

Special topic on dual carbon and critical mineral resources

Research on the relationship between key mineral resources and economic development*

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Abstract: Critical mineral resources are key resources with limited reserves, special attributes and irreplaceable properties in a country and region, but play a vital role in achieving high-quality economic development and maintaining economic security. As economic globalization continues to deepen and new developments in the context of the rapid development of the information technology revolution, key mineral resources are increasingly valued by various economies. This article first refers to the catalog lists of key mineral resources in eight major economies and selects the 19 key mineral resources with the highest degree of overlap as this article. catalog list, and analyze the natural attributes and distribution characteristics of key mineral resources based on this. Secondly, based on relevant domestic and foreign literature research, we use key mineral resources to promote the regional economy to achieve high-quality development, the stage characteristics that affect economic development, and the resource curse theory. In three aspects, the theoretical basis of key mineral resources and economic development is elaborated in depth. The study found that countries and regions suffering from the resource curse all have institutional flaws. That is, resources are not inherently innocent. They are a necessary element of economic development. There are flaws in the system itself. It is the decisive factor and cause of the resource curse. Finally, this article cuts in from the perspective of institutional guarantee, pursues the establishment of a complete supply guarantee system for scarce key mineral resources, and keeps in mind the lesson of history, seeks measures to effectively utilize key mineral resources, and avoids the occurrence of the

"resource curse". In order to provide reference for China to maintain resource security, improve the comprehensive

utilization level of key mineral resources, and achieve high-quality economic development. **Keywords:** Key mineral resources, economic development catalogue, impact mechanism, institutional guarantee. **Author:** Li Ping, Ph.D. in Economics, Shandong University

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Key mineral resources are widely used in aerospace, aviation, electronics, medicine, new energy, information technology, intelligent manufacturing and other fields. They are an important foundation for various economies to achieve sustained and high-quality economic development. With the rapid development of the current new information technology revolution As well as the continuous changes in the industrial structure, the demand for key mineral resources from global economies continues to intensify. The report of the 20th National Congress of the Communist Party of China in 2022 clearly proposed to further enhance the supply security capabilities of strategic resources. The 2023 "Government Work Report" emphasized the need to strengthen Domestic exploration and development of important energy and mineral resources and increasing reserves and production. At the same time, under the "double carbon" goal vision, key mineral resources are the material basis for the development of strategic emerging industries. However, due to the limitations of the exploration technology, recycling and utilization of key mineral resources Affected by uncertain factors such as capacity and price fluctuations, the development path of China's key mineral resources faces severe challenges.

The concept and basic situation of key mineral resources

At this stage, due to the influence of national and regional heterogeneity and other reasons, there is no unified definition of key mineral resources, so there are various names, such as "key mineral resources", "strategic mineral resources", "strategic new mineral resources", etc. However, the academic community agrees on its broad cognitive scope and importance. It is vital to the economic development and national defense security of the economy, indispensable to the development of strategic emerging industries, and at the same time, there are relatively large risks in supply. Class mineral resources. At the same time, there is no clear division as to which mineral resources are critical mineral resources. The types of key mineral resources will vary depending on the mining volume, technical level, international trade, economic structure and development strategy. The law of spatiotemporal evolution, The types of inclusions vary in different periods, countries and regions. For example, when a country or region is subject to "resource containment" from the international level, the most basic iron ore resources may also become its key mineral resources. Therefore, from the perspective of this article, key mineral resources are limited reserves, special attributes and irreplaceable in a country and region, but they play an important role in achieving sustainable economic development and maintaining economic security.

Xi Jinping writes: «Hold high the great banner of socialism with Chinese characteristics and work together in unity to comprehensively build a modern socialist country— Report at the 20th National Congress of the Communist Party of China» Beijing: People's Publishing House, 2022, pp. 31-32

Writing team of the Research Office of the State Council: «Government Work Report of the First Session of the 14th National People's Congress» Beijing: People's Publishing

House 2023 Cheng Jinhua, Yi Jiahui, Wu Qiaosheng: «Carbon neutrality, development of strategic emerging industries and Management of Critical Mineral Resources», published in "China's Population Resources and Environment", Issue 9, 2021, Pages 135-142 Li

Wenchang, Li Jianwei, Xie Guiqing, etc.: "Analysis on the Current Situation, Research Content and Resource Strategy of China's Critical Minerals" Published in "Frontiers of Geoscience", Issue 1, 2022, Pages 1-13 Wang Anjian: "Strategic Research on Global Mineral Resources - "Research on Strategic Key Minerals" Special Editor's Message" Published in "Acta Geosciences" Issue 2, 2023, Pages 257-260

Wang Anjian, Yuan Xiaojing: "Thoughts on the security of China's strategic key mineral resources in the context of great power competition", published in "Proceedings of the Chinese Academy of Sciences", Issue 11, 2022, pp. 1550-1559.

