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# China Mineral Resources

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# Foreword

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In 2014, China has continued the implementation of *National Exploration and Development Planning* and achieved outstanding progress in geological prospecting, and it is the reserves & resources of major mineral resources that increased obviously. There is a sustainable growth in the production and import of major mineral products as well as a further improvement in the supplying capacity. Efforts have been made to promote the survey and evaluation of geology and mineral resources, and better social services. To facilitate the construction of ecological civilization, China has paid more attention to enhance the environmental recovery of mines, and over 25% of the land damaged by mining development has been reclaimed.

Chinese government has further streamlined the administration, taken multiple measures to stimulate the market, standardized the management of mineral resources, and achieved progress in the conservation and comprehensive utilization. Since 2014, China has canceled 23 examinations and approvals pertaining to geology and mineral resources, brought the mineral resources compensation rate of coal, oil and natural gas to zero and applied ad valorem collection of resource tax on coal. In addition, China has released the first index criterion for the comprehensive utilization of mineral resources and the minimum index requirements for the extract recovery rate, concentration recovery rate and comprehensive utilization rate of 8 minerals.

Ministry of Land and Resources has formulated the Report on China Mineral Resources since 2011, in order to make the public better understanding the situation of exploration and exploitation of mineral resources, obtain more knowledge on the policies regarding the management of mineral resources, and enhance the capacity of public service and impel the opening of administrative information. This report systematically analyzes the situation of mineral resources, emphatically introduces the main progress in surveys and evaluations of geology and mineral resources, exploration, development and utilization of mineral resources, mine ecological civilization construction and management of mineral resources in China since 2014; reflects the dynamic state of mineral resources management from the perspectives of mineral resources planning, exploration & mining rights, reserves, exploration, supervision and so on; expounds the reform progress and essential policies from the perspectives of the construction of policy system, reform of taxes and charges; presents the latest progress of China's technical innovation of geology and mining from the perspectives of geological theories and technologies of exploration and exploitation; summarizes the situation of international cooperation on mineral resources.

We hope this report will be an important way to know of and understand the general situation

of mineral resources in China for those who care for and support the country's undertaking of mineral resources.

The statistical data of this report are mainly sourced from the National Bureau of Statistics, the Ministry of Land and Resources and the General Administration of Customs of the People's Republic of China, excluding those of the Hong Kong Special Administrative Region, the Macau Special Administrative Region and Taiwan Province.

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# Chapter I

## Situation of Mineral Resources

The global mining industry has witnessed a continuing depression along with the economic rebalancing and a weak demand for mineral products, which has been challenging the globe since 2014. At the same time, China has entered the phase of adjustment in its mining development. In order to stimulate market and propel the transformation and upgrading of the mining industry, Chinese government has intensified the geological exploration and improved the conservation and comprehensive utilization of mineral resources, streamlined the administration and improved social service.

**Deep comprehension of mineral resources potential.** In 2014, China has spent RMB114.5 billion on geological exploration, and there are 249 newly-discovered large and medium-sized ore fields. Significant breakthroughs have been made in the exploration of oil and gas resources, and the geological reserves of shale gas 106.8 billion cubic meters first reported. The newly-discovered geological reserves of oil are 1.06 billion tons and those of natural gas reach 943.8 billion cubic meters. In the 45 major minerals, the reserves & resources of 36 minerals increase, among which the remaining technically recoverable reserves of oil rise by 2.0% and those of natural gas increased by 6.5%; the reserves & resources of coal grow by 3.2% and those of iron ore increased by 5.6%, copper 6.3%, bauxite 3.2% and gold 9.4%. The latest dynamic evaluation on oil and gas resources indicates that geological resources of oil have reached 108.5 billion tons, natural gas 68 trillion cubic meters, shale gas 134 trillion cubic meters, and coal-bed methane 36.8 trillion cubic meters. The potential evaluation of 25 major minerals shows the average discovery rate of mineral resources is 30.3%, indicating a huge prospecting potential. The potential of coal resources at depth shallow than 2,000m is 3.88 trillion tons, with a discovery rate of 29.6%. That of iron ore is 196.0 billion tons, with a discovery rate of 33.1%; copper 304 million tons, with a discovery rate of 29.5%; and bauxite 17.97 billion tons, with a discovery rate of 20.3%.

**Conservation and comprehensive utilization of mineral resources enhanced.** In 2014, the output of primary energies, crude steel, ten non-ferrous metals and gold ranks top in the world. The output of primary energies is 3.60 billion tons of standard coal equivalents, among which the output of raw coal is 3.87 billion tons, crude oil 211 million tons and natural gas 130.16 billion cubic meters, and the consumption of primary energies is 4.26 billion tons of

standard coal equivalents, with a self-sufficiency rate of 84.5%. The output of crude steel amounts to 820 million tons, that of ten non-ferrous metals is 43.801 million tons and that of gold is 458.1 tons. In the same year, the country's total volume of mineral products trade is US\$1.09 trillion, with an increasing of 5.7% year-on-year, among which 291 million tons of coal have been imported, with a drop of 10.9%; oil 338 million tons, with a growth of 5.1%; and iron ore 933 million tons, with an increase of 13.8%. The standard for the indexes of evaluating the comprehensive utilization of mineral resources has been formulated and released. China has enacted the index requirements for the extract recovery rate, concentration recovery rate and comprehensive utilization rate of 20 minerals in three consecutive years and the evaluation index system for the conservation and comprehensive utilization of major mineral resources has been initially established. Besides, 159 recommended technologies have been popularized in three consecutive years. Furthermore, efforts have been made to propel the construction of pilot bases for the comprehensive utilization and the mine geological environment restoration projects of resource-exhausted cities and relevant demonstration projects. 661 mining enterprises have been selected in four batches to serve as the nation-level pilot entities for green mines.

**The administrative policies of mineral resources further improved.** Chinese government has revised the administrative regulations regarding the registration of exploration and exploitation, the transfer of exploration and mining rights and so on, released the Administrative Regulations on Geological Environment Monitoring and the Administrative Penalty Measures on Land and Resources, cancelled 23 examinations and approvals pertaining to mineral resources, put mineral resource compensation rates for coal, crude oil and natural gas to zero and applied ad valorem collection of resource tax on coal.

**Geological service further strengthened.** By the end of 2014, onshore regional geological survey of 1:50,000 and regional geological revision of 1:250,000 has covered 31.7% and 61.7% the territorial area, respectively. The regional geological survey of 1:1,000,000 has covered the entire marine area under the jurisdiction of China for the first time. In 2014, over 170 wells has been both explored and exploited, benefiting 300,000 people in water-deficient area. The access for the geological data sharing and service platform reached 620,000 times and the national-level and the provincial-level geological data entities provided data services for 130,000 times. The Cores and Samples Center of Land and Resources provided services for 5,646 person-times.

As the economic development has entered into a “New Normal” stage and the GDP grows at a high- medium speed, China keeps a high demand for bulk minerals and a rapidly increasing demand for mineral resources relating to high-tech industries. Hence, the development of

geological sectors should be transformed and upgraded and the management of mineral resources should adapt itself to the changing tendency. Additionally, constant efforts should be made to deepen the reform in the administrative system of mineral resources, attach significant importance to the support from science and technology and improve effectively the level of geological service.

## Chapter II

# Status of Mineral Resources

In 2014, evident growths have been witnessed in the newly-discovered reserves & resources of major minerals such as coal, oil, natural gas, shale gas, manganese ore, bauxite, gold, tungsten, molybdenum and so on. The geological reserves of shale gas were reported for the first time. The evaluation on the potential of 25 minerals has been completed, indicating a huge prospecting potential.

### I. Reserves & Resources

#### 1. Changes of reserves & resources

In 2014, among the 45 major minerals, the reserves & resources of 36 minerals increased, that of 5 decreased, and that of 4 remained unchanged. The geological reserves of shale gas were reported for the first time. A growth is witnessed in the reserves & resources of energy minerals and ferrous minerals. The remaining technically recoverable reserves of oil increased 2.0% year-on-year, and that of natural gas increased by 6.5%. The reserves & resources of coal increased by 3.2%, iron ore 5.6% and manganese ore 18.5%. Among non-ferrous minerals, the reserves & resources of copper increased by 6.3%, nickel 12.9% and lead 9.6%. Among precious metal minerals, the reserves & resources of gold increased by 9.4% and silver 6.3%. The reserves & resources of most nonmetallic minerals increased at different rates, with gypsum 18.4% and Potash 11.3%, while that of barite and diatomite declined (Table 2-1).

Table 2-1 Reserves & Resources of 45 Major Minerals

Name of Mineral	Unit	2013	2014	Increase or Decrease (%)
Coal	trillion tons	1.48	1.53	3.2
Oil	billion tons	3.37	3.43	2.0
Natural gas	trillion cubic meters	4.64	4.95	6.5
Shale gas	billion cubic meters	–	25.46	–
Iron ore	billion tons of ores	79.85	84.34	5.6
Manganese ore	billion tons of ores	1.03	1.22	18.5

Continued

Name of Mineral	Unit	2013	2014	Increase or Decrease (%)
Chromite	million tons of ores	11.42	11.62	1.8
Vanadium	V <sub>2</sub> O <sub>5</sub> million tons	57.13	60.75	6.3
Titanium	TiO <sub>2</sub> million tons	760	762	0.9
Copper	million tons of metals	91.12	96.90	6.3
Lead	million tons of metals	67.37	73.85	9.6
Zinc	million tons of metals	137.38	144.86	5.5
Bauxite	billion tons of ores	4.02	4.15	3.2
Nickel	million tons of metals	9.01	10.17	12.9
Cobalt	thousand tons of metals	637.0	670.0	5.3
Tungsten	WO <sub>3</sub> million tons	7.014	7.205	2.7
Tin	million tons of metals	4.255	4.189	-1.6
Molybdenum	million tons of metals	26.20	28.26	7.9
Antimony	million tons of metals	2.629	2.840	8.0
Gold	Tons of metals	8974.7	9816.0	9.4
Silver	thousand tons of metals	223.0	237.0	6.3
Platinum group metal	tons of metals	372.4	372.3	-0.04
Strontium	million tons of celestine	45.67	45.67	0.0
Magnesite	billion tons of ores	2.89	2.91	0.7
Fluorite	million tons of minerals	211	223	5.7
Refractory clay	billion tons of ores	2.51	2.52	0.5
Pyrites	billion tons of ores	5.69	5.83	2.4
Phosphate rock	billion tons of ores	20.57	21.45	4.3
Potash	KCl billion tons	1.01	1.12	11.3
Boron	B <sub>2</sub> O <sub>3</sub> million tons	76.136	76.225	0.1
Mirabilite	Na <sub>2</sub> SO <sub>4</sub> billion tons	111.30	117.09	5.2
Barite	million tons of ores	312	305	-2.2
Cement-producing limestone	billion tons of ores	119.88	123.51	3.0
Glass-making siliceous-rock	billion tons of ores	7.34	7.58	3.3
Gypsum	billion tons of ores	85.04	100.72	18.4
Kaolin	billion tons of ores	2.50	2.67	6.5
Bentonite	billion tons of ores	2.80	2.87	2.7

Continued

Name of Mineral	Unit	2013	2014	Increase or Decrease (%)
Diatomite	billion tons of ores	0.47	0.45	-3.9
Veneer granite	billion cubic meters	2.59	2.67	3.2
Veneer marble	billion cubic meters	1.51	1.56	3.4
Diamond	kilograms of minerals	3396.5	3396.5	0.0
Crystalloid graphite	billion tons of minerals	0.22	0.22	0.0
Asbestos	million tons of minerals	90.724	91.646	1.0
Talc	million tons of ores	277	276	-0.4
Wollastonite	million tons of ores	160	160	0.0

Note: That of oil, natural gas and shale gas are the remaining technologically recoverable reserves.

