

# White Papers of the Chinese Government 2012

Information Office of the State Council of  
the People's Republic of China



FOREIGN LANGUAGES PRESS

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# **Situation and Policies of China's Rare Earth Industry**

(June 2012)

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## **Preface**

- I. Current Situation of China's Rare Earth Industry**
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## **Preface**

Rare earths are an important, non-renewable natural resource with increasingly wider applications in economic and social development.

China is among the countries with relatively rich rare earth reserves. Since the 1950s, remarkable progress has been witnessed in China's rare earth industry. After many years of effort, China has become the world's largest producer, consumer and exporter of rare earth products.

While bringing benefits to mankind, the exploitation of rare earth has brought about increasingly significant problems regarding this resource and the environment. In the exploitation and utilization of rare earth, the rational utilization and effective protection of the environment pose common challenges for the world at large. In recent years, China has taken comprehensive measures in the links of mining, production and exporting of rare earth goods and strengthened efforts for the protection of the resource and the environment, endeavoring to ensure a sustainable and healthy development of this industry.

With the in-depth development of economic globalization, China is involved in more extensive international exchanges and cooperation in the field of rare earth. Always honoring the rules and living up to its commitments, China has provided the world with large quantities of rare earth products. It will continue to follow the WTO rules, strengthen scientific management of this industry and supply rare earth products to the global market, so as to make its due contribution to the development and prosperity of the world economy.

For some time now, some countries have been particularly fretful about the situation of China's rare earth industry and related policies, doing a lot of guesswork and conjuring up many stories. We hereby give a presentation on China's rare earth industry in order to further provide the international community with a better understanding of this issue.

## **I. Current Situation of China's Rare Earth Industry**

Rare earths are a group of 17 chemical elements in the periodic table of the elements, i.e., Lanthanum (La), Cerium (Ce), Praseodymium (Pr), Neodymium (Nd), Promethium (Pm), Samarium (Sm), Europium (Eu), Gadolinium (Gd), Terbium (Tb), Dysprosium (Dy), Holmium (Ho), Erbium (Er), Thulium (Tm), Ytterbium (Yb) and Lutecium (Lu), and their congeners Scandium (Sc) and Yttrium (Y). According to their atomic weights and physicochemical properties, they are divided into light, middle and heavy rare earth elements. The first five above-mentioned elements are light ones, and the rest are either middle or heavy ones. Because of their unique physicochemical properties, rare earth elements are considered indispensable in modern industry as they are extensively used in areas such as new energy, new materials, energy conservation and environmental protection, aeronautics and astronautics and electronic information, to name but a few.

China is relatively abundant in rare earth resources, and its rare earth reserves account for approximately 23% of the world's total. China's rare earth resources display the following characteristics:

— Their distribution presents a “light north, heavy south” pattern. Light rare earth mines are mainly located in Baotou of the Inner Mongolia Autonomous Region, and other northern areas, as well as

in Liangshan of Sichuan Province, while ion-absorbed-type middle and heavy rare earth deposits are mainly found in Ganzhou of Jiangxi Province, Longyan of Fujian Province, and some other southern areas.

— The types of rare earth resources are rather diversified. China has a rich variety of rare earth minerals, including bastnaesite, monazite, ion-absorption minerals, xenotime, fergusonite, and others, with a relatively complete range of rare earth elements. Among them, the ion-absorption middle and heavy rare earth deposits occupy an important position in the world.

— The associated radioactive elements of light rare earth minerals pose major problems for the environment. Most of China's light rare earth deposits can be industrially mined, but thorium (Th) and other radioactive elements are difficult to treat, and therefore great attention must be paid to its impact on people's health and the ecology when they are mined, smelted and separated.

— Ion-absorption middle and heavy rare earth ores have poor occurrence conditions. In ion-absorbed-type rare earth deposits, the rare earth elements are absorbed in the soil in the form of ions, making it difficult for industrial exploitation due to sparse distribution and low abundance rate.

Since the introduction of the reform and opening-up policies in the late 1970s, China's rare earth industry has seen rapid development. Major progress has been made in the research and development of relevant mining, smelting and utilizing technologies, and the increasing expansion of the industrial scale has basically satisfied the needs of the nation's economic growth and social development.

— A complete industrial system has been achieved. China has developed three major rare earth production areas, i.e., the light rare earth production areas in Baotou of Inner Mongolia and Liangshan of Sichuan, and middle and heavy rare earth production areas in the five southern provinces centering around Ganzhou of Jiangxi Province.

With a complete industrial system armed with mining, dressing, smelting and separating technologies and incorporating equipment manufacturing, material processing and end-product utilization, China can produce over 400 varieties of rare earth products in more than 1,000 specifications. In 2011, China produced 96,900 tons of rare earth smelting separation products, accounting for more than 90% of the world's total output.