Key resources that play a vital role.

Key mineral resources are a classification of mineral resources. Compared with traditional mineral resources, the commonality is mainly reflected in the natural attributes, that is, the formation of mineral resources requires a long and complex historical evolution process and is not subject to human will. The result of special geological processes, the distribution in time and space is non-uniform. The existing reserves of mineral resources in a country and region are closely related to its geological structure and excavation and mining capabilities. However, judging from the current evolutionary process of human beings, the key Mineral resources have limited reserves and are non-renewable. Their characteristics are mainly reflected in their economic attributes. Key mineral resources have key economic and political status. As key production factors for the future development of various countries and regions, key mineral resources help ensure strategic The development of emerging industries, high-end industries, new information technology and other industries plays a significant role in the transformation and upgrading of industrial and supply chains, as well as the exploration of future clean energy, pollution reduction and carbon reduction, and ecological and environmental protection, and has become irreplaceable. The source of power is the focus of the game among

various economies today. In view of the importance of key mineral resources, in recent years, each economy has set up a catalog list of key mineral resources that is consistent with its own reality based on its own resource endowment conditions and national development strategies, and make corresponding dynamic adjustments as supply and demand changes and the development of new technologies require. This article analyzes and summarizes the key mineral resource catalog lists set by eight major economies, and selects the top 19 key mineral resources with the highest overlap as the basis of this article. Catalog list (see Table 1). Through relevant data collection and information search, it was found that because the formation of key mineral resources is limited by natural conditions, the distribution of key mineral resources is highly concentrated and shows obvious heterogeneity. Among them, Latin America is uniquely endowed with natural conditions. Mineral resources have created a favorable foundation for formation. The region has the richest types of key mineral resources. China, Australia, Russia, and the United States, as the world's top mineral resource-rich countries, have an advantage in the possession of key mineral resources.

Based on the above analysis, key mineral resources are scarce, non-renewable and unbalanced in distribution, and there are supply risks. Due to the economic importance of key mineral resources, the demand for key mineral resources in various economies around the world continues to increase and is difficult to replace in a short period of time. At this stage, supply and demand The contradiction has caused various economies to worry about the security of key mineral resources. Based on this, this article attempts to theoretically clarify the relationship between key mineral resources and economic growth and its inherent impact mechanism, and puts forward targeted suggestions and measures, with a view to providing It provides inspiration for China to ensure the supply security of its own key mineral resources and achieve sustainable economic development in the complex international environment with surging undercurrents.

Saleem H Ali et al , "Mineral Supply for Sustainable Develop
in Nature Vol 543 No 7645 2017 pp 367 - 372

Table 1 List of critical minerals

serial number	critical minerals resource	China (2022)	Russia (2018)	USA (2022)	European Union (2017)	U.K. (2015)	Japan (2009)	Australia (2022)	Brazil (2021)
1	cobalt	●	●	●	●	●	●	●	●
2	Tungsten	●	●	●	●	●	●	●	●
3	niobium	●	●	●	●	●	●	●	●
4	Tantalum	●	●	●	●	●	●	●	●
5	Rare earth	●		●	●	●	●	●	●
6	mercury	●	●	●		●	●	●	●
7	beryllium	●	●	●		●	●	●	●
8	vanadium	●		●	●	●	●	●	
9	graphite			●	●	●		●	●
10	vanadium			●	●	●	●	●	●
11	platinum group		●	●	●	●	●	●	●
12	antimony	●	●	●		●		●	●
13	Nickel		●	●		●	●		●
14	beryllium			●	●	●	●	●	
15	zinc	●	●	●		●	●	●	
16	chromium	●		●		●	●	●	
17	barium		●	●		●	●	●	●
18	beryllium		●	●	●	●	●	●	
19	indium			●	●	●	●	●	

Source: Some data come from China's National Mineral Resources Planning (2016-2020), Australian Science Association, and the United States US Geological Survey (USGS), and refer to Mei Yanxiang, Pei Rongfu, Wei Ran, etc.: «Key Minerals and Energy Resources Security», published in «China Mining Industry», Issue 11, 2022, Pages 1-8.