“-” means there is no statistical data.

## 2. Newly discovered reserves & resources from exploration

In 2014, there are newly-discovered reserves & resources for important minerals in China. The newly-discovered technologically recoverable reserves of oil are 190 million tons, that of natural gas are 474.96 billion cubic meters and shale gas 26.69 billion cubic meters. The newly-discovered reserves & resources of coal are 56.1 billion tons, iron ore 4.3 billion tons, copper 4.95 million tons, lead 5.97 million tons, zinc 6.08 million tons, bauxite 180 million tons, tungsten 345 thousand tons, gold 836 tons, silver 15,000 tons, pyrite 176.46 million tons and phosphate rock 1.03 billion tons (Table 2-2).

Table 2-2 Newly-Discovered Reserves & Resources from Exploration

Minerals	Unit	2013	2014
Coal	billion tons	67.3	56.1
Oil	million tons	200	190
Natural gas	billion cubic meters	381.60	474.96
Shale gas	billion cubic meters	-	26.69
Iron ore	billion tons of ores	2.65	4.3
Manganese ore	million tons of ores	110	190
Copper	million tons of metals	2.61	4.95
Lead	million tons of metals	4.46	5.97
Zinc	million tons of metals	13.89	6.08

Continued

Minerals	Unit	2013	2014
Bauxite	million tons of ores	240	180
Gold	tons of gold	758	836
Silver	thousand tons of silver	13	15
Tungsten	WO <sub>3</sub> thousand tons	203	345
Tin	thousand tons of metals	130	8.7
Molybdenum	million tons of metals	4.61	1.98
Antimony	thousand tons of metals	137	246
Pyrite	million tons of ores	79.81	176.46
Phosphate rock	million tons of ores	440	1030
Potash	KCl million of tons	0	70.42

Note: That of petroleum, natural gas and shale gas is technologically recoverable reserves.

“-” means there is no statistical data.

## II. Potential of Mineral Resources

### 1. Oil and gas

China's oil and gas resources distribute mainly on large petroliferous basins and 80% of its oil and gas resources, reserves and output are contributed by such major basins as Bohai Bay, Songliao, Tarim, Ordos, Junggar and Pearl River Estuary. The nationwide evaluation on conventional oil and gas resources potential indicates that by the end of 2014, the geological resources of oil were 108.5 billion tons, of which 26.8 billion tons were recoverable; conventional natural gas 68 trillion cubic meters, with 40 trillion cubic meters recoverable; shale gas 134 trillion cubic meters, with 25 trillion cubic meters recoverable; and coal-bed methane 36.8 trillion cubic meters, with 10.9 trillion cubic meters recoverable. In general, natural gas has a greater potential than oil. China's reserves and output of natural gas will witness a rapid growth in the future.

### 2. Solid minerals

The evaluation on the potential of the mineral resources, including coal, uranium, iron ore, manganese ore, chromite, copper, lead, zinc, bauxite, nickel, tungsten, tin, molybdenum, antimony, gold, silver, lithium, rare earth, magnesite, fluorite, sulfur, phosphate rock, potash, barite and boron, was completed in 2014. The evaluation shows that the discovery rate of

major mineral resources is 30.3% in average, indicating a huge prospecting potential. The potential of coal resources at depth shallow than 2,000m is 3.88 trillion tons, with a discovery rate of 29.6%. That of iron ore is 196.0 billion tons, with a discovery rate of 33.1%; copper 304 million tons, with a discovery rate of 29.5%; and bauxite 17.97 billion tons, with a discovery rate of 20.3%(Table 2-3).

Table 2-3 Major Mineral Resources Potential

No.	Minerals	Unit	Predicted Resources	Discovery Rate/ %
1	Coal	trillion tons	3.88	29.6
2	Iron ore	billion tons of ores	196	33.1
3	Manganese ore	billion tons of ores	3.52	31.7
4	Chromite	million tons of ores	55.56	23.6
5	Copper	million tons of metals	304	29.5
6	Lead	million tons of metals	235	30.5
7	Zinc	million tons of metals	511	28.9
8	Bauxite	billion tons of ores	17.97	20.3
9	Nickel	million tons of metals	24.51	34.6
10	Tungsten	WO <sub>3</sub> million tons	29.73	24.6
11	Tin	million tons of metals	18.61	30.7
12	Molybdenum	million tons of metals	89.60	24.9
13	Antimony	million tons of metals	15.18	29.1
14	Gold	thousand tons of metals	32.7	32.2
15	Silver	thousand tons of metals	726	36.1
16	Hard rock lithium	million tons of metals	5.937	36.6
	Brine lithium	million tons of metals	92.481	18.8
17	Magnesite	billion tons	13.14	19.1
18	Fluorite	million tons	953	25.7
19	Pyrite	billion tons	18.4	25.9
	Sulphurite	billion tons	0.23	60.8
20	Phosphate rock	billion tons	56	29.3
21	Potash	billion tons	2.0	40.0
22	Barite	billion tons	1.44	25.0
23	Boron	B <sub>2</sub> O <sub>3</sub> million tons	189	33.5

### III. Registration of Exploration and Mining Rights

#### 1. Oil and gas

By the end of 2014, there were 1,030 oil and gas exploration rights involving a registered area of 3.93 million square kilometers, a year-on-year decrease of 3.6% and 4.9% respectively, and 705 oil and gas exploitation rights involving a registered area of 0.143 million square kilometers, a growth of 4.4% and 5.7% respectively. In the year, the Ministry of Land and Resources issued 484 oil and gas exploration permits and 36 exploitation permits.

#### 2. Non-oil & gas minerals

In 2014, 1,269 non-oil & gas minerals exploration rights were newly approved, dropping by 4.6% and 32,600 square kilometers of newly-increased survey area were registered, dropping by 29.2%. The number of newly approved exploitation rights was 2,306, a growth of 17.6% and the newly registered exploitation area was 1,165 square kilometers, a decrease of 38.7%. The newly increased design production capacity was 0.58 billion tons per year, rising by 9.7%. In the first half year of 2015, 457 non-oil & gas minerals exploration rights were newly approved, dropping by 23.4% and 11,200 square kilometers of survey area were newly registered, dropping by 9.2%. The number of newly approved exploitation rights was 1,002, a year-on-year growth of 19.0% and the newly registered exploitation area was 984.89 square kilometers, a year-on-year increase of 48.4%. The newly increased planing production capacity was 0.255 billion tons per year, rising by 14.4% year on year.

By the end of 2014, there were 30,000 non-oil & gas minerals exploration rights in China involving a registered area of 611,500 square kilometers, a year-on-year drop of 5.2% and 9.1% respectively, and 82,000 exploitation rights involving a registered area of 104,400 square kilometers, a drop of 9.6% and 1.5% respectively (Table 2-4). The annual planing production capacity was 14.7 billion tons, basically equivalent to the previous year.

Table 2-4 Non-oil & Gas Exploration and Exploitation Rights by the End of 2014

Item	Number	Year-on-year Change (%)	Registered Area (10 <sup>4</sup> km <sup>2</sup> )	Year-on-year Change (%)
Exploration right	30480	-5.2	61.15	-9.1
Inc.: New	1269	-4.6	3.26	-29.2
Exploitation right	82450	-9.6	10.44	-1.5
Inc.: New	2306	17.6	0.1165	-38.7

## Chapter III Exploration

In 2014, with the focus on the demand of resources under the new normal stage of economic development, efforts were made to continue promoting the *National Exploration and Development Planning*, through stimulation of geological exploration entities, overall deployment of various capitals and rational investment arrangement. The investment on geological exploration was RMB114.5 billion, still at a high level. The resources of major minerals, such as coal, oil, natural gas, shale gas, manganese ore, bauxite, copper, lead, zinc and gold, were increased.

### I. Exploration Investment

In 2014, the exploration investment amounted to RMB114.5 billion, a year-on-year decrease of 5.4% (Figure 3-1), among which RMB19.5 billion was from the governmental investment, accounting for 17.0%; RMB95 billion from the social investment, accounting for 83.0%. The investment in geological exploration of oil and gas amounted to RMB74.3 billion, dropping by 1.2%, accounting for 64.9% of the total exploration investment. The spending on the exploration of non-oil & gas minerals was RMB 40.2 billion, a decrease of 12.5% for the

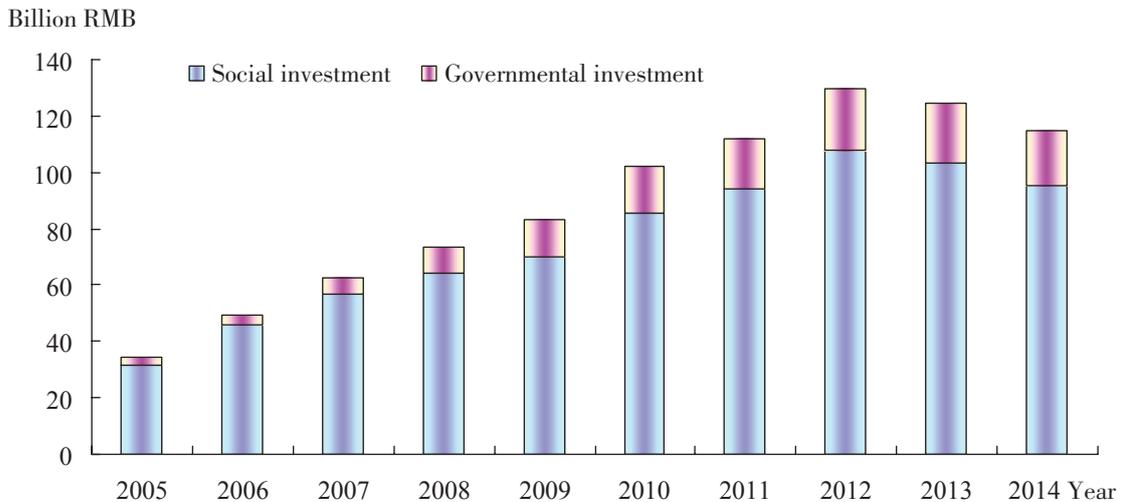


Figure 3-1 Exploration Investment

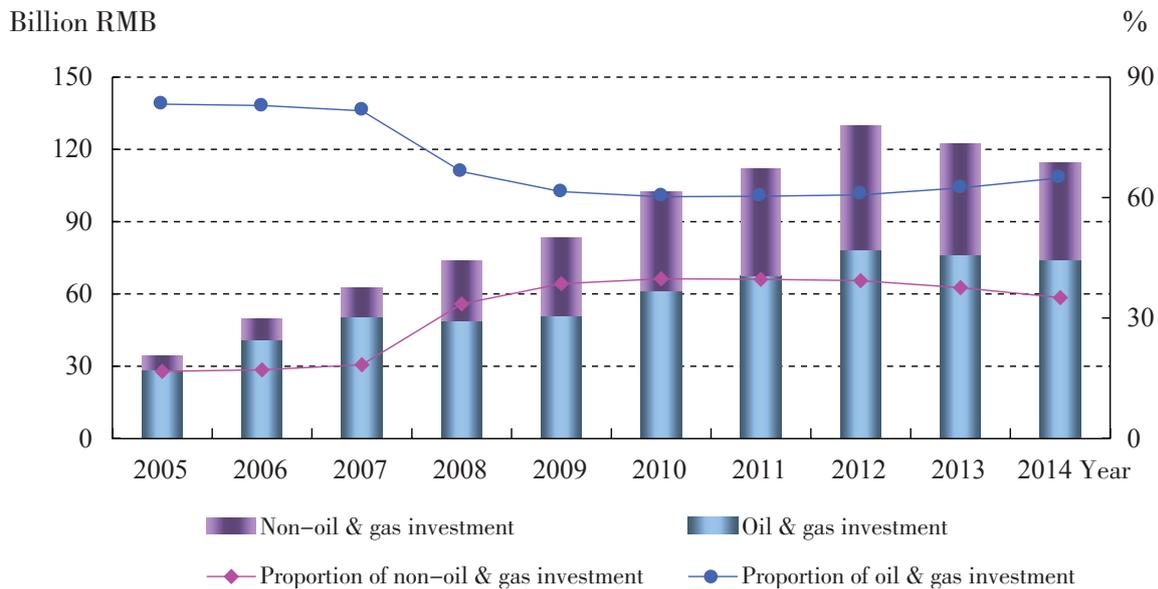


Figure 3-2 Exploration Investment of Oil & Gas and Non-Oil & Gas

second consecutive year, accounting for 35.1% (Figure 3-2), among which RMB17.9 billion was from the governmental investment, accounting for 44.5%, and RMB22.3 billion from the social investment, accounting for 55.5%.

