5 million tons per year for the first time.

The expenditure for the exploration and production segment was RMB 54.498 billion. Fairly rich oil and gas reserve was found in the northeast of Sichuan Province, Aiding block in Tahe field, Dongpu trough, the subtle reservoir in the east of China, the deep layers in the west of Sichuan province and in Songnan block. The construction of Sichuan-East China Gas project has commenced. The capacity of newly built crude oil and natural gas production was 6.05 million tons and 1.66 billion cubic meters per annum respectively.

Further optimize exploration, development and production plan. Enhance efforts to develop low-grade reserve to increase the recovery rate. The Sichuan-East China Gas Project will be substantially completed by the end of 2008, which will lead to a considerable expansion of the natural gas business. SINOPEC plans to produce 42 million tones of crude oil and 9 billion cubic meters of natural gas in 2008.

SINOPEC further accelerates its pace of technological innovation, which will give technical support to the development of its core businesses. In developing the exploration technology of oil and natural gas, main efforts will be made at conducting fundamental research on the stable production in the eastern areas, where reserves of oil are abundant. Research will also be deepened in respect of the geological condition and oil and natural gas distribution pattern in the key strategic regions such as south China, Ordos and Tarim. SINOPEC also carries out the research and development of technologies to improve the recovery rate in the eastern matured oil fields and efficiency of development in major blocks in the West of China.

China National Offshore Oil Corporation (CNOOC) is the largest offshore oil and gas producer in China. CNOOC has evolved from an upstream company into an integrated energy company. The business portfolios include the upstream (oil and gas exploration, development, production and sales); mid and downstream (gas and power, chemicals, refinery, fertilizers); technical services (oilfield services, offshore oil and gas engineering and construction, logistics services); financial services; and alternative energy.

As one of the world's largest independent oil companies, CNOOC has four major offshore production areas in China, such as Bohai Bay, the Western South China Sea, the Eastern South China Sea and the East China Sea. In 2007, CNOOC operated 58 drilling wells and 6 drilling wells in partnership with international companies. Oil and gas production of the year reached 40.47 million tons of oil equivalents.

In 2007, CNOOC achieved exciting results in exploration with 12 commercial independent discoveries, the added geological reserves reaching a new peak in recent years. The Company also completed appraisals for 10 oil and gas bearing structures.

Overcoming unfavorable factors such as the production delay caused by a typhoon at the Lihua Oilfield in 2006, and a decrease in production on old oilfields, CNOOC achieved net oil and gas production of 171 million barrels-of-oil-equivalent, with a year-on-year increase of 2.6%.

In 2007, CNOOC was ranked 395 on the "Forbes Global 2000" and 13 in "Asia's Fab 50 Companies" also released by the Forbes Magazine. It was granted the title of "The Most Shareholder-Friendly Company in 2007" by the Institutional Investor Magazine.

Liuhua 11-1 Oilfield restarted full scale production in 2007, adding 1.2 million tons of oil production and about RMB 4 billion to the Company. Bozhong 34-5 Oilfield, the small offshore oilfield in China started production. To make the small reserve commercially recoverable, CNOOC made substantial technological innovations. It made full use of the nearby offshore facilities and adopted the development model of "one submarine pipeline, one platform and one submarine cable", setting a leading example in the field of marginal oilfields development.

On April 30, 2007, the "HAIYANG SHIYOU 117" vessel hull, the biggest floating production, storage and offloading (FPSO) vessel jointly invested in by CNOOC and Conoco Phillips China Inc., was completed by Shanghai Waigaoqiao Shipbuilding Inc., a subsidiary of the China State Shipbuilding Corporation. In 2008, it will be operated in the Penglai 19-3 Oilfield. So far "HAI YANG SHI YOU 117" is the largest offshore engineering project contracted in China. The vessel has a length of 323 meters, a width of 63 meters, and a storage capacity of 2 million barrels of crude oil.

On November 8, CNOOC finished the construction of the first offshore wind power station in China, marking the Company's progress into renewable energies.

China United Coal-bed Methane Corporation (CUCBM) made a big investment of coal-bed methane (CBM) development in China in 2007. Self-financed projects by CUCBM accounted for RMB 31.9461 million. The investment of international cooperative projects reached USD 70.94 million. 270 wells were drilled, among which 196 wells belonged to self-financed projects, international cooperative projects accounted for 74 wells. The number of fractured wells reached 145 wells/ 170 seams, 116 wells/ 132 seams were fractured in self-financed project, 29 wells/ 38 seams were fractured in international cooperation project; CUCBM made producing 144 wells, 63 wells in self-financed project, 81 wells in international cooperation project. The sales amount of 16.27 million cubic meters was completed.

CUCBM has already finished drilling 405 vertical wells, four horizontal wells in south of Qinshui with the production capacity of 0.4 billion cubic meters. The 40 wells drilled in the earlier stage has shown very good benefits of development and production, the gas production of single well per day reached 3,500 to 4,000 cubic meters, up to now, 300 vertical wells and 4 horizontal wells has been drilled, fractured and produced, it's estimated that CUCBM would construct production base by the end of 2008 with the sales capacity of 0.4 billion cubic meters in south of Qinshui, where CUCBM had the condition of constructing CBM field and established the first branch company of CUCBM.

The first period of "National Demonstration Engineering Project"- Panhe Pilot Test Project has basically completed with the sales capacity of 0.15 billion cubic meters, which provided foundation for large-scale development and made CUCBM enter into the stage of commercial operation.