2. Theoretical Basis of Key Mineral Resources and Economic Development

The relationship between mineral resources and economic development has always attracted academic attention. Different countries and regions have some mineral resources have different effects on economic growth. Based on the heterogeneity of national economic development levels, research by domestic and foreign scholars has found that for most Western developed economies, mineral resources can play a role in stimulating economic growth, resource development will lead to increased export growth, foreign exchange earnings and personal income. By diversifying investment in resource wealth, economies ultimately enhance innovation capabilities, investment in education, and social development.

To achieve social welfare, achieve sustainable economic development and enhance international status, but for most resource-abundant developing economies, the opposite trend seems to be present. For example, countries such as Nigeria, Peru, Venezuela and Indonesia have all fallen into the "resource curse" Dilemma. They have experienced short-term growth and prosperity and long-term stagnation in the process of economic development, and caused extreme pollution to the environment during development and utilization. They eventually fell into severe poverty, inequality and civil strife, and did not achieve sustainable economic development. China is endowed with unique mineral resources. It is a country with large reserves of mineral resources, a large producer, and a large exporter. The phenomenon of resource curse is also common in various regions. Among them, the resource curse problem is the most severe in the central region, where traditional resource provinces are concentrated. In comparison, The "Four Asian Tigers" who are short of resources have achieved economic take-off. Therefore, it has not yet been determined whether abundant resources are a "blessing" or a "curse" for all countries. Therefore, it is necessary to analyze the role of mineral resources in economic development, especially the analysis of resources. The internal causes and transmission mechanisms of the curse phenomenon have important theoretical and practical significance for exploring possible ways for resources to promote high-quality economic development.

(1) Key mineral resources are elements of high-quality economic development.

As early as the mid-17th century, William Petty put forward the conclusion that "labor is the father of wealth, and land is the mother of wealth." Abundant natural resources are the prerequisite for economic development. However, the relationship between resources and economic growth has formed a dispute between pessimists and optimists from the very beginning: Malthus' pessimism believed that with the expansion of population, the shortage of natural resources will lead to stagnant economic growth again and again. The famous Club of Rome also mentioned in "The Limits to Growth" that the limitations of resources determine the limits of growth. The optimists used the development history of Western economies to refute, believing that technological progress can resist or slow down the scarcity of natural resources. Although The two factions dispute the scarcity of resources, but both agree that resources are an essential element of economic growth. Resource scarcity will constrain economic growth. Romer modeled resource constraints and concluded that resource constraints lead to a decline in average output. However, the economy will respond to scarcity. If the role of technological progress is greater than resource constraints, growth will be sustainable. Fu Yunsheng studied from the perspective of resource scarcity and found that changes in supply and demand relationships will increase the pressure of resource constraints in areas with resource shortages. carry

John Dobra, Matt Dobra and Abdoulaye Ouedrao "Does Mineral Development Provider for Sustainable Economic Development?" in Resources Vol 2018, 2018, pp 1-11

Raymond F Mikesell "Explaining the Resource Curse with Special Reference to Mineral - Exporting Countries" in Resources Vol 1997, 1997, pp 191-199

Jia Hongxiang et al "Decoupling Analysis of Economic Growth and Mineral Resources Consumption in China from 1992 to 2017: A Comparison between Tonnage and Exergy Perspective" in Resources Policy Vol 74, 2021, pp 1-15

Zhang Haijun: "Resource curse, factor flow and coordinated economic development", in "Statistics and Decision-making", Issue 24, 2022, Issue 93 - Page 96

Improve the competitiveness of resource-rich regions. ħ Hilmawan and Clark used 390 regional samples from 2006 to 2015 and found that there is a significant positive correlation between resources and growth. ħ Key mineral resources are strategic

It is an important material foundation for the development of emerging industries and can provide necessary material support for strategic emerging industries. Rare earth elements in key mineral resources, such as dysprosium, neodymium, lithium, cobalt, terbium, lanthanum, nickel, etc., are used in optical fiber communications, electronic equipment, Renewable energy and biomedicine are widely used, playing a key role in basic materials. The new structural economics represented by Lin Yifu believes that the factor endowment structure determines the industrial structure and its development. Therefore, the continuous development and utilization of key mineral resources can Provide necessary raw material support for strategic emerging industries, promote the rapid development of these industries, enhance their market competitiveness, and achieve high-quality economic development.