In the year, the completed drilling was 27.41 million meters, a drop of 5.4%.

## II. Energy Mineral Exploration

### 1. Coal

There were 17 newly-discovered large-sized ore fields in 2014. There were 2 coal orefields which newly-discovered reserves & resources surpassed 5 billion tons, including the Hongshaquan Open Coal Mine II in Black Mountain, Qitai County, Eastern Junggar Coalfield, Xinjiang and the Bayan Hada Exploration Field in Chenqi Coalfield, Inner Mongolia.

### 2. Conventional oil and gas

By the end of 2014, the accumulated geological reserves of oil was 36.1 billion tons and natural gas 12 trillion cubic meters. In 2014, the newly-discovered reserves of oil exceeded 1 billion tons for the 8th consecutive year. There was 1 oilfield, namely Changqing Xin'anbian Oilfield of PetroChina, with the newly-discovered reserves of over 0.1 billion tons. The newly-discovered geological reserves of natural gas were over 500 billion cubic meters for the

12th consecutive year. There were 5 gas fields which newly-discovered geological reserves surpassed 100 billion cubic meters, including Changqing Shenmu Gas Field of PetroChina, Tarim Kelasu Gas Field of PetroChina, Yanchang Yan'an Gas Field in Shaanxi Province, CNOOC Zhanjiang Gas Field 17-2 of Lingshui and CNOOC Ningbo Gas Field 22-1.

### 3. Non-conventional oil & gas

**Coal-bed methane.** By the end of 2014, more than 13,000 coal-bed methane wells were drilled (over 1000 new wells in 2014, with the drilling of 1.222 million meters). In 2014, the newly-discovered geological reserves of coal-bed methane were 60.2 billion cubic meters and the accumulated geological reserves were 626.6 billion cubic meters.

**Shale gas.** By the end of 2014, RMB23 billion were invested in the exploration of shale gas and 780 wells drilled, with the production capacity of 1.3 billion cubic meters reached. In 2014, the newly-discovered geological reserves of shale gas were 106.8 billion cubic meters, the first submission of geological reserves since the new minerals were determined in 2011. The newly discovered shale gas field is SINOPEC Fuling .

## III. Exploration of Metallic and Non-metallic Minerals

The newly increased reserves & resources of 14 minerals, including iron ore, copper, lead, zinc, bauxite, tungsten, tin, molybdenum, antimony, gold, silver, pyrite, phosphate rock and sylvite, were mainly located in Xinjiang, Yunnan, Shanxi, Inner Mongolia, Henan, Shandong, Guizhou, Jilin, Sichuan, Qinghai and Tibet in 2014. The iron ore mines with newly-discovered reserves & resources of over 0.5 billion tons included Dataigou Iron Field of Benxi city, Liaoning province and Cangshan Lanling Mine (Gulin-Lanling zone) in Shandong province. The manganese mine with the newly-discovered reserves & resources of over 0.1 billion tons was Daotuo Manganese Mine in Songtao county, Guizhou province. The newly-discovered reserves & resources of Tibet Nimu Bairong Gangjiang Copper Mine exceeded 1 million tons, those of Huaheng Danaopo Lead-Zinc Mine in Hunan province exceeded 2 million tons, those of Fengshan Fujiapo Bauxite Mine in Guangxi province exceeded 30 million tons, those of Golmud Xiarihamu HS26 Abnormal Area Copper-Nickel Mine in Qinghai province exceeded 1 million tons, those of Xinjiang Wuqia Sawayardun Gold Mine exceeded 100 tons, those of Suichang Zhedaikou Kengxi Fluorite Mine in Zhejiang province exceeded 1 million tons and those of Baokang Baishuihe Phosphate Mine in Hubei province exceeded 200 million tons.

The deep and outside exploration of the old mines resulted in outstanding economic and social benefits. Significant breakthroughs were achieved in the exploration of 14 mines, such as Qixia

Mountain Lead-Zinc Mine of Jiangsu province, Lala Copper Mine in Sichuan province and Laowan Gold Mine in Henan province, which might become large mineral deposits. Great progress has been made in 39 mines. In average, the mines life was extended by 10 years and 120,000 jobs were stabilized.

### Column 3-1 Progress on Special Funds of Central Geological Exploration

In 2014, the central geological exploration funds continued driving for the National Exploration and Development Planning, survey the major minerals in state-level package exploration areas and emphasize the exploration of such national energies and urgently-needed minerals such as coal, uranium, iron, copper and potash. A batch of large and medium-sized deposits have been discovered and there are a substantial increase in the resources of coal, uranium, iron, titanium, vanadium and etc. In the year, 14 large and medium-sized ore fields have been discovered, of which 5 are large and another 5 are medium-sized.

## IV. Groundwater Exploration

The land and resources departments have made efforts to survey the hydrogeological resources of the regions with severe shortage of water, such as the Wumeng Mountain area, the Taihang Mountain area, the Yimeng Mountain area and the Qaidam Basin area. In the combination of exploration and exploitation, over 170 hydrological wells were drilled, relieving the water deficiency for 300,000 local people. To support the fight against drought in Henan, Hubei and other provinces, the drilling of wells was arranged in emergency by virtue of the existing hydrogeological surveys and the catalogue of the achievements from over 1,200 hydrogeological surveys was released in time to help the professional exploration teams explore water and drill wells in the drought zones. The 1:50,000 Hydrogeological Survey Code was taken as the industrial standard and enacted. In the year, the hydrogeological survey for 1:50,000 on over 100 sheets was completed.

## Chapter IV

# Development and Utilization of Mineral Resources

In 2014, the mining fixed assets investment increases continually, the growing rate slowed down, the lowest in the past 12 years, and its proportion in national fixed assets investments was also declining. The mining fixed assets investment of coal has a negative growth for the second consecutive year. The production of minerals keeps growing, but an obvious drop is seen in the growth. In particular, the growth also slowed down in the output of infrastructure-related raw materials, such as crude steel, ten nonferrous metals and cement. The government has issued the first evaluation index standard for comprehensive utilization of mineral resources, and made great achievements in the construction of pilot bases for comprehensive utilization.

### I. Mining Fixed Assets Investment

In 2014, China's mining fixed assets investment is RMB 1.47 trillion, with an increase of 0.7%. The growth rate dropped by 10.2% which is the lowest growth rate in the past 12 years. The mining fixed assets investment accounts for 2.9% of the national fixed assets investment and decreased by 0.5% compared with 3.4% in 2013. Among the mining fixed assets investment, that of coal is RMB468.2 billion, with a decrease of 9.5% and a negative growth for the second consecutive year, that of oil and gas is RMB402.3 billion, with an increase of 6.1%, that of ferrous metal is RMB169 billion, with an increase of 2.6%, that of non-ferrous is RMB163.6 billion, with an increase of 2.9%, and non-metallic mineral is RMB204.6 billion, with an increase of 13.9% (Figure 4-1).

In the first half year of 2015, China's mining fixed assets investment is RMB 526.05 billion, with a decrease of 7.7%. Among it, that of coal is RMB 168.605 billion, with a decrease of 12.8%, that of oil and gas is RMB116.895 billion, with a decrease of 6.5%, that of ferrous metal is RMB65.581 billion, with a decrease of 12.8%, that of non-ferrous is RMB62.892 billion, with a decrease of 5.7%, and non-metallic mineral is RMB92.622 billion, with an increase of 5.4%.

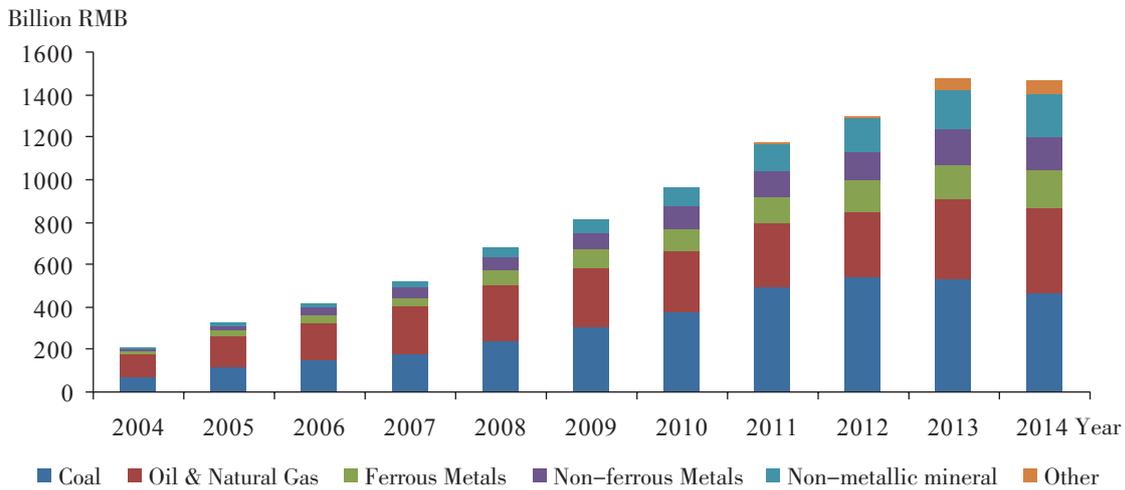


Figure 4-1 Mining Fixed Assets Investment

## II. Production and Consumption

### 1. Energy production and consumption

China is the largest energy production and consumption country in the world. In 2014, primary energy output totals 3.60 billion tons of standard coal equivalent with an increase of 0.5% (Figure 4-2), and the consumption has increased 2.2% to 4.26 billion tons of standard coal equivalent with the self-sufficiency rate of 84.5%. China's energy structure has improved continuously, brought down the proportion of coal and increased the share of natural gas and other clean energies. The consumption structure in 2014 is as following: coal accounting for

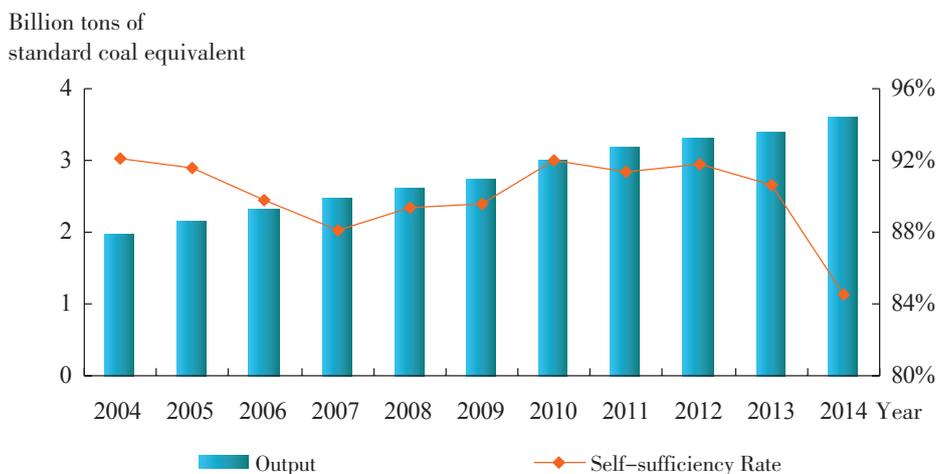


Figure 4-2 Primary Energy Production

66.0%, water power, wind power, nuclear power and natural gas jointly accounting for 16.9%.