CUCBM has made great achievements in Duanzheng gas production area. 255 wells has been drilled by the end of February, the sales capacity of 151 wells has been finished as matching. It's estimated that CUCBM will construct the sales capacity of 110 vertical wells and 2 horizontal wells and reach the sales capacity of 0.25 billion cubic meters, Duanzheng gas production area becomes another gas production area of south of Qinshui CBM field.

The fracturing of 5 wells and producing of 11 wells were completed in 2007, and CUCBM also successfully finished the installation, adjustment and test running of 2 compressors with 110KW, which formally started to transport commercial gas for civil residents of Hancheng city in Oct. 23.

In 2007, the proven reserves report in this area was approved by experts appointed by Petroleum Reserves Office of Ministry of Land and Resources, the proven CBM geologic reserves in Hancheng area reaches 5.078 billion cubic meters, it's estimated that we could construct the production capacity of 0.15 billion cubic meters per year in this area.

The projects of resources survey in Duanshi Shanxi province, Wangzhai, Qinyuan Panhe, Shizhuangnorth, Aiding lake Xinjiang province, Shenbei, Enhong Yunnan province, Zhaotong, Jixi-Hegang Heilongjiang province are going well, which make the potential development areas are discovered.

The ODPs of ShizhuangSouth and Jincheng Panzhuang have been completed. At present, the ODPs of the above two projects have been completed and gotten the approval for extending the prepared work from NDRC. The approval of land leasing, environment evaluation, and soil and water conservation are currently being processed. It is estimated that in the second half year of 2008, the ODPs will be submitted to the relevant government departments for approval.

The producing of 6 horizontal wells of Jincheng Panzhuang have reached the highest level of domestic CBM production per day, among which, the highest production per day of a single well could reach 100,000 cubic meter, and the gross production per day is 300,000 cubic meter. In the view of that situation, a CNG station with the capacity of 100,000 cubic meters per day is under the construction. In the year of 2007-2008, 4 international cooperation contracts are signed, and the scope of cooperation is expanding accordingly.

In 2007, CUCBM firstly applied for the international science and technology cooperation project — to inject/sequester CO<sub>2</sub> in coal seam to exploit coal-bed methane. In October 2007, the Ministry of Science and Technology issued the letter of approval. The financial support of the projects reaches 4,900,000 RMB, and by now, 2,290,000 RMB has been paid.

As one of the leading organizations of important and special project of science and technology -- <Development of Large Oil and Gas Field and Coal-bed Methane>, CUCBM has achieved the compilation and demonstration about coal-bed methane part of the implementation program, and is responsible for a demonstration project and three scientific research projects.

CBM project has been in the list of state “863” program for the first time, and CUCBM are responsible for two subjects of those. At the same time, CUCBM has submitted another six subjects for state “863” program of the year of 2008, which are under the approval and arrangement of the Ministry of Science and Technology. CBM projects being in the list of “863” program is a meaningful guidance for CUCBM to expand the field of science and technology research, and to deepen the achievements of science and technology. In addition, under the approval of NDRC, CUCBM played a leading role to cooperate with some other relevant companies to establish “China United Coal-bed Methane National Engineering Research Center”.

As a leading company in the field of CBM industry, CUCBM undertook the responsibility of making the standards and regulations of CBM industry. “Producing Engineering Technology Regulation of CBM Well”, “Surface Facility Engineering Design Regulation of CBM”, “Vertical Well Drilling Operation Standard of CBM”, “Geological Logging Operation Standard of CBM”, “Logging Operation Standard of CBM”, and “Development Program Establishment Standard of CBM” were submitted to China National Coal Association for applying the industry standard. Meanwhile, State Administration of Work Safety issued arranged the work of establishment of three safety standards, which are “Safety Regulation of Preventing Fires and Exploding of CBM Exploitation”, “Safety Regulation of CBM Gathering and Transportation”, and “Safety Regulation of CBM Storage and Transportation”. We made clear of the organization of three safety standards and submitted to the State Administration of Work Safety.

### **2.3 Proposed Future Activities and Assistance Required from CCOP in Support of Future Activities**

1. Needs the technology for exploration of non-structure oil pools.
2. Carry out the joint research on hydrocarbon reservoirs over 5,000 meters depth with the related country.

The sandstones at depth of more than 5,000 meters often become a low-quality reservoirs with low porosity and low permeability. To explore oil and gas resource in new area and new domain is closely related with high-quality reservoir

3. Injecting CO<sub>2</sub> to increase the recovery of CBM and cooperation on CO<sub>2</sub> sequestration in coal seam.

## **3. GROUNDWATER PROGRAMME**

### **3.1 Summary**

In 2007, Groundwater investigations in plains/basins of North China are fully completed. North Shannxi and Inner Mongolia energy and chemical industry bases located in Ordos Basin, the survey and evaluation of groundwater was further enhanced. The demonstration project of groundwater exploration in endemic disease area in Northwest or Northeast China or severe water shortage areas in Southwest China has been undergoing continuously. Investigations and evaluations of groundwater contamination in eastern plain are implemented continuously; **Annual Review of Activities.**

#### **3.1.1 Groundwater investigations in North China basins/plains**

Based on data from some 10,000 drills and geophysics investigations, in 11 main plains or basins in North China, 3D spatial model of regional aquifer systems are build by use of geostatics method. Hydro-geological basic database and main aquifer parameter database are building. And 3D or para-3D groundwater flow is simulated by use of groundwater modeling software, such as GMS. MODFLOW or Feflow.