(2) Mineral resources affect economic development with stage characteristics.

Different stages of economic development have different types of demand for mineral resources. The comparative advantage in the early stage of economic development is reflected in abundant natural resources or primary products. Therefore, in the first global During the golden period of economic growth, countries such as Britain and Germany relied on rich traditional resources to achieve strong economic growth and rapid development. ħ Chenery et al., based on the economic development process of the United States, divided economic growth into the primary product production stage, the industrialization stage and the developed economy stage. ħ In the process of industrialization, the United States exploited traditional mineral resources more intensively than other countries, which accelerated the industrialization process. From the perspective of various economies in the world, before 1970, the economic growth rate of resource-rich countries and regions was higher than that of resource-poor countries. and regions ħ, and resource-rich Latin America is also an early region that started the modernization process. However, mineral resources are non-renewable, mining production has typical characteristics of diminishing returns to scale, and the resource-dependent growth model is unsustainable. Therefore, the phenomenon of resource curse began in the 1970s. It began to appear generally after the year that these resource-rich countries and regions failed to achieve sustainable growth and fell into the "middle-income trap."

Different types of mineral resources have evolved with the needs of industrial development in the process of economic development in various countries and regions.

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- ħ Fu Yunsheng: «Resource Constraints and Regional Economic Convergence—An Examination Based on Resource Scarcity and Resource Allocation Power», published in The
- ħ Economist, Issue 5, 2006, pp. 33-40, Rian Hilmawan and Jeremy Clark ħ "An Investigation of the Resource Curse in Indonesia" ħ in Resources Policy ħ Vol 64 ħ 2019 Yifu Lin:
- ħ «Theoretical Foundation and Development Direction of New Structural Economics» ħ Published in «Economic Review» ħ Issue 3, 2017, Pages 4-16
- ħ Cai Fang, Wang Dewen and Qu Yue: «Chinese Industry Analysis of the Upgraded Flying Geese Model of Great Powers» Published in "Economic Research", No. 9, Issue 4,
- Economic Review 4-14. [US] Written by Hollis Chenery, Sherman Robinson, and Moses Selquin ħ Translated by Wu Qi and others: «Industrialization and A long comparative study» Shanghai: Sanlian Publishing House, 1989
- ħ Ian Coxhead ħ "A New Resource Curse? Impacts of China's Boom on Comparative Advantage and Resources rld Development ħ Vol 35 ħ No 7 ħ 2007 ħ pp 1099 - 1119
- ħ Jean-Philippe C Stijns ħ "Natural Resource Abundance and Economic Growth Revised " ħ in Resources Policy ħ Vol 30 ħ No 2 ħ 2005 ħ pp 107-130

The differences present different strategic criticalities: energy minerals and bulk minerals are indispensable elements for the development of the industrial revolution. In the post-industrial development stage, with the development of high-tech, emerging industries and the emphasis on resource and environmental issues, the key The importance of mineral resources continues to increase. Combining the development trend of China's strategic emerging industries and the endowment conditions of key mineral resources, realizing the transformation of resource advantages into technological advantages and economic advantages is crucial to maintaining economic competitiveness, technological innovation frontiers and high-quality economic development. Important strategic significance

(3) Resource curse theory Oti first

proposed the resource curse phenomenon in "Sustainable Development of the Mineral Economy: The Resource Curse", pointing out that countries and regions with rich natural resources have poor economic performance, democracy and development results, forming a The dilemma of backward industrialization, difficult industrial transformation, and over-reliance on a single economic structure. However, resource endowment is not blameless. The key lies in resource allocation and effective utilization. In particular, half of China's key mineral resources have abundant reserves. Mineral resources rely on various transmission channels. In turn, it affects economic growth. The occurrence of the resource curse also requires certain conditions. Analyzing the internal causes and transmission mechanisms of the resource curse can provide experience and reference for curbing the resource curse.