In 2014, the coal production is 3.87 billion tons, decreased by 2.5%, ranking the first place in the world for consecutive years. 211 million tons of crude oil has been produced, with an increase of 0.7% (Figure 4-3), ranking 4th in the world. The output of natural gas is 130.16 billion cubic meters, with a growth of 7.7%, ranking 6th in the world. In the first half year of 2015, the crude oil production is 106 million tons and increased by 2.1% year-on-year, and natural gas is 63.0 billion cubic meters with an increase of 2.5%.

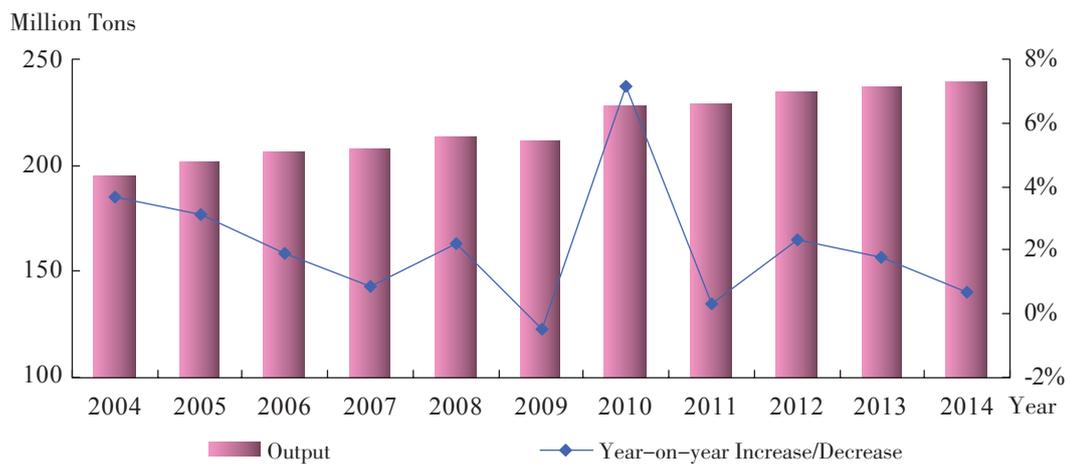


Figure 4-3 Crude Oil Production

## 2. Metal minerals Production and Consumption

In 2014, the output of iron ore is 1.51 billion tons, with an increase of 3.9%; crude steel 820 million tons, with an increase of 1.2% (Figure 4-4); rolled steel 1.13 billion tons, with an increase of 4.0%. The production of ten non-ferrous metals is 43.801 million tons, with an increase of 7.4%. Among them, the output of refined copper is 7.644 million tons, with an increase of 15.0% and electrolytic aluminum 27.517 million tons, with an increase of 8.2%. The output of gold is 458.1 tons, with an increase of 5.5%; the consumption is 886.09 tons, with a decrease of 24.7%. The production of crude steel, ten non-ferrous metals and gold ranks the first in the world. In the first half year of 2015, the output of iron ore amounts to 630 million tons, with a decrease of 10.7%; ten non-ferrous metals 25.263 million tons, with an increase of 9.3%; and gold 228.7 tons, with an increase of 8.4%.

## 3. Non-metallic minerals Production

In 2014, the output of cement is 2.48 billion tons, with a year-on-year increase of 2.3% (Figure

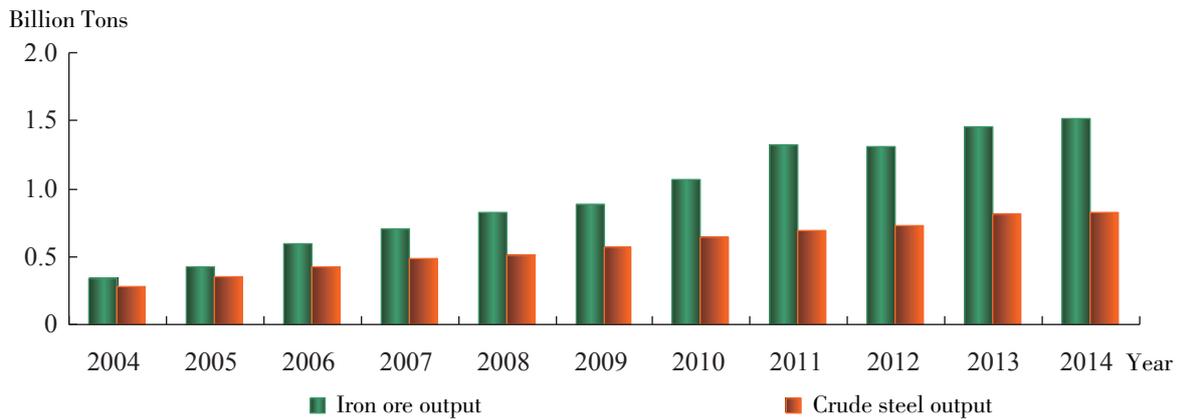


Figure 4-4 Iron Ore and Crude Steel Production

4-5); plate glass 790 million weight cases, with an increase of 1.1%; potash fertilizer 6.105 million tons ( $K_2O$  100%), with an increase of 13.5%; and phosphate rock 120 million tons ( $P_2O_5$  30%), with an increase of 7.0%. In the first half year of 2015, the output of cement is 1.08 billion tons, with a year-on-year decrease of 5.3%; plate glass 400 million weight cases, with a decrease of 4.2%; and phosphate rock 66.298 million tons, with an increase of 9.1%.

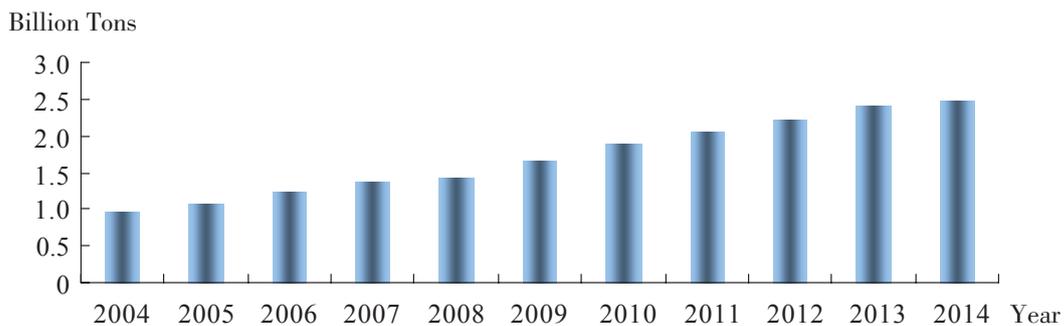


Figure 4-5 Cement Production

### III. Conservation and Comprehensive Utilization

#### 1. The comprehensive utilization standard system of minerals established

China has issued the first comprehensive utilization evaluation index standard—Technical Indexes for the Comprehensive Utilization of Mineral Resources and Their Computing Methods (DZ/T 0272-2015), stipulating the technical indexes of the comprehensive utilization and building uniform requirements for evaluating the utilization levels of mineral resources. Besides, the country has announced the third group of minimum index requirements regarding

extract recovery rate, concentration recovery rate and comprehensive utilization rate for 8 minerals, such as manganese ore, chromite, bauxite, tungsten, molybdenum, pyrite, graphite and asbestos, and totally released 20 minerals of the index requirements in the past three years. Also it has formed the index system for the conservation and comprehensive utilization of mineral resources.

## 2. The construction of pilot bases for comprehensive utilization made in remarkable progress

The accumulated investment from the central government has reached RMB14.88 billion since the construction of pilot bases for comprehensive utilization of minerals, which has promoted an investment of RMB94.987 billion from companies. The construction has accelerated the reform and industrialization of the technologies, processes and equipments for the comprehensive utilization of 8 minerals, such as low permeable and ultra-low permeable oil and gas fields, shale gas, oil shale, vanadium titano-magnetite, solid potash, low-grade collophanite. That has made the low-grade, associated and hard-to-use resources transformed into economic recoverable resources and improved the resource guarantee capacity significantly.

## 3. The guidance of technology and policy enhanced

China has formulated the Directory of the Encouraged, Restricted and Eliminated Technologies for the Conservation and Comprehensive Utilization of Mineral Resources (Revised) (GTZF [2014] NO. 176), intensified the management for entrance qualification and supervised companies weeding out outdated production facilities gradually.

## 4. Recommended technologies promoted

In 2014, China has issued 60 recommended technologies selected from the mining industry (Table 4-1). Over the past three years, it has announced 159 recommended technologies in three batches (22 for oil and gas, 34 for coal, 70 for metal minerals and 33 for non-metallic minerals), of which there are 59 mining technologies, 40 dressing technologies and 60 technologies for the comprehensive utilization of associated minerals and tailings.

Table 4-1 Recommended Technologies for Comprehensive Utilization of Mineral Resources

10 Technologies for highly-effective mining, dressing and comprehensive utilization of coal	
1	New technique of coal slurry pipeline conveying system
2	Technique for efficient exploitation of thick coal seams under water

Continued

10 Technologies for highly-effective mining, dressing and comprehensive utilization of coal			
3	Key technique for efficient and comprehensive exploitation of ultra-thin coal seams	7	Technique for comprehensive utilization of symbiotic and associated oil shale in coal seams
4	Technique for extraction of methane gas from low-permeable coal seams	8	Technique for high-wall and steep-wall exploitation of open coal mines
5	Clean incineration and utilization technique for compound circulating fluidized bed of coal slurry	9	Technique for comprehensive utilization of abandoned heat source of mines
6	Technique for high-density, heavy-media beneficiation of high-sulfur coal refuse	10	Exploitation and upgrading technology for ultra-thin seams of open coal mines
7 technologies for highly-effective mining and comprehensive utilization of oil and gas			
11	A set of new techniques for fracturing shale gas of marine facies	15	New torch igniting system of offshore platforms and onshore terminals
12	Technique for 3D development of complicated fault-block oil reservoirs	16	Extraction technique of water injection in offshore thin-bed oil reservoirs
13	Dual horizontal well SAGD development technique for shallow ultra-viscous oil reservoirs	17	Enhanced Technique for recovery rate of air foam-driven
14	CO <sub>2</sub> / water alternatively driven technique for raising greatly the recovery rate of water-driven waste oil reservoirs		
29 technologies for highly-effective mining, dressing and comprehensive utilization of metals			
18	Key technique and equipment for efficient high-magnetic beneficiation of weak-magnetic ores	23	Technique for efficient exploitation by induced falling of hard-to-mine broken orebodies
19	A set of technique and equipment for dry beneficiation and tailings discarding during high-pressure grinding of magnetite	24	Technique for close-to-roof limestone curtain grouting, blocking and mining of heavy-water deposits
20	Technique for quality improvement, impurity reduction and ore dressing of Jingtieshan-type refractory iron oxide ores	25	Technique for new high-magnetic PMG for beneficiation of and integrated utilization of magnetic minerals-containing industrial residue
21	Technique of solid modeling of blasting units by sublevel caving without sill pillar	26	Technique for conversion and residual ore recovery of complex and potentially dangerous
22	Technique of producing high-purity manganese sulfate and manganese dioxide by low-grade manganese ore and sulfur-containing smoke	27	Technique for production of new wall materials by iron ore tailings