### **3.1.2 Groundwater exploitation in Ordos basin**

The project “Groundwater exploitation in Ordos basin” is complemented continuously, including three subproject, that is “Groundwater Exploration in Ordos Basin Inner Mongolia Energy Base”, “Groundwater Exploration in Energy and Chemicals Base in Northern Shaanxi Province” and “Groundwater Circle and Reasonable Development in the Northern Ordos Basin” in 2007. 33 water sources regions in northern Shaanxi energy base have been explored. 20 new groundwater sources regions with available resources  $9.42 \times 10^8 \text{ m}^3/\text{a}$ , were found; 13 water sources regions with available resources  $4.92 \times 10^8 \text{ m}^3/\text{a}$  were checked. 10 groundwater sources regions in Inner Mongolia Energy Base have been investigated in detail.

### **3.1.3 Groundwater exploration in endemic disease area and severe water – shortage areas**

Groundwater exploration was implemented in endemic disease areas in Northeast China and Northwest China or severe water shortage areas in Southwest China. 34 wells were drilled in three pilot counties including Tang County in Hebei Province, Pingluo County in Ningxia Autonomous Region and Zaoyuan County in Heilongjiang Province, supplying Groundwater as a clean, safe drinking water source for more than 120,000 residents. In Sichuan Province of Southwest China, the work of groundwater survey and evaluation and well-drilling demonstration was implemented continuously, about 320,000 demonstration-well were drilled, supporting 1,200,000 residents with drinking water.

### **3.1.4 Groundwater investigation in the southwest karst areas**

Synthetically 1:50,000 scale hydro-geological investigation covering 12,000 km<sup>2</sup> in the southwest 8 provinces has been finished. Development and utilization of karst groundwater by various Engineering in the areas of different karst geo-environment background have got success. 18 pilot demonstration projects were implemented in Daozhen county, Tongren county, Xincheng county of Guizhou Province, and Longshan county of Hunan Province, Which includes 15 wells, 2 subsurface groundwater reservoir and 1 spring storage reservoir, supporting 250,000 residents with drinking water and 100,000 acres plowland with irrigation water.

### **3.1.5 Groundwater contamination investigations in eastern plains**

Groundwater contamination investigations were continued in eastern plains, including Zhujiang Delta, Yangtz Delta, Huaihe Drainage Basin and Huabei plain. The objective of this progame is to investigate the groundwater quality conditions, evaluate the extend of groundwater contamination and make prevention and control zoning of groundwater contamination. In 2007, 140,000 square kilometers area was investigated and 5,095 groundwater samples were collected. Testing data from these samples shows that,  $\text{NH}_4^+$  and  $\text{NO}_3^-$  contamination condition of groundwater becomes severer, the detection rate of organic components comparatively high, but only 5 % of samples exceeds Drinking Water Standard of China, some organic components were detected in public groundwater supply by some extend.

## **GEO-ENVIRONMENT SECTOR**

### **4. COASTAL ZONE PROGRAMME**

#### **4.1 Summary**

The geologic survey of coastal zone in China mainly was carried out by China Geologic Survey, State Oceanic Administration and some institutions and universities in the coastal provinces and cities.

In 2007, China Geologic Survey carried out the projects such as “littoral environmental geologic surveys and assessments in the important coastal zone of China” (2001-2010), “the second-round (2004-2008) researches on modern geologic environmental changes in the circum-Bohai Sea coastal areas” and “investigations of potential marine sand resources in the coastal areas around Chengshantou, Shandong Peninsula (2007-2008). All these projects covered marine environmental geologic surveys and assessments and potential marine sand resource investigations in the circum-Bohai Sea area, coastal area in the west of the South Yellow Sea, off the Yangtze River mouth, and the Zhoushan Islands area.

#### **4.2 Annual Review of Technical Programmes / Activities**

##### **4.2.1 Circum-Bohai Sea region**

Objectives and targets: in the Laizhou, Bohai and Liaodong Bays, dynamically monitoring sea bank sections (including bank surface leveling and monitoring sediment compositions and width of every subzone), conducting multidisciplinary researches on surficial and shallow stratigraphy (sedimentary dynamics, chronostratigraphy, and event stratigraphy etc.), making reconnaissance in the whole region mainly composed of dating of such short half-period tracer isotopes as  $^{210}\text{Pb}$  and  $^{137}\text{Cs}$  to make the work content more concrete, and also developing special subject studies such as the hidden peril of dammed water, origin of the coastal plains, formation of barrier islands off the muddy and sandy coastal zone and 3-D expressions of geologic achievements.

Work finished in 2007 in the coast of the Bohai Bay: (1) researches on changes in modern geologic environments of the coast zone and on Quaternary shallow sediments and structures; (2) dynamic monitoring of changes in modern geologic environments of the coast zone; (3) investigations in bottom materials and shallow stratigraphic structures in the intertidal zone and neritic areas; (4) researches on sedimentation rates in the modern intertidal zone and neritic areas; and (5) analysis of evolutionary tendency of coastal geologic environments. The following work has been done: shallow drilling cores on land (with a total length of 160 m) and on shallow sea areas (with a total length of 80 m); monitoring of coastal profiles, totally 10 km in length; 95 km of shallow seismic profiling and bathymetry.

##### **4.2.2 Coastal Wetland in the Yellow River Delta**

The study area lies in the modern Yellow River delta wetland and ranges from 118°30' to 119°25'E and from 37°30' to 38°15'N.

Objectives and targets: using remote sensing, drilling and hydrogeologic modeling methods to investigate shallow lithologic characters and structures, hydrogeologic and geochemical characteristics and microorganisms and to analyze how geologic evolutions can control ecologic environment in the deltaic wetland.