1 Deterioration of terms of trade leads to growth of poverty

The added value of primary products such as mineral resources is low and there is no monopoly advantage. The price elasticity of income and demand is small. Most economies with abundant mineral resources are not the main consumption areas. Instead, they directly use the comparative advantages of mineral resources to participate in the international division of labor. They have stayed in the international division of labor for a long time. At the low end of the value chain, the terms of trade have a long-term deterioration trend, and it is easy to fall into the "comparative advantage trap". It is difficult to form sufficient motivation to catch up with and surpass developed countries through comparative advantage strategies, and thus it is difficult to change the backwardness of the economy. Lederman and Ma Loni proved that abundant natural resources are conducive to economic growth, but concentrated export of resources will hinder economic growth. In the Middle East, North Africa, and Latin America, it is precisely because of the high proportion of primary product exports and high dependence on resources that the economies of these resource-rich regions have suffered. Development is slow and it falls into the "growth trap".

2. "Dutch Disease" dilemma - the hollowing out of the manufacturing industry. The "Dutch Disease" was first described by economists in 1977 as the appreciation of the "Dutch Guilder" due to booming natural gas, weakening the economy. The phenomenon of the Central African extractive sector is ultimately applicable to all the phenomena of primary product exports enjoying an extraordinary boom, leading to the decline of other industries. The longer the boom in the natural resource sector lasts, the greater the possibility of stimulating mismatches in other economic sectors. Corden and the Dutch disease model proposed by Neely.

Richard M Auty *Neural Economics: The Resource Curse* 1993:
Routledge 1993

Daniel Lederman and William Maloney "Trade S" Structure and Growth ch
Working Paper" in *The World Bank* Washington DC 2003 pp 1 - 32

This model studied the impact of increasing exports of mineral resources on overall economic growth. Kaznachev summarized the mineral resources

The vigorous development of resources has three main effects on the overall economy: (1) "Resource transfer effect"

The siphon effect of mineral resource exports is very obvious. High returns attract labor and capital from other industries.

inflow, thus causing the hollowing out of the manufacturing industry. (2) "Exchange rate effect", the export of mineral resources will push the local currency

Appreciation directly suppresses the export competitiveness of the manufacturing industry. It will also be affected by the double increase in commodity prices and labor prices.

Indirectly promotes the increase in manufacturing production costs. (3) "Expenditure effect", the national and regional impact on manufacturing products

The demand for products will further weaken the domestic and regional manufacturing industry through import substitution, and the export of non-energy products will

As export competitiveness and trade conditions are severely squeezed, resource-rich countries and regions will become more dependent on energy.

The export of resources has caused a vicious cycle. As a result, the original manufacturing industry has gradually been hollowed out, and trade dependence has declined.

With prices getting higher and higher and the export structure being single, once the price of mineral resources drops, the economy will suffer a heavy blow.

The "single-out" source industry is not conducive to the realization of sustainable economic development goals. Xu Kangning and Wang Jiancong Provincial

The "resource curse" hypothesis was tested at the domain level, and the study found that abundant natural endowments have a positive impact on economic growth.

The main reason is that the manufacturing and technology industries are squeezed out through the transfer mechanism of capital investment.

The labor transfer mechanism is slightly less significant. Ismail used a large amount of oil exports from 1977 to 2004.

Using data from exporting countries, it was found that the boom in the oil sector led to the contraction of the manufacturing sector, and the price of labor to capital increased.

Prices are rising. Goffasson and Zorga pointed out that the resource industry will inevitably have a crowding-out effect on the manufacturing industry. In the long term

It has a negative effect on economic development. Bazib et al. investigated the relationship between sector growth and its determinants.