Continued

29 technologies for highly-effective mining, dressing and comprehensive utilization of metals			
28	New process for dressing of hard-to-separate micro-fine particulate iron ore	38	Technique for production of ceramic glazes and aerated concrete materials by tailings of gold mines
29	Technique for upgrading and waste reducing of metal mines by application of suspending-vibration conical-surface dressing machine	39	Key technique for high-concentration flow-regime pipeline conveying and filling of coarse aggregates of mines
30	Technique for recycle of iron minerals in tailings	40	Technique for non-driving flotation equipment of bauxite
31	Technique for fully comprehensive utilization of tailings	41	Technique for integrated recovery of valuable metals in tailings of gold mines
32	Technique for magnetic and heavy-media beneficiation of iron tailings	42	New technique for clean and efficient recovery of fine-fraction metallic minerals from tailing resources
33	Technique for low-temperature roasting and utilization of copper and cobalt containing tailings	43	Technique for integrated recovery of micro-fine particulate tungsten in tailings
34	Key technique for copper-molybdenum beneficiation of large porphyry copper-molybdenum deposits with a high content of secondary copper	44	New technique for efficient dressing of nickel and molybdenum ores with a high content of carbon,
35	Technique of dressing for complicated refractory low-grade nickel ore	45	Technique for activating flotation of sulfur concentrate from tailings of skarn-type copper mines
36	Visual dispatching management system for open pits	46	Technique for flotation separated copper from lead and zinc by liquid sulfur dioxide
37	Technique for high-magnetic beneficiation and grading of wolframite and scheelite		
14 technologies for highly-effective mining, dressing and comprehensive utilization of non-metallic ores			
47	Technique for efficient processing of calcite powder	50	Technique for extracting lithium from old brine by the adsorption method
48	Technique for production of potassium chloride by cold crystallization-direct flotation	51	Technique for gradient utilization of low-grade limestone
49	Technique for integrated governance of geological environment and landscape building of abandoned open pits	52	Technique for production of high-purity superfine torispherical silica powder and special silica new materials by konilite

Continued

14 technologies for highly-effective mining, dressing and comprehensive utilization of non-metallic ores			
53	Technique for desliming of low-grade slime-containing solid potassium ore	57	Technique for deep development of smectite products
54	Technique for purification and processing of natural vein quartz	58	Technique for safe and efficient full tailings-filling mining under the highly confined aquifer of phosphate rock
55	Technique for converting phosphogypsum into ammonium sulfate	59	New technique for comprehensive utilization of magnesium-smelting dolomite tailings
56	Technique for underground solution mining and processing of trona deposits	60	Technique for efficient recovery of machine-made fine power of gravels and cycling utilization of waste water

# Chapter V

## Mine Ecological Environment Construction

Efforts have been intensified to fund the governance and restoration of the geological environment of mines and remarkable progress has been made in the governance and restoration of land damaged by mining development. The number of national mine parks has increased steadily and the management has been increasingly normalized. The construction of green mines has been promoted comprehensively and the construction of ecological land has been improved.

### I. Geological Environment Restoration

By the end of 2014, China's spending on the governance of the geological environment of mines had amounted to RMB90.18 billion, with RMB28.73 billion from the central finance, 1,954 projects deployed and RMB61.45 billion from local finance and companies. The land damaged by mining development had covered an area of 3.03 million hectares in total, of which 810,000 hectares had been restored, with the governance rate of 26.7%. Among it, 214,000 hectares were supported by the central finance and 596,000 hectares by the local finance and companies.

The central government continued to support the geological environment restoration and demonstration projects in resource-exhausted cities. In 2014, RMB1.728 billion subsidies was allocated to govern the geological environment of mines.

By the end of 2014, the payable cash deposit for the governance and restoration of geological environment of mines was RMB159.87 billion, of which RMB86.77 billion had been paid, accounting for 54.3%. In the 99,000 mines that should make the payment throughout China, 85,900 mines had paid the cash deposit, accounting for 86.8% of the total number of mines. RMB30.74 billion was returned to the mining right holders that had performed the obligation of governance. RMB2.52 billion of the closed mines that had failed the obligation was preserved in the account.

A highlight is the construction of national mine parks. Since 2005, China has approved the construction of 72 national mine parks totally, of which 30 have been built up. In total, RMB2.29 billion has been spent on the construction of mine parks in the provinces, autonomous regions and municipalities directly under the central government. 41 mine parks at the provincial level have been built.

In 2014, fossil excavation was carried out in such places as Qianshan County in Anhui Province, Foshan City in Guangdong Province, Nihewan Village in Hebei Province, Lingwu City in Ningxia Hui Autonomous Region and Shanshan County in Xinjiang Uygur Autonomous Region. The excavation entities governed and restored the environment for the 930 square meters involved according to the approved recovery schemes.

## II. Green Mining Development

### 1. Pilot construction for green mining promoted

By the end of 2014, 661 mining companies had been involved in the pilot program of national green mines construction, realizing the goal of constructing over 600 state-level pilot mines by the end of the Twelfth Five-Year Plan and playing a demonstrating and guiding role in the development of circular economy, efficient utilization of resources, guidance of green technology, ecological protection of mines and harmony and common benefits of mineral estates. In addition, the Measures on the Acceptance Inspection of State-level Green Mine Pilots (Trial Implementation) was formulated. The evaluation on the construction of the first 37 pilot entities, such as Shanxi Tongmei Datang Tashan Coal Mine, was completed, the effect and problems were summarized and suggestions on follow-up incentive policies and measures were put forward.

### 2. Local governments played an active role in green mine construction

Local governments have driven provincial and municipal construction of green mines orderly. Zhejiang, Hebei and Jiangxi have formulated administrative regulations and incentive policies. Inner Mongolia and Guizhou have developed implementation plans and Guangxi, Jiangxi and Beijing have drawn up construction plans.

## Chapter VI

# Mineral Resources Management and Policies

Efforts have been made to promote the institutional reform of administrative examination and approval, accelerate the transformation of government functions and make the management of mineral resources increasingly scientific, standardized and legitimate. Since 2014, China has intensified the streamlining of administration and the delegation of power, made the market more active, modified 3 administrative regulations, promulgated 2 new regulations, cancelled 23 administrative examinations and approvals and adjusted some compensations and taxes for mineral resources.

### I. Items Subject to Administrative Examination and Approval

#### 1. 3 Administrative regulations modified

On July 29, 2014, the State Council promulgated the Decision of the State Council on Modifying Some Administrative Laws and Regulations (Order No. 653).

Modification to the Administrative Regulations for the Registration of Mineral Resources Exploration Regions: Firstly, “Regarding the exploration right that has been validated through evaluation...” as specified in Article 13.1 is changed into “Regarding the exploration right of the region which has been explored using state-funded and whose ore field has been identified, the applicants shall pay the cost of the exploration right, besides using fee of the exploration right as per Article 12”; Secondly; Article 13.2 is changed into “the cost of the exploration right formed using governmental funds should be evaluated by an agency with the qualification of assessing exploration and mining rights; the evaluation report should be registered with the competent authorities”; Thirdly Article 38 is changed into “Where the mineral resources are explored under Chinese-foreign cooperation, the Chinese party should, after signing the contract, register the contract with the original issuing authority”; Finally “Those working on regional geological survey, regional mineral resources survey, regional geophysical survey, regional geochemical survey, geological survey by aerial remote sensing, regional hydrogeological survey, regional engineering geology survey, regional environmental geology

survey, marine geology survey and so on, should register with the competent administrative authorities” as specified in Article 40 is deleted.

Modification to the Administrative Regulations for the Registration of Mineral Resources Exploitation: Firstly, “Regarding the mining right that has been validated through evaluation...” as specified in Article 10.1 is changed into “To apply for the mining right of the region which has been explored using government-funded and whose ore field has been identified, the applicator should pay the cost of the mining right formed by government funds, besides using fees for the use of the mining right as specified in Article 9”; Secondly, Article 10.2 is changed into “the cost of the exploration right formed by government funds should be evaluated by an agency with the qualification of assessing exploration and mining rights; the evaluation report should be registered with the competent administrative authorities”; Finally Article 29 is changed into “The mineral resources will being exploited under Chinese-foreign cooperation, the Chinese party should, after signing the contract, register the contract with the original issuing authority”.

Modification to the Administrative Regulations for the Transfer of Exploration and Mining Rights: Article 9.2 is changed into “the cost of the exploration and mining rights formed by governmental funds should be evaluated by the agencies with the corresponding qualification; the evaluation reports should be registered with the authorities in charge of exploration and mining rights registration”.

## 2. New regulations promulgated

### (1) Administrative Regulations for the Monitoring of Geological Environment

On April 29, 2014, the Administrative Regulations for the Monitoring of Geological Environment ( The 59th Decree of the Ministry of Land and Resources, 2014) was promulgated in accordance with the Mineral Resources Law of the People’s Republic of China, the Regulations on the Prevention and Control of Geological Disasters and other applicable laws and regulations, stipulating the purpose, basis, definition, principles, subjects, applicable scope and legal liabilities of geological environment monitoring.

### (2) Regulationss on the Administrative Punishment for Land and Resources

The Regulations on the Administrative Punishment for Land and Resources (The 60th Decree of the Ministry of Land and Resources,2014) was promulgated on May 7, 2014, with the primary principles of normalizing administrative power and safeguarding the rights and interests of the masses.

## 3. Changes in examination and approval

### (1) Twenty three examinations and approvals cancelled

Since 2014, 23 examinations and approvals relating to mineral resources have been cancelled, including examinations and approvals of distribution plans for exploration and mining rights, deployment plans or registration for exploration and mining rights, postponed collection of geological data, deployment for package exploration regions, adjustment for classification of mineral exploration risks, registration of exploration and mining rights' prices evaluation and etc. (Table 6-1)

Table 6-1 Examinations and Approvals Cancelled Since 2014

No.	Item	Category	Basis
1	Forward examination of exploration and exploitation of mineral resources under Chinese-foreign cooperation	Administrative examination and approval	Decision of the State Council on Canceling and Releasing Another Group of Administrative Examinations and Approvals (GF[2014] No. 5)
2	Registration approval of geological survey	Administrative examination and approval	
3	Examination and approval of exploration and development of mineral resources and engineering construction in the areas beyond the relic protection zones of the national geological parks	Non-administrative examination and approval	
4	Examination and approval of distribution plans for exploration and mining rights	Non-administrative examination and approval	
5	Examination and approval of naming "Home/ City/ Land of Hot Springs"	Non-administrative examination and approval	
6	Register examination and approval of coal exploration and mining rights, in those provinces where reforming management	Non-administrative examination and approval	
7	Registration of mineral water sold in different provinces, autonomous regions and municipalities directly under the central government	Non-administrative examination and approval	Decision of the State Council on Canceling and Releasing Another Group of Administrative Examinations and Approvals (GF[2014] No. 27)