Work finished in 2007: 200 surface soil samples, 100 deep soil samples, 50 shallow water samples, 25 biosamples, five short column samples. 32 water levels were measured.

#### **4.2.3 Coast in the west of the South Yellow Sea**

The study area, that is, coast from Rizhao to Lianyungang, is located in the littoral area in the west of the South Yellow Sea and goes from 119°00' to 121°45'E and from 33°45' to 36°00'N.

Objectives and targets: to make clear the coastal sedimentary dynamics, bottom material types, geomorphic features as well as shallow stratigraphic structures and formation and evolutionary mechanisms of geohazard distributions below the seafloor of less than 50 m depth and to compile map series of remote sensing interpretation of environmental geology in the study area, map of sea bottom material types, map of geohazard distributions, map series of heavy metal distributions in the seafloor surface sediments, and 1:250,000 scale specifications for investigations of coastal environmental geology so as to provide fundamental geological data for coastal development and comprehensive management.

Work finished in 2007: Two drilling cores with a total length of 140 m; 2,000 km of remote sensing geologic survey and field geologic reconnaissance in the coastal zone.

#### **4.2.4 Off the Yangtze River mouth**

The study area spans from 30°45' to 31°45'N and from 122° to 123°E, consisting of most of the modern Yangtze River delta formed in Holocene and a part of the late Pleistocene delta and roughly covering the offshore area of the Yangtze River mouth.

Objectives and targets: before and after the Yangtze River flow cut off by the Three Gorge dam, carrying out sedimentary dynamic and sediment background survey in the offshore Yangtze River mouth, monitoring changes in the sedimentary environment so as to serve the sustainable development in the Yangtze River deltaic area.

Work finished in 2007: 25 hours of 3-ship synchronous sediment-dynamic survey to measure seawater salinity, current velocity, water depth and turbidity; 300 km of underway sediment-dynamic survey; and 1500 km of shallow seismic profiling.

#### **4.2.5 The Zhoushan Islands area in the East China Sea**

The study area roughly covers the coastal and shallow-sea area around the east end of Shandong peninsula.

Objectives and targets: using multiple geologic and geophysical means to carry out potential marine sand resource surveys in the coastal and shallow-sea area around the east end of Shandong peninsula, Yellow sea in order to evaluate China's offshore marine sand and other solid mineral resources to help land and resource authorities scientifically manage mineral resources under legal process and thus to serve economic development, environmental protection and strengthening government behavior.

Work finished in 2007: 2,400 km of shallow seismic profiling, 730 km of side scan sonar measurement and multi-beam measurement, 50 vibracores, 180 surface samples, five shallow drilling cores with a total length of 160 m, and marine sedimento-dynamic investigation at 6 sites.

#### **4.2.6 Beihai offshore area in Guangxi**

The study area lies within 21°12' -21°36'N and 108°47'-109°06'E, the offshore area of Beihai City of Guangxi.

Objectives and targets: making 1:100,000 scale marine geologic environmental and geohazard investigations to reveal topographic, geomorphologic and sediment types, shallow stratigraphic structures, physical mechanical property of each layer, seawater chemical characteristics, marine hydrodynamic conditions and dynamic sedimentations in key sections, and potential geohazard types and distributions in the offshore Beihai area so as to predict geologic environmental changes, give suggestions of hazard reduction and prevention and serve the local economic constructions.

Work finished in 2007: 605 km of work amount each for side scan sonar, shallow seismic profiling, single-channel seismic and bathymetric measurements, geologic sampling at 54 stations, seawater sampling at 27 stations, 3 shallow drilling cores (totally 155 m in footage), 25 hours of fixed observations of sea currents at two stations for two times, and measurements of parameters such as seawater temperature, salinity and depth at 27 stations, monitoring of one beach profile and 3 coastal equilibrium profiles.

#### **4.2.7 Geological surveys in other coastal areas and symposiums**

In 2007, the project on “Comprehensive Investigations and Assessments of China Coastal Areas” was carried out by the State Oceanic Administration. The project was an integrated job of surveys and evaluations of marine hydrology, organic ecology, marine chemistry and atmospheric chemistry, geology and geophysics, and remote sensing sciences in the sea areas within China’s boundary line of territorial waters and in the coastal and sea island regions of China. Work that was done in 2007 includes investigation of marine chemistry and atmospheric chemistry, surface sampling, shallow seismic profiling, shallow coring, investigations of marine sedimentary dynamics in the coastal areas of Bohai Sea, Yellow Sea, East China Sea and South China Sea.

Geologic survey institutions in some coastal areas carried out the project “Multi-Target Biogeochemical Surveys and Assessment”, and the work in 2007 was done in the Pearl delta and its nearshore area, including surface sampling at 599 sizes and 181 vibracores (each longer than 2 m) in the nearshore areas, surface sampling at 314 sizes and 179 vibracores (each longer than 2 m) in the delta plain.

Institute of Oceanology, Chinese Academy of Sciences and Qingdao Municipal Science and Technology Commission jointly organized an open cruise on the marine science investigation in the offshore of China in July and in August 2008. Scientists attending this cruise finished in situ observation of 8 marine profiles with 67 fixed observational sizes, involving in marine chemistry, marine biology, marine dynamics, and marine geology.