— The market environment is gradually improving as China is constantly expediting reform in the rare earth industry, promoting the development of a market system featuring diversified investment, independent decision-making by businesses and pricing according to supply and demand. In recent years, investment in China's rare earth industry has experienced rapid growth, the market has been constantly expanded, state-owned, privately owned and foreign-invested sectors coexist, and the value of the rare earth metal market is approaching 100 billion yuan. The market order in this sector is gradually improving, and progressive development is being made in the merger and reorganization of businesses. The old picture of a “small, scattered, and disorderly” rare earth industry has vanished.

— Scientific and technological level has improved further. After many years of development, China has established a relatively complete R&D system, pioneered numerous technologies of international advanced levels in rare earth mining and dressing, smelting, separating, etc., and its unique mining and dressing processes and advanced separating techniques have laid a solid foundation for efficient exploitation and utilization of rare earth resources. The rare earth new materials industry has experienced steady development, and industrialization has been achieved in using rare earths to produce permanent-magnet, luminescent, hydrogen-storage, catalytic and other new materials, providing support for the restructuring and upgrading of traditional industries, and the development of emerging industries of strategic importance.

The rapid development of China's rare earth industry has not only satisfied domestic demand for economic and social development, but also made important contributions to the world's rare earth supply. For many years, China has been faithfully fulfilling its pledges upon its accession to the WTO, honoring the WTO rules, and promoting fair trade in rare earths. Currently, China supplies over 90% of the global market rare earth needs with 23% of the world's total reserves, its output of permanent-magnet, luminescent, hydrogen-storage and polishing materials, which use rare earths as raw materials, accounts for more than 70% of the world's total, and China-produced rare earth materials, parts and components, as well as rare earth end products, such as energy-saving lamps, special and small electric motors and NiMH batteries, satisfied the development needs of high-tech industries of other countries, especially those of the developed countries.

Despite its rapid development, China's rare earth industry also faces many problems, for which China has paid a big price. The following are some of the problems:

— Excessive exploitation of rare earth resources. After more than 50 years of excessive mining, China's rare earth reserves have kept declining and the years of guaranteed rare earth supply have been reducing. The decline of rare earth resources in major mining areas is accelerating, as most of the original resources are depleted. In Baotou, only one-third of the original volume of rare earth resources is available in the main mining areas, and the reserve-extraction ratio of ion-absorption rare earth mines in China's southern provinces has declined from 50 two decades ago to the present 15. Most of the southern ion-absorption rare earth deposits are located in remote mountainous areas. There are so many mines scattering over a large area that it is difficult and costly to monitor their operation. As a result, illegal mining has severely depleted local resources, and mines rich in reserves and easy to exploit are favored over the others, resulting in a low recovery rate

of the rare earth resources. Less than 50 percent of such resources are recovered in ion-absorption rare earth mines in southern China, and only ten percent of the Baotou reserves are dressed and utilized.

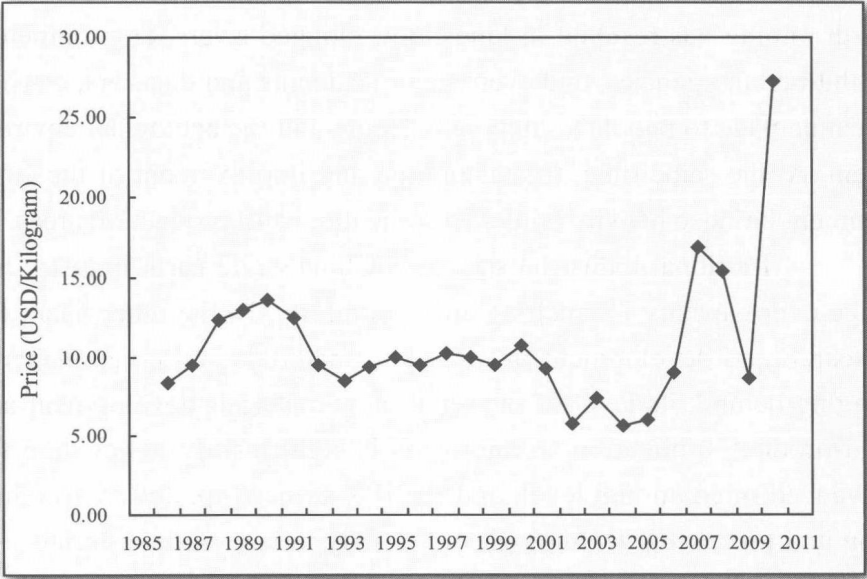
— Severe damage to the ecological environment. Outdated production processes and techniques in the mining, dressing, smelting and separating of rare earth ores have severely damaged surface vegetation, caused soil erosion, pollution, and acidification, and reduced or even eliminated food crop output. In the past, the outmoded tank leaching and heap leaching techniques were employed at ion-absorption middle and heavy rare earth mines, creating 2,000 tons of tailings for the production of every ton of REO (rare earth oxide). Although more advanced in-situ leaching method has been widely adopted, large quantities of ammonium nitrogen, heavy metal and other pollutants are being produced, resulting in the destruction of vegetation and severe pollution of surface water, ground water and farmland. Light rare earth mines usually contain many associated metals, and large quantities of toxic and hazardous gases, waste water with high concentration of ammonium nitrogen and radioactive residues are generated during the processes of smelting and separating. In some places, the excessive rare earth mining has resulted in landslides, clogged rivers, environmental pollution emergencies, and even major accidents and disasters, causing great damage to people's safety and health, and the ecological environment. At the same time, the restoration and improvement of the environment has also heavily burdened some rare earth production areas.