Continued

No.	Item	Category	Basis
8	Examination and approval of postponed collection of geological data	Administrative examination and approval	Decision of the State Council on Canceling and Adjusting Another Group of Administrative Examinations and Approvals (GF[2015] No. 11)
9	Examination and approval of mineral resources development and utilization in reserve regions of ore fields	Administrative examination and approval	
10	Examination and approval of consulting the geological data within the protective period by governments above the county level	Administrative examination and approval	
11	Examination and approval of plans for protecting the geological environment of mines of provinces, autonomous regions and municipalities directly under the central government	Administrative examination and approval	
12	Examination and approval of directories of places with fossils under key protection	Administrative examination and approval	
13	Examination and approval of construction of science and technology platform of the Ministry of Land and Resources	Administrative examination and approval	
14	Examination and approval of deployment for package exploration regions	Administrative examination and approval	
15	Examination and approval of adjustment of mineral exploration risk classification	Administrative examination and approval	
16	Accreditation of qualification of hydrological and water resource survey and appraisal agencies	Administrative examination and approval	
17	Examination and approval of confirming and overall plans for construction of mineral resources comprehensive utilization pilot bases	Non-administrative examination and approval	
18	Examination and approval of applications for transferring exploration and mining rights by agreements	Non-administrative examination and approval	

Continued

No.	Item	Category	Basis
19	Examination and approval of check or filing for exploration and mining rights deployment	Non-administrative examination and approval	Decision of the State Council on Canceling Non-administrative Examinations and Approvals (GF[2015] No. 27)
20	Examination and approval of the setup, alteration or cancellation of mining areas under national planning or of important value to the national economy	Non-administrative examination and approval	
21	Examination and approval of evaluation of cost of exploration and mining rights	Non-administrative examination and approval	
22	Examination and approval of overall plans for development and construction of Home/ City/ Land of Hot Springs declared by the governments of municipalities directly under the central government	Non-administrative examination and approval	
23	Examination and approval of planning for national geological parks	Non-administrative examination and approval	

## (2) Retained and adjusted examinations and approvals

According to the opinions on the sorting of non-administrative examinations and approvals passed on the 91st Executive Meeting of the State Council on May 6, 2015, the non-administrative examinations and approvals of “plans for mineral resources” and “specific mineral resources under protective exploitation” have been changed into the interior management by government. The Ministry of Land and Resources has retained 9 administrative examinations and approvals, involving 19 sub-items (Table 6-2).

Table 6-2 Administrative Examinations and Approvals in Force for the Time Being

Item Code	Item Name	Sub-item	Subjects
12004	Examination and approval of mineral resources exploration	1. Registration of new exploration rights	Public institutions and enterprises
		2. Registration of extension exploration rights	Public institutions and enterprises
		3. Registration of retained exploration rights	Public institutions and enterprises

Continued

Item Code	Item Name	Sub-item	Subjects
12004	Examination and approval of mineral resources exploration	4. Registration of cancelled exploration rights	Public institutions and enterprises
		5. Registration of altered exploration rights	Public institutions and enterprises
		6. Examination and approval of pilot exploitation for the exploration of fluid minerals, such as oil and natural gas	Enterprises
		7. Examination and approval of transfer for exploration rights	Public institutions and enterprises
12005	Examination and approval of mineral resources exploitation	1. Registration of new exploitation rights	Enterprises
		2. Registration of transferred exploitation rights	Enterprises
		3. Registration of extension exploitation rights	Enterprises
		4. Delimitation of mines fields	Enterprises
		5. Registration of altered exploitation rights	Enterprises
		6. Registration of cancelled exploitation rights	Enterprises
		7. Examination and approval of schemes for protecting, controlling and restoring geological environment of mines	Enterprises
12006	Examination and approval of geological survey qualification	None	Public institutions and enterprises
12008	Registration of geological data protection	None	Public institutions and enterprises
12009	Examination and approval of Class A qualifications of geological disasters prevention and control entities	1. Examination and approval of Class A qualifications of entities that evaluate geological disaster risks	Public institutions and enterprises
		2. Examination and approval of Class A qualifications of entities that survey geological disaster-controlling projects	Public institutions and enterprises

Continued

Item Code	Item Name	Sub-item	Subjects
12009	Examination and approval of Class A qualifications of geological disasters prevention and control entities	3. Examination and approval of Class A qualifications of entities that design geological disaster-controlling projects	Public institutions and enterprises
		4. Examination and approval of Class A qualifications of entities that implement geological disaster-controlling projects	Public institutions and enterprises
		5. Examination and approval of Class A qualifications of entities that supervise geological disaster-controlling projects	Public institutions and enterprises
12010	Examination and approval of excavation of fossils under key protection	None	Public institutions, enterprises and social organizations
12011	Examination and approval of transfer, exchange and donation of the collected fossils under key protection among collection entities	None	Public institutions, enterprises and social organizations
12012	Examination and approval of fossils under key protection that entry and exit China	None	Public institutions, enterprises and social organizations
12044	Certification by the Quality Supervision and Testing Center, Ministry of Land and Resources	None	Public institutions

## II. Taxes and Fees

### 1. Adjustment of policies

According to the Notice on Implementing the Reform of Coal Resources Tax (CS [2014] No. 72), the Notice on Adjusting the Policies of Crude Oil and Natural Gas Resources Tax (CS [2014] No. 73) and the Notice on Solving the Problems about Coal, Crude Oil and Natural Gas Charges Funds (CS [2014] No. 74) (October, 2014), released by the Ministry of Finance, mineral resources compensations rate of coal, oil and gas has dropped to zero, ad valorem has been applied to resources tax of coal, and cleanup Charges Funds associated with China since December 1, 2014. Besides, the applicable tax rate of crude oil and natural gas resources

has been raised from 5% to 6%. In April, 2015, the Ministry of Finance and the National Development and Reform Commission announced jointly the Notice on Solving the Problems about the Charged Funds Involving Rare Earth, Tungsten and Molybdenum (CS [2015] No. 53), determining to bring the compensation rate for rare earth, tungsten and molybdenum ores down to zero and stop collecting price regulation funds for rare earth, tungsten and molybdenum ores from May 1, 2015 (Table 6-3 and 6-4).

Table 6–3 Compensations Rates of Mineral Resources 2015

Minerals	Rate (%)
Oil, natural gas, coal, rare earth, tungsten, molybdenum	0
Lake salt, rock salt, natural brine	0.5
Coal–bed methane, stone coal, oil sand	1
Native bitumen, oil shale; iron ore, manganese, chromite, vanadium, titanium; copper, lead, zinc, bauxite, nickel, cobalt, tin, bismuth, mercury, antimony, magnesium; bromine, arsenic	2
Uranium, thorium, terrestrial heat; niobium, tantalum, beryllium, lithium, zirconium, strontium, rubidium, cesium; germanium, gallium, indium, thallium, hafnium, rhenium, cadmium, selenium, tellurium; carbon dioxide gas, hydrogen sulfurous gas, helium gas, radon gas	3
Gold, silver, platinum, palladium, ruthenium, osmium, iridium; iron–absorbed rare earth; gemstone, jade, gem diamond; mineral water	4
Other minerals	2

Table 6–4 Items and Rates of Resources Tax Since 2014

Tax Items	Adjusted Tax Rate
I. Crude oil	6% of sales volume
II. Natural gas	6% of sales volume
III. Coal	Coking coal
	Others
IV. Other non–metallic raw minerals	Ordinary
	Precious
V. Raw ferrous metals	RMB 2–30 per ton
VI. Raw non–ferrous metals	Rare earth ore
	Others
VII. Salt	Solid
	Liquid

### 2. Taxation

In 2014, China collected RMB19.737 billion compensation fees for mineral resources, a year-on-year decrease of 8.4%, and RMB108.36 billion resource taxes, an increase of 7.8%.

## III. Mineral Resources Planning

### 1. The third round of mineral resources planning launched comprehensively

The Ministry of Land and Resources has started the third round of planning and made overall arrangement for the provincial, municipal and county planning at all levels, together with the National Development and Reform Commission, the Ministry of Finance, the Ministry of Industry and Information Technology, the Ministry of Environmental Protection and the Ministry of Commerce.

### 2. The top-level design for the third round of planning finished

The top-level design has been improved according to the new requirements of comprehensively deepening reform and land and resources management. The overall thinking for the third round of planning has been put forward and planning functions and major tasks for each level have been defined. The regionalized management system and the policies on differential management of minerals have been improved. Finally, arguments have been conducted on the planning targets, major items and major projects of exploration and development of mineral resources and control of geological environment of mines.

### 3. Local planning has been guided and promoted

The Technical Regulations for the Overall Planning of Mineral Resources at the Provincial Level and the Guiding Opinions on the Overall Planning of Mineral Resources at the Municipal Level and the County Level have been formulated to define the planning requirements for each level. At present, 31 provinces, autonomous regions and municipalities have carried out studies on the planning and arguments on major indexes and major projects and on this basis, put forward the planning guidelines at the provincial level.

## IV. Management of Exploration and Mining Rights

### 1. The streamlining of administration has been intensified

Since 2014, 10 examinations and approvals relating to the management of exploration and

mining rights have been cancelled (Table 6-1).

## 2. Market regulation enhanced

Firstly, the “application for pausing the acceptance of new coal exploration right” has been cancelled and start new approval process of coal exploration license approval started . From September 12, 2014, when the implementation of the policy was started, to June 30, 2015, 35 exploration rights were established. Secondly, the issuance of overall exploitation control indexes for antimony has been cancelled; Thirdly, the comprehensive utilization index of tungsten has been changed from binding to guiding. Finally, “the policy of pausing the acceptance of new rare earth exploration and mining rights management” has been altered, allowing the large rare earth enterprises and groups confirmed by the state and satisfy the precondition of “overall exploitation control and the balance between exploitation and reserves” to apply for new rights of exploring and exploiting rare earth.

## 3. The publicity of examinations and approvals of exploration and mining rights strengthened

The information of granting and transfer of exploration and mining rights have been disclosed to the public. 14,600 pieces of basic information has been publicized in the portal web of the Ministry of Land and Resources since 2014 and 60,200 pieces accumulatively. There were 54000 pieces of exploration and mining rights registration information disclosed since 2014, and 241000 pieces from the beginning.

The information on the registration of exploration and mining rights can be checked in the portal web. 134,000 checks have been made since 2014 and 386,000 accumulatively.

# V. Management of Geological Survey Qualifications

## 1. Overview

By the end of 2014, there were 2,574 geological survey entities holding 7,336 qualifications of various types and levels, of which 2,658 were at Class A which held by 1,106 entities (including 885 state-owned entities), 2,800 were at Class B which held by 744 entities, and 1,878 were at Class C which held by 724 entities.