### **5. GEO-HAZARDS PROGRAMME**

#### **5.1 Summary**

In 2007, CGS set up 80 projects on the geo-hazards mitigation. About 100 million Yuan was arranged to these projects. 20 projects of 1:50,000 geo-hazards survey in landslides prone area were set to assess the probability and hazards of the potential landslides. Land subsidence survey and monitoring systems in the Yangtze River delta, North China plain and west China keep going and made a national level land subsidence monitoring system and experimented a process of land subsidence risk management. Several programs were set to study the landslide

mechanism and construct a prediction system to find the economic feasible and practical landslide mitigation methods. The mass-preparation system was strengthened. A national level weather and landslide forecasting program is to find the relationship between weather and landslide and to make the landslide prediction by weather forecast. The experimental landslides monitoring programs in the typical areas of different geo-settings were carried out to implement the study on the new technique for geo-hazards precaution.

## **5.2 Annual Review of Technical Programmes / Activities**

### **5.2.1 The Landslide survey and inventory**

In 2007, about 20 million Yuan were invested in the 1:50,000 landslide survey programs. The surveys in Hekou, Jinping, Nanjian, Yan'an, Lanzhou, Litang, Sinan, Xifeng, Dongchuan, Changyang, and Wuzhou were completed, covering about 15,000 km<sup>2</sup>, with 15,000Km<sup>2</sup> RS survey and about 7,000 km<sup>2</sup> surface survey. Over 2000 more landslides were identified than the programs before. The landslide distribution features in the study areas were clarified. The landslides in every area were divided into several kinds according to the geological condition and topography. The combos of the geological conditions with which the areas are prone to slide are constructed. Through the study of the combos of the geological conditions prone to slide and the landslide distribution features, the susceptible maps and danger maps in each area were made. According to the landslides kinds, some typical landslides were investigated. With the mapping and drilling campaigns on the typical landslides, the stabilities of the landslides were calculated. The results of these typical landslides stability calculation were applied in the judgment of the stable situation of other important landslides according to the relationship the landslides in geology conditions. The mass-preparation systems were strengthened with the progress of the Survey and a new prediction critical was set up. With the results of the Survey, some special topics studies, local rainfall critical studies and risk assessments were carried out. All the results were handed to the local governments.

Program of Geo-environment Survey in the Upper Stream of Yangtze River had made a Rock Mass Discontinuous Survey. The detailed information of the discontinuous features in the rock mass along the Yangtze River bank was got after survey. The rock masses were divided into several kinds according to the features of the discontinuous and the topographies of the Yangtze River bank. 4 very danger rock masses were detected. The rock avalanche distribution feature in the basins of Qingganhe River and Guizhouhe River, the branches of Changjiang River. 6 monitoring systems were set up in the danger rock mass. Danger landslides like Wangxia, Pailou and Tudiling were investigated. The mechanism and the stability were analyzed.

Through the RS survey, surface survey, physical investigation and drilling campaign, the catastrophic landslides in Chongqing, Qinghai, Hubei and Sichuan Provinces had been surveyed and the risk were assessed. With the result of the 1:50,000 landslides survey, the typical catastrophic landslides were clarified out. Among them, 60 landslides were reviewed and investigated in detail. A catastrophic inventory and map were made in each of these four areas. With the typical landslides analysis, the location, boundary, volume, material, location of the shear zone, topography of the shear surface and some other features. A judgment of the stability of these landslides was made and a prediction of the stability of these landslides in the future was made. The mechanism and distribution feature of these catastrophic landslides were made, the key trigger factors were found. A combo of the topography, geo-setting, tectonic feature and rainfall density was found, with which the slopes prone to have a big

volume area failure. At the last, the risk of the landslides and the slopes with the similar combo were assessed.

### **5.2.2 Researches and demonstration of crucial monitoring and warning techniques for the geological hazards**

In 2007, CGS constructed a national level geo-hazards prediction information system. A weather- landslides forecast model had been set up and the software had been made. In August 2007, a national level landslides forecast basing on the software come into use and get a good result.

Yuexi Enshi landslide mechanism study and risk assessment program is a program aiming to test the contribution of the mechanism analysis in the landslide dangerous reduction. From this program, a method from selection of the typical landslides to calculate the stability of these landslides and then to estimate the stability with the similar conditions was tested. In this program, the landslides in Yuexi Enshi area were divided into 10 kinds. And we selected a typical landslide for each kind to do the detailed investigation. The key factors of the landslides were investigated. The section and plan were made. The 3-D models were made and the digital simulations were made. With the results of the digital simulation, the monitoring networks were set up to test the simulation.

Also a serials Monitoring and prewarning demonstrations for the typical geological hazards programs were carried out in 2007. Wuha, Yan'an, Lanzhou, Ailaoshan, Beijing and Southeast part of Fujian Province were selected as the demonstration area to experiment the Karstic Collapses Monitoring, Loess avalanche monitoring, Loess landslides monitoring, Mountain and Valley Landslides monitoring, debris flow monitoring and mass landslides trigger by heavy rainfall monitoring. In Wuhan, the background conditions of the Karstic Collapses, the depth of the Quaternary layer, the structures, the martial, the hydrogeology condition, the geo-engineering condition and the distribution of the cave and the carbonate rock, and some other features were surveyed. The distribution of Karsts and the dynamic factor of collapses were clarified. In Yan'an, the cooperation between CGS and the Meteorological Bureau in Yan'an was carried out. A set of rainfall gauges were set up. The critical rainfall to trigger landslides was studied. From the analysis of some examples, a local critical rainfall was found and a risk assessment map was made. In Lanzhou, the landslides of different kinds were monitored using different methods. In Ailaoshan Area, 10 automatic rainfall gauges were put there. A relation map between the landslides and the slope angle, valley water level, material, rainfall density was made. In Beijing, the paper and report of the debris flow in Beijing were collected. The distribution of the debris flow valley and the significant feature of debris flow in Beijing was summed up. The parameters of debris flow valley were studied. And with the guide of the results, 1: 10000 RS survey and surface survey had been finished. The location and the vegetable condition of these valleys were reviewed. A danger map of the debris flow in Beijing was made. In Fujian Province, a 1:10,000-1:50,000 709km<sup>2</sup> survey was done. 1049 slopes around the residents were reviewed. And a feature card for every slope was made. The according information system was found. 10 rainfall gauges, 4 water content levels, 4 ground water table monitoring system, 6 displacement monitoring systems and 1 Ground Stress monitoring system were put on the typical landslides. The automatic data lodging and transfer system was in use.