It was discovered at that time that natural resources harmed agriculture and manufacturing. Research by Meng Xiaoyu and others found that mineral resources are extremely

Mongolia, which is rich in resources, has low investment in manufacturing and other industries due to its over-reliance on resources, which has led to an economic

The speed of development is hindered. Otley and Warhurst describe four economies that are susceptible to the "Dutch disease"

Key issues: Lack of savings, Unsustainable income and expenditure habits, Neglect of manufacturing and agriculture, Post-prosperity

W Max Corden and Neary J P "Booming Sector and De - Industrial analysis in a Small Open Economy" in Economic Journal Vol 92 No 368 1982 pp 825 - 848

Kaznacheev P , "Resource Rents and Economic Growth" in Russian Presidential Academy of National Economy and Public Administration (RANEPAN) 2013

Xu Kangning, Wang Jian: "Research on the relationship between the abundance of natural resources and the level of economic development", published in "Economic Research", 2006 Issue 1, pages 78-89.

Kareem Ismail The Structural Manifestation of the Dutch Disease: The Case of Oil Exporting Countries New York: International Monetary Fund 2010

Thorvaldur Gylfason and Gylfi Zoega "Inequity" in Cesifo Working Paper Vol 34 No 4 2002 pp 127-155

Badeeb R A , Lean H H and Clark J , "The Evolution of the Natural Resource Curse Thesis: A Critical Materials LICY and Environment», Issue 12, 2021, Pages 100-105.

slow response to the recession during the period.

3 Resource price fluctuation theory

Due to the nature of commodities, mineral resource products have greater price fluctuations than manufacturing products.

The frequency is higher, and the price fluctuation of key mineral resources is significantly higher than that of traditional mineral resources. Resource prices

Fluctuations will lead to increased development instability in resource-dependent countries and regions, and the cycle of the resource economy will

This is not conducive to resource-dependent countries and regions formulating sustainable long-term plans. Makhlof believes that resource-dependent countries and regions

The source curse incident occurred in countries and regions with rich resource endowments and high price volatility. Li Gang

Others believe that the price of resource-based products is easy to fluctuate, and it takes a long time for the price mechanism to adjust the balance, which will

Bringing welfare losses. Chichauri et al. found that Algeria's oil resource exports from 1979 to 2013

There is a significant positive correlation with economic growth in the long term, but if oil revenue is unstable, the result

will become negative. (5) A resource-dependent economy will often have a negative impact on its GDP due to fluctuations in resource prices.

Excessive fluctuations in (GDP) growth have a negative impact on productivity. Reiner and Welmer demonstrated that

Fluctuations in resource prices will make resource-dependent countries and regions less resilient to external economic shocks.

A large decrease in the price of mineral resources. The fragile ability of the economy to resist risks is a constraint on sustainable development.

Wide fluctuations have led to unstable macroeconomic indicators, further reducing investment opportunities and also reducing access to foreign exchange.

Opportunities for domestic direct investment. 9. At the same time, price fluctuations will prompt investment to tend to obtain short-term excess profits.

Richard Auty and Alyson Warhurst "Sustainable Developing in Mineral Exporting Economies" *Resources Policy* Vol 19 No 1 1993 pp 14 - 29

David S Jacks et al "Commodity Price Volatility and World Market Integration 1700" *Review of Economics and Statistics* Vol 93 No 3 2011 pp 800 - 813

Yousef Makhlof et al "Child Mortality Commodity Price Volatility and the Resource Curse" *Social Science & Medicine* Vol 178 2017 pp 144 - 156 Li Gang, Xing Shubao:

"Research on artificial social model of resource carrying capacity", published in "Computer Technology and Development", Issue 9, 2007, Page 217 - 219 Page 223

Sidi Mohammad Chekouri et al "Algeria and the Natural Resource Curse: Oil Abundance and Economic Growth" in *Middle East Development Journal* Vol 9 No 2 2017 pp 233 - 255 "Volatility"

and Growth: Credit Constraints and Productivity - Enhancing

and Michael D Bradley "Oil Prices and the Fiscal Policy Response in Oil - Exporting Countries" in *Journal of Policy Modeling* Vol 34 No 5 2012 pp 605 - 620

Sven Renner and Friedrich W Wellmer "Volatility Drivers on the Metal Market and Exposure of Producing Countries" in *Mineral Economics* Vol 33 No 3 2020 pp 311 - 340

Tiago V de V Cavalcanti et al "Growth Development and Natural Resources: New Providence Using a Heterogeneous Panel Analysis" in *The Quarterly Review of Economics and Finance* Vol 47 2011 pp 305 - 318

Frederick van der Ploeg and Steven Povelhekke "Volatility and the Natural Resource Curse" *Oxford Economic Papers* Vol 61 No 4 2009 pp 727 - 760

It is not conducive to sustainable development. Oti and Fran believe that the instability of natural resource income often hinders economic diversification, leads to unsustainable infrastructure investment, distorts the country's distribution structure of resource income, and causes the economy to fall into long-term stagnation and fracture.