The qualification form by sectors : 396 were for regional geological survey, 16 for marine geological survey, 4 for oil and natural gas exploration, 660 for liquid mineral exploration, 276 for gas mineral exploration, 1,925 for solid mineral exploration, 1,028 for hydrogeology,

engineering geology, environment geology survey, 773 for geophysical exploration, 364 for geochemical exploration, 5 for aerogeological survey, 84 for remote sensing geological survey, 1,344 for geological drilling (pitting) and 461 for geological experiment and testing (Figure 6-1)

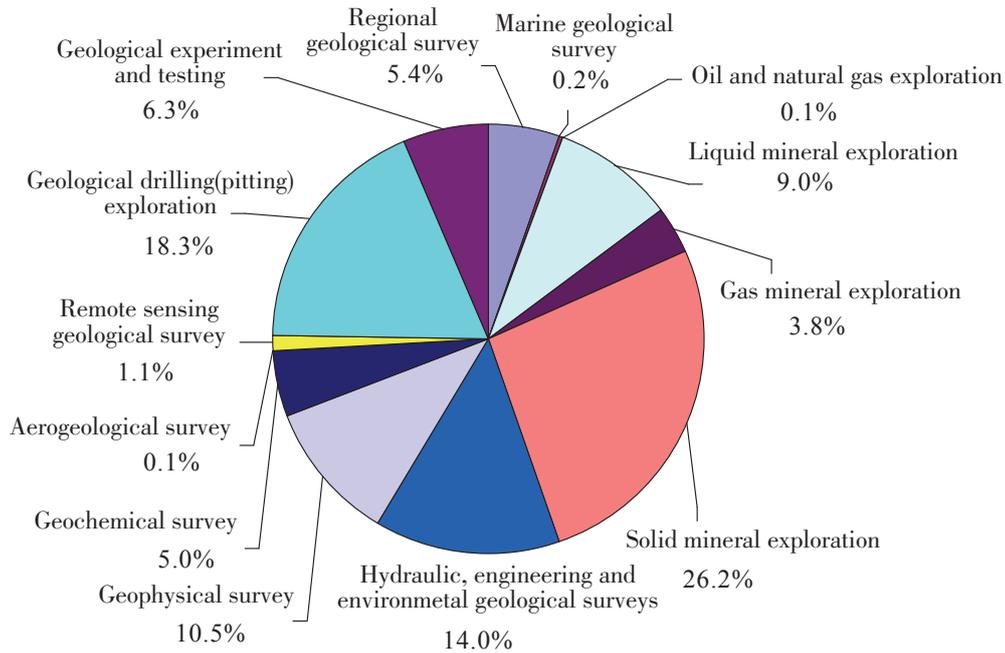


Table 6-1 Qualification Categories of Geological Survey

Based on the economic category, the foregoing geological survey entities include 1,268 state-owned entities, 21 collectively-owned entities, 12 joint-equity entities, 1,129 limited liability entities, 63 entities limited by shares, 55 private entities, 21 other entities, 1 joint venture (with funds from Chinese Taipei, Hong Kong and Macau), 1 entity with entire funds from Chinese Taipei, Hong Kong and Macau, 2 entities with entire funds from foreign countries and 1 foreign-funded shareholding company (Figure 6-2).

## 2. Examination and approval of geological survey qualifications

The Ministry of Land and Resources has completed the centralized acceptance, reporting and announcement of applications for establishment and renewal and the routine acceptance, examination and announcement of applications for alteration, supplementation and cancellation of geological survey qualifications for 2014, issued 389 geological survey qualification certificates (Established 196, retained 29 and altered 164), cancelled 3 qualification certificates.

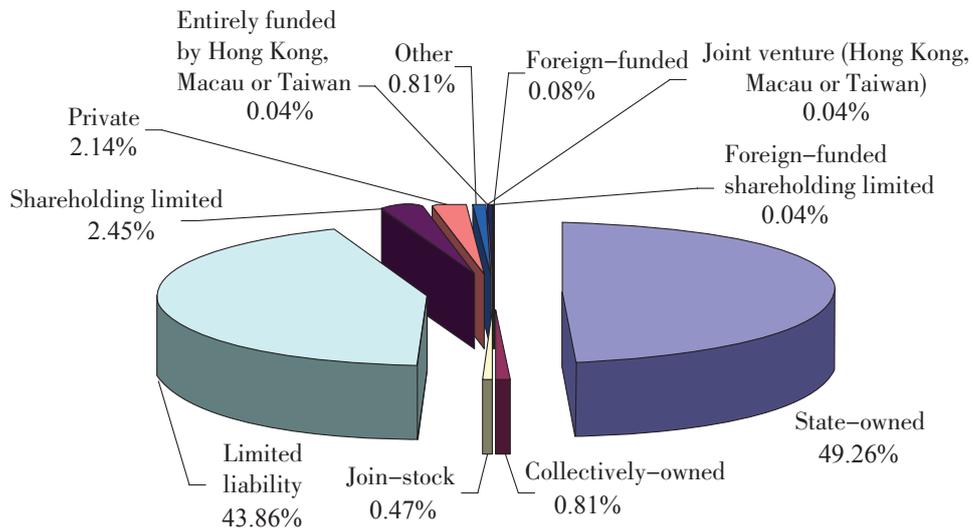


Figure 6-2 Economic Categories of Geological Survey Entities

## Chapter VII

# Geological Survey and Geological Data Service

In 2014, geological survey and geological data service played a more guiding and fundamental role in the economic and social development and provided important support and security for the development of economy, society and ecological civilization. The substantial achievements in geological survey have provided great support for the security of mineral resources. In addition, the collection of geological big data and the construction of the geological data sharing and service platform have been accelerated and the availability and quality of geological data service have been improved further.

### I. Basic Geological Survey

#### 1. Regional geological survey

In 2014, the regional geological survey for 1:50,000 finished 216,000 square kilometers, aggregated to 3.046 million square kilometers, accounting for 31.7% of the onshore territorial area. The regional geological revision for 1:250,000 finished 22 thousand square kilometers, aggregated to 5.935 million square kilometers, accounting for 61.7% of the onshore territorial area.

#### 2. Regional geophysical survey

In 2014, the aeromagnetic survey for 1:50,000 finished 230 thousand square kilometers and the working level of key metallogenic belts reached to 49%. The magnetic survey, regional gravity survey and electrical method survey for 1:50,000 finished 51 thousand square kilometers, 24 thousand square kilometers and 4 thousand square kilometers respectively. The regional gravity survey for 1:250,000 finished 190 thousand square kilometers and the working level on the land rose to 59%.

#### 3. Regional geochemical survey

In 2014, the regional geochemical exploration for 1:50,000 finished 240 thousand square

kilometers and the working level of key metallogenic belts was enhanced to 35%. The regional geochemical exploration for 1:250,000 reached 51 thousand square kilometers and the working level on the land rose to 66%.

#### 4. Remote sensing geological survey

Aerial hyperspectral data for over 2,000 square kilometers in the west of the Qilian Mountain metallogenic belt was obtained to manufacture ortho-rectification products and produce mineral information. High-precision remote sensing survey finished 5,020 square kilometers in East Kunlun, Alkin and Bangong Lake-Nujiang River metallogenic belts.

#### 5. Marine geological survey

Efforts were continued to carry out geological surveys for 1:1,000,000 in the maritime space under the jurisdiction of China, for 1:250,000 in key maritime space and for 1:50,000 in maritime space, comprehensive geological surveys and monitoring on key coastal zones, surveys on maritime oil and gas resources, exploration of natural gas hydrate (NGH) resources and other scientific ocean surveys. Among them, the filed investigation on 16 sheets under marine geological survey for 1:1,000,000 was finished. The entire maritime space under the jurisdiction of China was covered for the first time.

## II. Survey and Evaluation of Mineral Resources

### 1. Survey and evaluation of conventional oil and gas resources

A series of significant achievements have been obtained in comprehensive research, overall evaluation and multi-function survey of oil and gas basins, with a focus on new areas, new series of strata, new types and new cognition.

The new area survey opened up new fields. 3 lithologic traps were discovered in the on-site seismic exploration of Tibet Lunpola Basin, providing strategic reserves for the oil and gas exploration in the Qiangtang Basin. Besides, brown crude oil was discovered in the Muli Area in the northeast of Southern Qilian Basin, leading to a bright prospect for the multi-energy exploration.

A group of new targets were identified in the survey of new series of strata. Light crude oil was obtained in “Tushen 1” well in the peripheral Tuquan area of Songliao Basin. Important breakthroughs were made in the Middle-Lower Jurassic in the northeast. Oil and gas-containing rock layer was discovered in the Permian System in the Bogda Region in the south rim of

Junggar Basin. All of these started a new field of oil and gas exploration.

Significant new knowledge was obtained in basic geological survey. 9 important blocks were selected in the Qiangtang Basin, and 6 important favorable blocks were outlined in the carbonatite oil and gas survey in the large basins of Western China. Follow-up explorations verify that great progress has been made in the Midwest Triassic System of Sichuan Basin, the Ordovician System of Erdos Basin and the Lower Cambrian System of Tazhong Area, oil and gas bidding blocks were selected and the Xinjiang oil and gas system reform was supported enormously.

### 2. Survey and evaluation of non-conventional oil & gas resources

In the survey of coal-bed methane, 28 basin groups and 56 favorable zones were selected. High-quality oil shale was discovered in the peripheral of Songliao Basin and thick-layer oil sand was acquired in the Weibei Upheaval of South Erdos Basin.

Substantial progress was made in the survey of shale gas in the marine facies of South China. Analysis proved a higher content of shale gas in Niutitang Formation of Northwest Hunan Province and Dawuba Formation in South Guizhou Province. The survey of shale gas in North China expanded the new areas of the transitional facies of land and sea. Shale bed with a higher content of gas was discovered in the Yanchang Formation of South Erdos Basin. Gas exploration abnormalities were discovered in “Weishen-1” well in Henan Province. Comprehensive survey and evaluation selected 42 favorable blocks, providing basis for the invitation for bids of shale gas blocks.

### 3. Survey and evaluation of uranium resources

By the end of 2014, the metallogenic prospects of uranium-bearing sandstone in 13 basins, such as the Ili Basin and the Erdos Basin, and the peripheral resources potential of key uranium mineralizing zones, such as South Momoyama-Chu-kuang Mountains, Gan-Hang Belt and Xuefeng Mountain-Motianling, were evaluated in a systematic way and the uranium survey exceeded 600 thousand square kilometers. Over 500 coal exploration fields were screened and over 30 thousand coalfields and oil drillings were checked. 1,500 potential uranium resource drillings or so were discovered. There were 1,400 potential mineralized holes, over 200 prospecting targets and over 20 newly-discovered ore fields and occurrences.

### 4. Survey and evaluation of geothermal resources

The survey and evaluation of shallow geothermal resources of 256 prefecture-level cities

and the survey and division of geothermal resources of 31 provinces, districts and cities were completed comprehensively. 215°C terrestrial heat was obtained at the depth of 230 meters in Gudui Town, Cuomei County, Tibet, showing a promising prospect of resources. 150°C hot dry rock was discovered at the depth of 3,050 meters in Guide County, Qinghai Province.

### 5. Survey and evaluation of non–energy mineral resources

The mineral geological survey for 1:50,000 finished 50 thousand square kilometers. 6,300 geochemical and geophysical exploration abnormalities were determined, over 1,000 mineral occurrences or mineralized spot were discovered, over 300 prospecting targets were outlined and 35 ore fields were newly discovered. A super large copper-gold-iron polymetallic ore zone was discovered in the Gaize Shelama Region, Tibet. A large prospecting copper-nickel ore deposit was discovered in the north piedmont of East Tianshan Mountain of Xinjiang. A large gold mineralization belt was discovered in the Yazhaqu Region of East Kunlun of Qinghai Province. A super large gold ore prospect was proved in the periphery of Hunan Dawan Gold Mine. 200 thousand tons prospecting tin ore was discovered in Shixing County, Guangdong Province. 2 million tons of chromite resources were reported in South Luobusha Town, Tibet. Chromite ore was discovered newly and estimated 250 thousand tons in the Xiangka Mountain ore field in Tibet, which might become a 10-million-ton resource base. 100 million tons of prospecting potassium chloride resources was increased in Qaidam Basin, Qinghai Province. 640 thousand tons of lithium oxide resources (super-large size) were increased in the periphery of Jiajika Region, Sichuan Province. 18 high-purity quartz veins were discovered in Chengbu County, Hunan Province, with a SiO<sub>2</sub> content of over 99%. 2 medium-sized crystalloid graphite ore fields were newly discovered in Yichang City, Hubei Province and nearly 1 million tons of prospecting colombite mineralizing belt was discovered newly in Zhuxi County, Hubei Province.