### **5.2.3 Landslides survey and evaluation of regional crust stability in Tibet area**

With the aim to give basic information to the important architectures plans, several programs to survey and evaluate the landslides, crust stability, active tectonic and Quaternary sediment were carried out in 2007. A RS landslides survey program showing us a brief view of the landslides distribution in Tibet was finished in 2007. 361 huge debris flows, 151 large scale landslides, 11 broken glacier lakes, 24 prone to break glacier lakes and 7 huge rock collapse were identified. The kinds and features of the geo-hazards in Tibet area were clarified and the potential risk was evaluated. Several periods RS investigation were made in Pali River Basin for a landslides dam lake. 9 phases Quick Bird images were got. From these images, the feature of the Pali River was very clear. The motion in the recent 4 years of Pali River was recorded. The study with over 20 phases RS image reviewed the change of Pali River from 2004-06-22, the day the river was dammed. And the first broken of the dam was recorded and the trend to be stable was clear. A 3-D digital visual model was constructed. A program aimed to reveal the active tectonic feature and lodge the historical earthquakes was carried out in 2007. From 5 prospecting trenches, the tectonic movement indicators were found and the time of each historic earthquake was identified. The GPS monitoring along Qingzang Railway was conducted in 2007, the result gave us a precise velocity data of the crust movement and a precise data of the tectonic movement. The 3-D ground stress monitoring experimental station was set up in Qushui. A period of ground stress monitoring was finished. The results showed the relationship between ground stress and the depth in the Southern Block of Tibet. The consequence geo-hazards of the tectonic, hummocked ice and sand dune was surveyed and evaluated. A landslides survey and regional crust stable evaluation for the Dianzang Railroad was carried out from Linzhi to Zuogong. A grading strategic for the active tectonic in the Southwest China was given. The main factors to evaluate the regional crust stable in these area were found. A new theory about the continuous increasing of the regional crust stable was developed. Chuanxi Valley Quaternary Geology survey program finished the relationship study between the landslides distribution and the Quaternary features. A Quaternary map in Hanyuan and Jinchuan was finished.

### **5.2.4 Land subsidence survey and monitoring systems in the Yangtze River delta, North China plain and west China**

The monitoring networks of land subsidence, GPS and groundwater regiment, which cover all regions, have been set up. A 3D automatic monitoring system was connected in some important cities and some land subsidence influenced areas, which consists of precious benchmarks and standard marks buried in different depths and in bedrocks. The data from these networks were comprehensively integrated and analyzed. A subsidence risk management system in Yangtze River Delta had been set up. The GPS and InSAR combined monitoring system issued the data to the government every day. The amending plan is in progress.

### **5.2.5 Data analysis**

A series of maps were finished in 2007, including the national landslides map (1:4000,000), the national rock avalanche map (1:4000,000); the national debris map (1:4000,000); the national ground collapse map (1:4000,000); the national mine environment map (1:4000,000).

A study and analysis on the County/city-level geologic hazards survey in 700 counties had been done. The landslide distribution feature in the national level is clear, and the features of landslides in different area were concluded. A guide for the establishing of mass

preparedness was finished. A successful examples integration of the mass preparedness was made. A landslide map for each county was compiled in 2007.

## **6. ENVIRONMENTAL GEOLOGY PROGRAMME**

### **6.1 Summary**

Geo-environment investigations in main cities and Bohai Region are carried out continuously; continue to strengthen environment investigation and evaluation of hydrogeology in the main karst river basins within 8 southwest provinces at the scale of 1:50000; continue to carry out the demonstration of groundwater development and land renovation in typical karst river basins in North south China.

### **6.2 Annual Review of Technical Programmes / Activities**

#### **6.2.1 Investigation and evaluation of environmental geology in main urban areas of the country**

Until to 2007, the environment geological surveys in main 126 cities were completed. In 2007, this kind of work in 28 cities of Jilin, Henan, Guizhou, Hunan and Fujian provinces was finished. The evaluation of environment geology problems in urban areas such as 7 provinces mentioned above were got, and finished strategic researches on urban environment geology of China, have analyzed the types of environment geology problems, distribution and the development mechanism of the cities of China, and have established analysis and evaluation methods for city engineering geology environment.

#### **6.2.2 Environment geological investigation and vulnerable evaluation around the Behai Sea area**

Environment geological investigations in the main city, seaport and coastal shore line in Behai Sea area are implemented continually. In 2007, the monitoring of sea level change, sea water intrusion and coastal shore line change was made. Environment geological investigations in Tianjin Binhai new developed area and Caofeidian port in Hebei Province was initiated, which includes regional earth crust stability investigation, land subsidence warning system establishment and groundwater investigation for emergence condition.