— Irrational industrial structure. China's rare earth industry has huge over-capacity in smelting and separating. On the other hand, the research and development of rare earth materials and components is lagging behind, its level of rare earth new materials development and end-product application technologies is significantly lower than the advanced international level, and the IPR ownership, and the production and processing technologies of new-type rare earth materials and

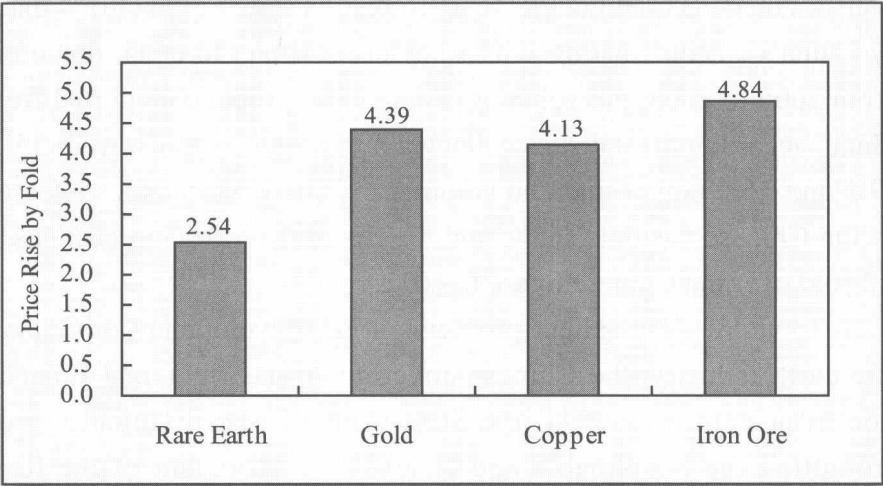
components are relatively small in number. As a result, low-end products overflow while high-end products are in short supply. China's rare earth industry, relatively small in scale, features a low concentration rate with numerous businesses, but lacks large enterprises with core competitiveness. Self-discipline in the industry is also weak, and vicious competition exists to some extent.

— Severe divergence between price and value. Over quite a long time, the price of rare earth products has remained low and failed to reflect their value, the scarcity of the resources has not been appropriately represented, and the damage to the ecological environment has not been properly compensated for. Since the second half of 2010, despite the gradual rise in the price of rare earth products, the rise has been much lower than that in the price of other raw materials like gold, copper and iron ore. From 2000 to 2010, the price of rare earth products rose by 2.5-fold, while that of gold, copper and iron ore increased by 4.4-, 4.1- and 4.8-fold during the same period, respectively.

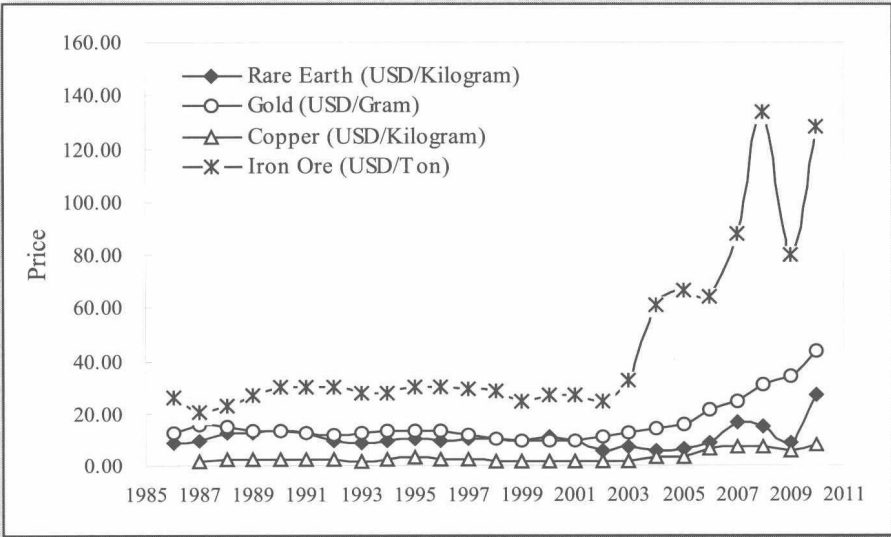
Chart 1: Changes in the Price of China's Rare Earth Products  
1986-2010