4. Rent-seeking and corruption

High returns on resources can lead to rent-seeking and corrupt behaviors. Rent-seeking is the privilege and opportunity for enterprises or individuals to seek excess income (rent). The "resource curse" stems from the fact that most resource-abundant economies are more susceptible to rent-seeking problems. Rent-seeking problems are mainly divided into the following three types. (1) Enterprise rent-seeking. Only the rent generated by government intervention leading to resource scarcity will trigger rent-seeking behavior. The resource industry requires rent-seeking from mining, processing and production to export sales. With the government's concession approval, the licensing system makes resources scarce, resulting in resource rent. The high resource income (rent) triggers all groups in the sector to have enough motivation and strength to engage in rent-seeking behavior, trying to convince decision-makers. Unequal distribution squeezes out market resources, thereby increasing the existing wealth share of powerful groups, but failing to contribute any value to the overall economic growth. Rent-seeking behavior causes factors that could have been used for productive activities to be wasted in the pursuit of rent, causing the decline of enterprises. Factor input is inefficient. (2) Entrepreneurial talent allocation is distorted. The nature of capital is to pursue profits. The high returns of the resource sector attract most mobile production factors to transfer from productive enterprises to the resource sector. Potential entrepreneurs and innovators flow into the employment sector. It will have a crowding-out effect on entrepreneurs' entrepreneurial or innovative activities. The number of competitive entrepreneurs working in the manufacturing industry will decrease accordingly. The increasing proportion of entrepreneurs working in the resource field will lead to scale inefficiency. A large number of entrepreneurs will waste talent and energy in rent-seeking activities. (3) Politician rent-seeking. In order to gain power or seek re-election, politicians will excessively seize resource rents and allocate rents to influential groups without caring about the resource returns. Reasonable allocation among various industries and between investment and consumption. The increasing proportion of non-market factors in resource allocation is the fundamental reason for the slowdown or even stagnation of economic growth. For example, in Latin America, due to the game of political groups, the government chooses current consumption. Spending huge resource gains on inefficient and undifferentiated energy subsidies will not only aggravate social

Richard M Auty and Haydn I Furlong "The Rent Curse: Natural Resources and Economic Development" site Press 2019
Anne O Krueger "The Political Economy of the Rent-Seeking Society" in

The American Economic Review Review Vol 64 No 3 1974 pp 291 - 303 Emma Gilberthorpe and Elias Papyrakis
and Develop: The Resource Curse at the Micro and

Meso and Macro levels" in The Extractive Industries and Society Ragnar Torvik Resources Rent Seeking and
Welfare" in Journal of Development Economics Vol 77 No 2 2002 pp 455 - 470 James A Robinson and Thierry Verdier "Political
Foundations of the

Resource Curse" in Journal of Development Economics Vol 79 No 2 2006 pp 447 - 468

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Injustice also squeezes savings or investment demand for sustainable development. The struggle to seize and distribute rents will also increase the risk of political instability and armed conflict. In order to maintain power, government departments spend too much tax revenue on weapons and equipment, which is not good for the economy.

stable development. 5 Crowding out effect on productive capital

The "resource curse" itself does not deny that resources will drive short-term economic prosperity. However, the mineral resources sector does not need to master advanced technologies and skills. It can obtain high profits and income in the short term, and government departments can also obtain considerable tax revenue. This is Countries and regions rich in mineral resources are prone to over-reliance on resource-driven economies, lack crisis awareness, do not pay attention to investment in productive capital such as human capital and technological innovation, do not pay attention to the development of education and science, and neglect pillar industries such as manufacturing. Ultimately, the potential for economic development is lost. Especially in countries and regions with imperfect initial institutional conditions, the distribution of resource benefits is even more short-sighted. In contrast, Israel, which lacks natural resources, relies on its relatively high human resources and technology in a harsh environment. It has developed an industrial system with complete categories and a complete structure, turned its disadvantages into innovative advantages, and developed into an advanced industrialized country.