## **GEO-INFORMATION SECTOR**

## **7. GEO-DATA AND INFORMATION MANAGEMENT PROGRAMME**

### **7.1 Summary**

The progress was made by CGS since 2007 in the field of geo-information. Invest in data resource collection and systematic national fundamental geo-databases construction is continuously enhanced. A breakthrough was made in GPS based geo-compass development. CGS network construction and information security were improved, Issue and following-up of information standards are stepping forward steadily. The progress was also made by CGS both in geo-data and geo-archive release and in data processing service to the public in 2007.

### **7.2 Annual Review of Technical Programmes / Activities**

#### **7.2.1 National fundamental geo-database development**

### **7.2.1.1 Regional geological map databases**

350 sheets of 1:50,000 and 70 sheets of 1:250,000 geological map data have been digitized, coordinated and put into the database. Data managing system software has also been developed and improved. 'Provincial database construction guide' has been revised in practice and national uniformed code base and legend library formed. Spatial data transformation from MapGIS to ArcINFO were studied and successfully tested.

### **7.2.1.2 Databases of airborne geophysics, remote sensing and physical property of rocks**

Airborne geophysical database: General framework of the database has been improved and datasets of 5 new survey areas have been coordinated and put into the database, including airborne magnetic, airborne EM, and airborne radioactive data and survey information. The database managing systems were developed based on ArcSDE and Oracle. Enhanced functions of the system are directory tree generation, data input and output, data quality control, data editing, data query, retrieval and analysis, database logging and archiving, layer control, thematic mapping and output, etc.

Remote sensing database: 300 sheets of spatial images of different sources and types, and 10,000 square kilometers aerial images have been coordinated and put into database. Storage of the database is now more 3,000 sheets spatial remote sensing images and 38,000 square kilometers aerial remote sensing images in coverage.

Database of physical property rocks: A trail database is completed for rock physical parameters. Standard is roughly established and more 30,000 items of physical parameter of rocks have been stored in the database, including density, susceptibility, resistivity, etc.

### **7.2.1.3 Environmental geology and geo-hazard databases**

1:500,000 scale spatial database of environmental geology: Archive collection, digitization, attribute data collection, data coordination and data input into the database have been finished for 8 provinces, including Hainan, Guangdong, Fujian, etc. with 4GB data in total. Spatial data managing system is also developed for administrative classification, layer control, metadata generation and data quality control.

Geo-hazard monitoring database: data collection, coordination and integration of Ya'an and the Three Gorges' demonstration areas have been completed and put into database. Geo-hazard data releasing framework based on the web is also constructed.

## **7.2.2 Main procedure informationization of geological survey**

### **7.2.2.1 Development and use of field geological data acquisition system**

Integration of field data collection based on digital geo-compass has made it practice that field observation, data collection, description, data basing, data processing, and result expression are all in digital format. Field geological data acquisition system is now widely applied in the work of both regional geological mapping and mineral investigation. Geologists in underground water resource and geo-hazard investigation are also taking courses to use the system, and skillful staff number enlarged rapidly each year.

Geo-compass of the first grade techniques in the world has made field outcrop measurement fast, easy, automatic, digital and with high accuracy.

### **7.2.2.2 Data processing and integration software development**

Data processing and synthetic analysis systems for mineral deposits investigation and for environmental geology have been continuously developed, and improvements were made in 3D ore bodies display, body's connection, mathematical modeling and statistics, etc. The system for environmental geology can carry out 6 kinds of analysis tools, including AHP levels, increasing analysis, decision tree, Bayes, artificial BP network and RBF for dynamic regional environment evaluation. It has been put into use for detail observation data modeling in Xinping, Yunnan Province and Baoji, Shanxi Province with satisfaction.

Gravity and magnetic data processing and interpretation software RGIS, Geochemical data analysis software GeoMDIS, Mineral resource assessment software MORAS, and Heavy mineral anomaly analysis software has been improved and widely adopted by provincial geological organization in 2007 for national mineral resource assessment.

## **7.2.3 Information technology supporting system**

### **7.2.3.1 National geological network**

National geological network has connected CGS with regional survey centers and provincial organizations. Real-time data transmission system based on satellite IP communication technique have been established and put into use for fast maneuver for field work and emergency control. It played an important role in rescue communication this summer after May 12 Wenchuan Earthquake.

### **7.2.3.2 Network maintenance and online service**

CGS' website was revised in 2007, and now the website of CGS become a 'one-stop' information station, an important platform for national geological survey activity, and an authority, standard, professional, in time and geo-information service window to the public.

### **7.2.3.3 Geo-information standards**

Geological data model standard has nearly been completely drafted, which covers 22 professional disciplines. Professional classification, including fields and terms cross-over, and catalogue are studied with coverage of 10 different disciplines: geological mapping, mineral, hydrogeology, environment geology, engineering geology, geophysics, geochemistry, mineral engineering, remote sensing, and geo-laboratory.

Regulation for CGS Network Daily Running and Maintenance, Data Transformation of Geo-hazard Monitoring, and Underground Water Database Standard are being issued and standard frames are already formed. First edition of Data Model Based on MapGIS for integration of multiple geological discipline data in national mineral resource assessment is formed recently.

## **7.2.4 Geological data and archive service system**

### **7.2.4.1 Service infrastructure of geological survey data and archives**

User order oriented on-line and off-line geo-data and geo-archives service started in 2007, including archive catalogue and digital context. Geochemical database, geological map database of 1:200,000, 1:250,000 and 1:500,000 and geo-data sets of the Wenchuan earthquake region have been released to the public. Roughly 230 GB data have been provided since 2007 by CGS to the public, totally more than 320 thousands sheets in map sheet. More than 5,000 geo-archives have been put onto the web. Some 6,000 geo-archive are digitized, and thus 20% of China national geological archives are so far digitized.