**Chart 2: Price Rise of Rare Earth Products as Compared with That of Some Other Commodities, 2000-2010**



**Chart 3: Price Changes of Rare Earth, Gold, Copper and Iron Ore 1986-2010**



— Grave smuggling. Due to multiple factors, including domestic and international demand, the smuggling of rare earth products to overseas markets continues to be a problem in spite of the efforts made by China's customs listing it as a key criminal act to crack down on. From 2006 to 2008, the volumes of rare earth products imported from China, according to statistics collected by foreign customs, were 35%, 59% and 36% higher than the volumes exported, as statistics released by the Chinese customs show, and the figure from foreign customs is 1.2-fold over the Chinese figure in 2011.

To address the salient problems in the development of China's rare earth industry, the Chinese government has tightened supervision over it. In May 2011, the State Council issued Guidelines on Promoting the Sustainable and Healthy Development of the Rare Earth Industry (hereinafter referred to as the "Guidelines"), attaching more importance to the protection of resources and the environment, and the realization of sustainable development. According to the "Guidelines," the government — in accordance with law — will strengthen control over the mining, production, circulation, import and export, and other links of the rare earth industry, and study and formulate as well as amend and improve related laws and regulations on the administration of this industry. The Chinese government has established an inter-departmental coordinating mechanism for the rare metals industry to make overall plans and study of the national strategy, program, plan, policy, and other important issues concerning the development of the rare earth industry. The state has also set up a rare earth office to coordinate and propose plans on the mining, production, reserve, and import and export of rare earth materials. The relevant departments of the State Council will perform their respective administrative functions accordingly. In April 2012, Association of China Rare Earth Industry was founded with official approval. It is expected to play an important role in promoting self-

discipline in the industry, regulating the industrial order, and proactively carrying out international cooperation and exchanges, among other functions. A year or so has passed since the implementation of the "Guidelines," the transformation of the development pattern of China's rare earth industry has picked up speed, and significant improvement has been seen in its development order.

## **II. Principles and Targets of Development**

### **1. Fundamental Principles**

— Adhering to environmental protection and resource conservation. The state will implement stricter standards for ecological protection and protective exploitation policies concerning rare earth resources, improve relevant laws and regulations on the industry's administration, and crack down on all violations of laws and regulations according to law.

— Adhering to total-amount control and optimizing reserves. The state will quicken its steps to implement the conglomerate strategy, promote structural adjustment of the industry, actively push forward technological innovation, strictly control the mining, smelting and separating capacities, phase out outdated capacity, and further increase the concentration rate of the industry.

— Adhering to giving consideration to both the domestic and international markets and resources. The state will take synchronized administrative measures on rare earth mining, production and export, and encourage international exchanges and cooperation.

— Adhering to coordinated development of local economy and society. The state will strive to correctly handle the relations between local and overall development and current and long-term development, and maintain a normal order of industrial development.

## **2. Main Targets**

Within a short period of time, the state will strive to establish a regulated and orderly system of rare earth resource exploitation, smelting and separating, and market circulation, and effectively control the disorderly exploitation of resource, deterioration of the ecological environment, blind expansion of production, and rampant smuggling; increase the recycling rate of rare earth resources, the recycling rate of ore dressing recovery, and the rate of comprehensive utilization, enforce effective control over the intensity of resource exploitation, and restore the reserve-extraction ratio to a proper level. It will make sure the discharge of waste water and gas and slag meet the established standards, and effectively restore the ecological environment in key areas. It will push forward merger and reorganization in the rare earth industry, and develop large-scale, highly efficient, and clean production enterprises. New product development and new technology application will be accelerated. On this basis, the state will further improve related policies and laws and regulations regarding the rare earth industry, gradually establish a unified, standardized, and highly efficient administrative system for the industry, and develop a sustainable and healthy development pattern featuring rational mining, orderly production, efficient utilization, advanced technology and intensive development.

## **III. Effectively Protecting and Rationally Utilizing Rare Earth Resources**

Rare earths, as a non-renewable natural resource, need to be effectively protected and rationally utilized. As part of its drive to ensure the sustainable use of resources, China has been practicing protective exploitation of its rare earth resources for many years.