## III. Geological Data Management and Service

### 1. The supervision over the collection intensified

(1) More resultant geological data collected increasingly

In 2014, 14,827 pieces of geological data were collected throughout China, of which the data on mineral geology and hydrological-engineering-environmental geology accounted for 42.8% and 47.4% respectively, and the data on oil and gas amounted to 604 pieces, an increase of 17.7% over the previous year. By the end of 2014, the number of pieces of geological data collection institutions at the ministerial level and the provincial level had reached 459.5

thousand, rising by 3.7%.

### (2) The collection of original geological data grown steadily

In 2014, the geological data collection institutions at the ministerial level and the provincial level received 2,062 pieces of original geological data totally, an increase of 78% over the previous year. The entrusted oil and gas data preservation institutions received 191.9 thousand pieces of original geological data. By the end of 2014, the amount of original geological data under entrusted preservation had reached nearly 600 thousands, rising by 17%.

### (3) Collection of geological material data enriched constantly

35 types of geological material data from mineral geological survey and regional geological survey have been collected. The Cores and Samples Center of Land and Resources has preserved such geological material data as 298,200 meters of rock cores and 40,814 slices of 557 drillings. In 2014, the entrusted oil, gas and other geological material preservation institutions received 89.9 thousand meters of rock cores and 250.7 thousand bags of rock debris and accepted the entrusted preservation of 194 thousand meters of rock core and 3 million bags of rock debris.

### (4) Online supervision launched comprehensively

By the end of 2014, over 200 thousand pieces of data on exploration and mining rights and geological projects as well as over 70 thousand kinds of collected achievements, original geological data and geological material data had been collected in the nationwide geological data collection supervision platform.

## 2. Remarkable achievements in the socialized service

### (1) Outstanding progress in the information sharing and service platform

In 2014, 34 nodes for the geological data collection departments of the provincial, district and municipal land and resources authorities and the Information Center of the Ministry of Land and Resources, China Geological Survey Development and Research Center (National Geological Archives of China) and the Cores and Samples Center of Land and Resources were built up completely, the system of “scattered preservation and network service” was established basically and non-confidential geological data service was provided to the whole society.

In the year 2014, the geological data sharing and service platform received nearly 620 thousand views and directory services of 358 thousand pieces of data was provided, an increase of 19 thousand over the previous year.

(2) Social service improved further

In 2014, China Geological Survey Development and Research Center (National Geological Archives of China) and the geological data collection departments of 31 provinces, districts and municipalities provided on-site services for 25.5 thousand person-times and 101 thousand data services; the Cores and Samples Center of Land and resources provided on-site services for 5,646 person-times; the entrusted oil, gas and other geological data preservation entities provided on-site services for 8,321 person-times and 26.6 thousand original geological data services.

(3) Service products enriched constantly

In 2014, the services of 1:50,000 mineral resources survey results for 2,565 sheets were provided to the society; basic information of 900 thousand geological drillings and bar chart information of 50 thousand drillings were released via the national key geological drilling service platform; serial map data of hydrological-engineering-environmental geology surveys for 1:50,000, data on the geological documents of 109 package exploration areas, Geological Atlas of Land, Resources and Environment of Beijing-Tianjin-Hebei Region and China Atlas of Natural Resources were issued to the public.

(4) Digital service products increased significantly

The geological data collection departments at the ministerial level and the provincial level have given great impetus to the digital service of geological data. Among the data collected, there has been 404.9 thousand pieces of electronic archives, accounting for 88.1%. 15 provinces, districts and municipalities, such as Tianjin and Hebei, have digitalized all of their geological data, which has provided powerful support for the construction of the sharing and service platforms and e-reading rooms and promoted the reading and utilization of electronic data. In 2014, the electronic data were copied for 38,700 times in the collection departments at the ministerial level and the provincial level.

# Chapter VIII

## Scientific and Technological Innovation and International Cooperation

Positive progress has been made in the scientific and technological innovation and international cooperation pertaining to mineral resources since 2014. New generation of stratigraphic chart has been released formally and a group of new geological exploration equipments have been developed. 12 national standards and 75 voluntary industrial standards for geology and mineral resources have been promulgated, enhancing the support for the exploration, development and management of mineral resources. Besides, several international mineral conferences, such as the Fifth APEC Ministers Responsible for Mining Meeting, have been held successfully, deepening the bilateral and multi-lateral cooperation and exchanges in respect of geology and mineral resources.

### I. Basic Geological and Mineral Theoretical Research

#### 1. New generation of stratigraphic chart released formally

The Stratigraphic Chart of China 2014 and the 2014 Stratigraphic Guide of China and Its Specifications have been revised on the basis of Version 2001, fully showing the country's stratigraphic research achievements for the past decades and referring to the latest international progress in stratigraphic studies. Both have been published under the approval of the Ministry of Land and Resources (GTZ [2014] No. 374).

#### 2. The oldest Asian zircon discovered in the Longquan Region of Cathaysia Massif

Two zircon fragments of Priscoan have been discovered for the first time in the mica-quartz schist in the Longquan Terrain of Cathaysia Massif. One of them is aged 4.127 billion years, the oldest one in Asia.

### 3. Crustal structure and evolutionary process of the ancient continent of North China revealed

Zircon fragments formed 3.8 to 3.5 billion years ago were discovered in East Hebei Province and 3.8 to 3.1-billion-year multi-stage magmatic activities were discovered in Anshan Area, proving the Ordos Massif drawn violently into the tectonic-heating event in late paleoproterozoic era, marking off three ancient continental blocks aged over 2.6 billion years in North China Craton and improving the understanding of the early crustal evolution, crust-mantle interaction and sedimentary metamorphic iron in the same period of time.

### 4. Major achievements obtained in the studies on the abstriction of Wenchuan Earthquake

The data on the rapid agglutination of the fracture caused by an earthquake was recorded for the first time, improving the facture theories and being of great significance for understanding the triggering of Wenchuan Earthquake.

## II. Techniques of Mineral Exploration, Exploitation and Utilization

### 1. A group of new geological exploration equipments developed

A group of deep-ocean unmanned remote-control working system (called “Sea Horse” for short) with a localization rate of 90% have been developed and tested at the depth of 4,502 meters in South China Sea. The principled prototype for ZSM-6 electronic gravimeter has been developed, and intelligent completely. The development of TOF-SIMS scientific instruments specific to isotope geology has succeeded and a group of multiple-reflection mass analyzers have been designed, realizing the preliminary focusing of primary ions on the surface of samples and the pulse attack of ion beams on samples and detecting the signal of secondary ions. Furthermore, internationally advanced  $\Phi 2000$  full-circle-swinging casting drillers have been developed, reaching a record drilling depth of gravel deposits.

### 2. The methods and techniques system for geological exploration improved further

A multiple-function airborne geophysical exploration data processing system with proprietary intellectual property rights has been developed (GeoProbe Mager). The techniques and methods for marine geochemical survey have been improved, supporting analytical schemes for the analysis on geochemical constituents of offshore sediments formulated and a series of supporting technologies and methods established. Besides, key techniques of UAV reliability, real-time delivery of big data, communication link relaying of mountainous areas and rapid

processing of data have been mastered and a UAV remote-sensing emergency monitoring technology system has been built up preliminarily.

### 3. Application demonstration has promoted effectively the utilization of technologies and equipments

The UAV geophysical exploration system has been improved to the applicable level. Solid prospecting demonstration of the great-depth three-dimensional exploration system has succeeded.

### 4. Comprehensive utilization techniques applied better

Great progress has been made in the development and industrialization of the new process of “flotation, cluster and concentrated magnetic separation” of rare earth ore. Major breakthroughs have been achieved in the low-grade bauxite dressing technology in Yunnan-Chongqing Region. New types of sulfur flotation foaming agent and activating agent have been researched and developed, improving the selectivity of sulfur flotation and realizing the efficient utilization of sulfur in bauxite.

## III. Technical Standards for Geology and Mineral Resources

China has implemented 12 national standards (Table 8-1), such as Methods for Chemical Analysis of Copper Ores, Lead Ores and Zinc Ores, and recommended 75 industrial standards pertaining to geology and mineral resources, such as Regulation of Shale Gas Resources/Reserves Estimation, further improving the technical standards’ support for the exploration, development and management of mineral resources.

Table 8-1 Related National Standards Promulgated Since 2014

National Standard Code	National Standard Name
GB/T 16950-2014	Geological Core Drilling Tools
GB/T 30712-2014	Provision of Permissible Errors for Measurement of Polished Diamond Mass
GB/T 30713-2014	Microscopic Method of Ink Stone Identification
GB/T 30714-2014	Determination of Rare Earth in Ink-stone by Inductively Coupled Plasma Mass Spectrometry
GB/T 14353.13-2014	Methods for Chemical Analysis of Copper Ores, Lead Ores and Zinc Ores—Part 13: Determination of Gallium Content, Indium Content, Thallium Content, Tungsten Content and Molybdenum Content

Continued

National Standard Code	National Standard Name
GB/T 14353.14-2014	Methods for Chemical Analysis of Copper Ores, Lead Ores and Zinc Ores—Part 14: Determination of Germanium Content
GB/T 14353.15-2014	Methods for Chemical Analysis of Copper Ores, Lead Ores and Zinc Ores—Part 15: Determination of Selenium Content
GB/T 14353.17-2014	Methods for Chemical Analysis of Copper Ores, Lead Ores and Zinc Ores—Part 17: Determination of Thallium Content
GB/T 14353.18-2014	Methods for Chemical Analysis of Copper Ores, Lead Ores and Zinc Ores—Part 18: Determination of Copper Content, Lead Content, Zinc Content, Cobalt Content and Nickel Content
GB/T 958-2015	Geological Legends Used for Regional Geological Maps
GB/T3 1390 -2015	Appraisal for View Stone
GB/T3 1432-2015	Dushan Yu—Denomination and Classification

## IV. International Cooperation

### 1. International cooperation in mining industry expanded

Firstly, the Fifth APEC Ministers Responsible for Mining Meeting, China Mining Congress and Expo 2014, 2014 China-ASEAN Mining Cooperation Forum and China (Changsha) Mineral & Gem Show were held successfully. Secondly, the mining cooperation with the U.S., Argentina, Chile and Mexico has been included in the general framework of bilateral cooperation. The cooperation with the U.S. regarding the exploration and exploitation of shale gas has been strengthened and China-U.S. Forum on the Sustainable Development of Unconventional Oil and Gas Resources was held jointly. Besides, the 4th meeting of China-Mexico Mining Cooperation Workgroup was held. Thirdly, the cooperation with such conventional mining giants as Canada, Australia, Russia and South Africa has been consolidated and achievements have been obtained in improving inter-ministerial dialogue and cooperation mechanisms, propelling the cooperation in mining investment and trading and strengthening scientific, technological and information exchanges. Finally, the cooperation with such new economies as Central Asia, Southeast Asia, Latin America and Africa has been expanded. And cooperative intentions have been reached regarding the cooperation in shale gas development and utilization, geochemical survey and geological data sharing with Uzbekistan, Kazakhstan, Indonesia, Poland and other countries.

### 2. International cooperation in science and technology has been enhanced.

Firstly, active efforts have been made to promote the establishment of the UNESCO Global-Scale International Geochemical Research Center in the Institute of Geophysical and Geochemical Exploration of Chinese Academy of Geological Sciences as well as the proposed plan of “Providing resources for our descendants”. Secondly, the 3rd World Landslide Forum, the 8th International Conference on Salt Lake Research and other major international congresses have been hosted, improving the international influence of China’s geosciences. Finally, China-SCO Geosciences Cooperation Research Center has been founded, offering an important platform for SCO member states to improve their cooperation in geosciences.