#### **7.2.4.2 Geo-information integration and service**

Geo-information platform development: geological survey data integration and service platform based on SOA, grid service GGIS, SIG are developed. The improvements have been achieved in systematic framework, data management, analysis and computing, service oriented user interface, spatial information integration, data security and man-machine communication and visualization, etc. in practice. Huge quantity data and image organizing, retrieval and release can be done in a short time on the platform. The geological map series of China from 1:5 million to 1:500,000 scale can be released and send to user with data flow.

CGS data and information sharing system construction: Geo-archive borrowing service system was upgraded in 2007. With this system, there are more than 21,000 time data download and searching in CGS website in 2007, in which more than 3700 times download of 1:2.5 million geological map, more than 1340 times download of geological work index, more than 1000 times download of geochemical maps, 1000 times more download of mineral deposits maps and some 6800 times download of geo-archives.

Remote sensing information system for resource and environment study is developed based on Geo-information metadata standard of CGS, and sub-system for information managing and data releasing has been developed.

CGS has done a huge work for Wenchuan earthquake rescue and geo-hazard investigation with high efficiency since May 12, 2008 in geography, remote sensing, geology and geo-hazard data coordination, transformation, processing and mapping. Roughly 1000GB data were processed and provided in time for decision makers, rescue staff and field investigation geologists.

#### **7.2.5 Geo-specimen information system**

Geo-specimen database system has been upgraded in 2007 for practical data input, edition, search and retrieval. And information of core specimens of more than 20,640 meters long from 35 drill holes, and 374 important rock specimens are coordinated and put into the database.

#### **7.2.6 Geo-information cooperation with CCOP**

Cooperation between CCOP and China in the field of geo-information had been continuously enhanced in 2007 and big progress's made.

##### **(1) CCOP EPPM metadata workshop**

CCOP, CGS and SINOPEC jointly held a workshop on nature gas metadata in June 2007 in Chengdu, China. Total 45 participants from CCOP Member Countries attended this Workshop. After a fully discussion on both experiences and lessons learnt in the past related with metadata, CCOP Member Countries agreed that metadata was a very important work for both geo-information and geo-projects, and that CCOP EPPM has its own problems on metadata standard, EPPM should issue the standard jointly with CCOP metadata working group to develop a whole coverage metadata standard for CCOP projects.

##### **(2) CCOP Metadata Project Phase II –First Workshop**

In order to issue a whole coverage metadata standard for CCOP programs and projects, the Workshop supported by CGS was held in Haikou, China on 17-21 March 2008. More than 26 participants from CCOP Member Countries attended this 4-day Workshop. CCOP metadata standard was drafted by the CCOP metadata working group at this Workshop based

on ISO19115 and CGS geo-information metadata standard (DD2006-05), with reference to Dublin core. Now, the standard draft will soon finish its circulation for comment and modified and formally published by the end of 2008.

## **International Year of Planet Earth (IYPE) in China**

Approved by the State Council of the People's Republic of China, the China National Committee for IYPE (NC China) was established in 2007. NC China is comprised of 25 members, including the Ministry of Land and Resources (MLR), the Ministry of Foreign Affairs, the Ministry of Education (the China National Commission for UNESCO is affiliated to), the Ministry of Science and Technology, the Ministry of Finance, the Ministry of Environmental Protection and etc. Mr. Xu Shaoshi, Minister of Land and Resources, serves as the Chairman of the Committee.

The first meeting of NC China was held at the headquarter of MLR in December, 2007, the China's Action Plan for IYPE was reviewed and adopted and the slogan and logo for IYPE activities were released at the meeting.

Invited by UNESCO, a NC China delegation, led by Mr. Wang Shouxiang, Vice-Minister of MLR, attended the Global Launch Event of IYPE held at UNESCO's headquarters in Paris, France. On behalf of NC China, Mr. Wang Shouxiang was invited to deliver a speech at the Event.

In accordance with NC China's Action Plan, geoscience outreach activities (publicity, education and scientific popularization) and scientific researches have been actively pushed forward.

With the theme of "Understanding the Earth for Harmonious Development", the IYPE China Launch Event and Celebration of the 39<sup>th</sup> Earth Day was hosted by NC China in Beijing on April 22, 2008. Mr. Wang Shouxiang, Vice-Minister of MLR, presided over the ceremony.

Mr. Lu Xinshe, Vice-Minister of MLR, Mr. Zhang Xinsheng, Vice-Minister of Education and Chairman of the China National Commission for UNESCO, Mr. Zhang Hongren, the President of the International Union of Geological Sciences (IUGS), Mr. Min Bista, Representative of UNESCO Beijing Office, Mr. Eduardo de Mulder, Executive Director of IYPE Secretariat, addressed the Event. Over 500 people, including representatives from NC China, geoscientists, students from universities and primary schools, journalists and etc., attended the Launch Event.

NC China has also actively participated in global IYPE activities. A representative of NC China attended the IYPE African Launch Event and Symposium held in Tanzania in early May and delivered a talk on the work undertaken by NC China and the role of geoscience in the sustainable development of China's economy and society.

Due to its active work, NC China received positive appraisal at the Meeting of the IYPE National Committees held during the 33<sup>rd</sup> International Geological Congress (IGC) in Oslo, Norway in August 2008.