Analysis on the Exploitation and Utilization of Non-oil and Gas Mineral Resources in China from 2015 to 2017

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Abstract. A comprehensive understanding of the exploitation and utilization of non-oil and gas mineral resources, which is of great significance to both the mineral resources management departments and mining investors. This article analyzed the exploitation and utilization of non-oil and gas mineral resources in China from 2015 to 2017, by using the authoritative data which issued by the Ministry of Natural Resources, PPC, and the work achievements of the project "Remote Sensing Monitoring of Mineral Resources Exploitation Environment in China". It was found that the number of non-oil and gas mines in China was generally decreasing, with a decrease of 20.1% from 2015 to 2017. It showed that the exploitation of non-oil and gas mineral resources in China was changing to large-scale and intensification. China's coal and iron ore production capacity had been significantly reduced in 2015-2017. It showed that the socio-economic dependence on mineral resources was gradually decreasing. It was suggested that the mineral resources management department should strengthen the crackdown on illegal mining. It was suggested that mining investors should strengthen cooperation, and transform to knowledge intensive industries such as deep processing of mineral products.

1. Introduction
A comprehensive understanding of the exploitation and utilization of non-oil and gas mineral resources is conducive to the rational formulation of mining management policies and mining development strategies, which is of great significance to both the mineral resources management departments and mining investors.

The mainly data on the exploitation and utilization of mineral resources in China were as follows: "China Mineral Resources" which regularly issued by the Ministry of Natural Resources, PPC, "Mine Geological Environment Monitoring based on Remote Sensing in China" in different years based on the work achievements of the project "Remote Sensing Monitoring of Mineral Resources Exploitation Environment in China" by China aero geophysical survey and remote sensing center for natural resources, and relevant articles and monographs published by scientific researchers such as the information center of the Ministry of natural resources, PPC[1-5], and the project work unit[6-16] of "remote sensing monitoring of Mines".

Based on these data, this article analyzed the exploitation and utilization of non-oil and gas mineral resources in China from 2015 to 2017, and put forward relevant suggestions, hoped to be helpful to relevant work.
2. With Mining Rights Mines

2.1. 2015
According to "2016 China Mineral Resources", by the end of 2015, there had been 9,480 coal exploitation rights in China, involving a registered area of 58,100 km\(^2\). There had been 64.5 thousand exploitation rights for metallic and nonmetallic minerals in China, involving a registered area of 46 thousand km\(^2\) and a designed production scale of 10.582 billion tons/year\(^{[17]}\). That was to say, there had been 74 thousand exploitation rights for non-oil and gas minerals, involving a registered area of 104.1 thousand km\(^2\).

2.2. 2016
According to "2017 China Mineral Resources", by the end of 2016, 64.5 thousand non-oil & gas exploitation licenses involved a registered area of 100,600 km\(^2\), down by 11.4% and 3.3%, respectively. The designed annual capacity was 14.97 billion tons, up by 1.1%\(^{[18]}\).

2.3. 2017
According to "2018 China Mineral Resources", by the end of 2017, there were 56.6 thousand non-oil and gas mineral mining rights covering a registered area of 95.9 thousand km\(^2\) in China, decreasing by 13.6% and 4.7% respectively. The designed production capacity was 15.146 billion tons per year, increasing by 1.2%\(^{[19]}\).

3. Without Mining Rights Mines

3.1. 2015
"Remote Sensing Monitoring of Mineral Resources Exploitation Environment in China" project workers find 10383 suspected illegal mines, from remote sensing data of China in 2015. Include 7040 no rights mines, 2769 beyond the boundary of mining rights mines, 432 mining with exploration rights mines, 142 unauthorized changed the mining method or specie\(^{[20]}\). Among these, both no rights mines and mining with exploration rights mines were without mining rights mines, the total was 7472.

3.2. 2016
"Remote Sensing Monitoring of Mineral Resources Exploitation Environment in China" project workers find 12412 suspected illegal mines, from remote sensing data of China in 2016. Include 8012 no rights mines, 3547 beyond the boundary of mining rights mines, 350 mining with exploration rights mines, 503 unauthorized changed the mining method or specie\(^{[21]}\). Among these, without mining rights mines were 8362 in total.

3.3. 2017
"Remote Sensing Monitoring of Mineral Resources Exploitation Environment in China" project workers find 12881 suspected illegal mines, from remote sensing data of China in 2017. Include 8397 no rights mines, 3835 beyond the boundary of mining rights mines, 142 mining with exploration rights mines, 507 unauthorized changed the mining method or specie\(^{[22]}\). Among these, without mining rights mines were 8539 in total.

4. Production of Main Mineral Products
According to "China Mineral Resources" which regularly issued by the Ministry of Natural Resources, PPC, the production of main mineral products in China were shown in Table 1.
Table 1. Production of main mineral products in China in 2015-2017

| Product Species           | Unit     | Production in 2015 | Production in 2016 | Production in 2017 | Changes from 2015 to 2017 |
|---------------------------|----------|-------------------|-------------------|-------------------|---------------------------|
| Coal                      | Billion Tons | 3.68              | 3.36              | 3.45              | ↓6.3%                     |
| Iron Ore                  | Billion Tons | 1.38              | 1.28              | 1.23              | ↓10.9%                    |
| Gold                      | Tons     | 450.1             | 453.5             | 426.1             | ↓5.3%                     |
| Ten Kinds of Nonferrous Metals | Million Tons | 50.90         | 52.83             | 53.778            | ↑5.7%                     |
| Phosphate Rock            | Million Tons | 140              | 140               | 120               | ↓14.3%                    |
| Cement                    | Million Tons | 2.35              | 2.4               | 2.32              | ↓1.3%                     |
| Plate Glass               | Million Weight Cases | 740              | 770               | 790               | ↑6.8%                     |

5. Changes Analysis

5.1. Changes in Number of Mines
From 2015 to 2017, the number of non-oil and gas mining rights in China decreased significantly, by more than 10% every year, a total of 17.4 thousand, a decrease of 23.5%. The number of mines without mining rights in China was on the increase trend, with 1067 increased, an increase of 14.3%. The total number of non-oil and gas mines showed a decreasing trend, with an decrease about 10% every year, a total decrease of 16.4 thousand, a decrease of 20.1% (Table 2).

Table 2. Changes in number of non-oil and gas mines in China in 2015-2017

| Year | Number of Mining Rights (Thousand) | Changes in Number of Mining Rights | Number of Without Mining Rights Mines | Changes in Number of Without Mining Rights Mines | Total Number (Thousand) | Changes in Total Number |
|------|------------------------------------|------------------------------------|--------------------------------------|-----------------------------------------------|------------------------|------------------------|
| 2015 | 74.0[17]                          |                                    | 7472                                 |                                               | 81.5                   |                        |
| 2016 | 65.6[18]                          | ↓11.4%[18]                         | 8362                                 | ↑11.9%                                        | 74.0                   | ↓9.2%                  |
| 2017 | 56.6[19]                          | ↓13.6%[19]                         | 8539                                 | ↑2.1%                                         | 65.1                   | ↓12.0%                 |
| Changes from 2015 to 2017 | ↓17.4 | ↓23.5% | ↑1067 | ↑14.3% | ↓16.4 | ↑20.1% |

5.2. Changes in Mining Rights Registered Area
From 2015 to 2017, the non-oil and gas mining right registered area in China decreased by 8.2 thousand km², a decrease of 7.9% (Table 3), less than the decrease of 23.5% in number of non-oil and gas mining rights.

5.3. Changes in Designed Production Capacity
From 2015 to 2017, the non-oil and gas mines designed production capacity in China showed an increasing trend, with a total increase of 340 million tons/year, an increase of 2.3% (Table 3).
Table 3. Changes in non-oil and gas mining rights registered area and designed production capacity in China in 2015-2017

| Year     | Registered Area (Thousand km²) | Changes in Registered Area | Designed Production Capacity (Million Tons/Year) | Changes in Designed Production Capacity |
|----------|-------------------------------|-----------------------------|-----------------------------------------------|----------------------------------------|
| 2015     | 104.1[19]                     |                             | 14806                                         |                                        |
| 2016     | 100.6[18]                     | ↓3.3%[18]                   | 14969[18]                                     | ↑1.1%[18]                              |
| 2017     | 95.9[19]                      | ↓4.7%[19]                   | 15146[19]                                     | ↑1.2%[19]                              |
| Changes from 2015 to 2017 | ↓8.2 | ↓17.9% | ↑340 | ↑2.3% |

Note: the designed production capacity data in 2015 was calculated by the designed production capacity data and growth rate in 2016.

5.4. Changes in Production of Main Mineral Products
Among the main mineral products, the production of coal, iron ore, gold, phosphate rock and cement showed a decreasing trend. The decrease of coal and gold were more than 5%. The decrease of iron ore and phosphate rock were more than 10%. But the production of ten kinds of nonferrous metals and plate glass showed an increasing trend, with an increase of more than 5% and less than 10% (Table 1).

6. Understandings and Suggestions

6.1. Main Understandings
(1) From 2015 to 2017, the number of non-oil and gas mining rights in China significantly decreased, the number of mines without mining rights was on the increase trend, the total number of non-oil and gas mines showed a decreasing trend, with a decrease of 20.1%.

(2) From 2015 to 2017, the decrease of non-oil and gas mining right registered area less than the decrease of mining rights number, the designed production capacity showed an increasing trend, it showed that the exploitation of non-oil and gas mineral resources in China was changing to large-scale and intensification.

(3) From 2015 to 2017, the production capacity of coal and iron ore had been significantly reduced in China.

(4) The number of non-oil and gas mines significantly decreased, coal and iron ore production capacity significantly reduced, it showed that the socio-economic dependence on mineral resources was gradually decreasing in China.

6.2. Suggestions
(1) In view of the number of non-oil and gas mines without mining rights in China was on the increase trend, suggested that the mineral resources management department should strengthen the crackdown on illegal mining, such as no rights mines and mining with exploration rights mines.

(2) In view of the exploitation of non-oil and gas mineral resources in China was changing to large-scale and intensification, suggested that mining investors should strengthen cooperation, form large-scale and intensive mining industry, and enhance international competitiveness.

(3) In view of the socio-economic dependence on mineral resources was gradually decreasing in China, suggested that mining investors should transform to knowledge intensive industries such as deep processing of mineral products, develop more value-added space for mineral products.

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