Abundant natural resource endowments limit the motivation of governments or authorities to invest in high-quality education and economic policies. Therefore, human capital accumulation is ignored, which is not conducive to economic growth. Bravo-Ortega and Gregorio found that the accumulation of human capital It can become a key means to overcome the resource curse and achieve economic prosperity. Parrakis and Grager verified through evidence from 49 states in the United States. In order to avoid the resource curse, the government should pay more attention to education. Education is the most important channel of growth. Ali Kseyev and Konrad modeled the relationship between resource abundance and economic growth in 27 economies and believed that in economies where oil exports account for a large share, the accumulation of human capital helps to The negative impact of resources on economic growth has turned into a positive impact. Olayombo's research found that the huge oil export revenue from 1970 to 2015 had a significant positive contribution to Nigeria's short-term economic prosperity, but over-reliance on resources and inappropriate trade openness and low education quality are the transmission channels through which the country has experienced slow growth. Jalala found that institutional quality

Thorvaldur Gylfason and Gylfi Zoega "Natural Resources and Economic Growth: The Role of Investment" in *World Economy* Vol 29 No 8 2006 pp 1091 - 1115

Claudio Bravo - Ortega and José de Gregorio "Relate Richness of the Pool? Natural Resources Human Capital and Economic Growth" in *Leder man and Maloney* 2007 pp 71-103

Elissaios Papyrakis and Reyer Gerlagh "Natural Resources: A Blessing or a Curse" in *Agricultural & Natural Resources Economics* January 1, 2003

Michael Alexeev and Robert Conrad "Economic Systems" Vol 35 No 4 2011 pp 445 - 461

Olayungbo D. "Effects of Global Oil Price on Exchange Rate Trade Balance and Reserves in Nigeria: A Free Market Approach of Risk and Financial Management" Vol 12 No 1 2019

It has a positive impact on human capital. Resource rent and corruption have a significant negative impact on human capital.⁵

6 Institutional defects and institutional erosion

Resource-abundant countries and regions are more prone to corruption within the ruling class, which damages effective democracy, leads to institutional defects, and exerts a downward pull on the quality of the system. Resource owners have huge profits, and vested interests will use various methods to prevent innovation in the system. ⁶ Preventing developing countries from breaking out of the poverty system trap. The quality of the system will determine whether resource rents in the economy are used for productive or non-productive activities (such as rent-seeking). Good systems encourage making the "cake" bigger, while bad systems will The system induces the sharing of the "cake". Only a strong government can ensure the fairness of resource rent sharing. Melham and others established a model of institutional quality and rent-seeking, believing that the system is what allows abundant natural resources to affect economic growth. The key mechanism is that institutions have a direct impact on the distribution of natural endowments. The lack of institutions and the weakening of institutions can easily lead countries or regions to transfer potential resources to unproductive activities such as rent extraction, stimulating the occurrence of the resource curse phenomenon. Only good institutions can Better promote the economic growth of resource-rich countries and regions. Torres and others believe that under the imperfect institutional framework, the revenue collected from the natural resource sector is monopolized by a minority group that dominates the political arena. Zheng Yihe Based on data from 85 major countries around the world, Qin Bingtao explored the relationship between the resource curse and economic growth from three levels: comprehensive institutional index, institutional design, and institutional effectiveness. The research results show that resources are inherently innocent, and its role in economic growth depends critically on the economy. Institutional arrangements. In countries with excellent institutions and high institutional efficiency, abundant natural resources will boost economic growth, and a country's resource endowment will also profoundly affect the country's institutional design.⁷

There is a non-linear relationship between mineral resources and economic development due to institutional quality. Boschini and others believe that the improvement of institutional quality will pave the way for valuable resources to play an important role in economic growth. ⁸ Njoku and Zopu Mo determined the threshold effect of institutional quality on the relationship between abundant resources and economic growth. The resource curse phenomenon occurs when the institutional level is low, and improving institutional quality can avoid resource curse.

⁵ Ruba Aljarallah " Impact of Natural Resource Rents and Insitu Quality on Capital: A Case Study of the United Arab Emirates" in *Research in Development Economics*

⁶ Harald Badinger and Nindl Elisabeth "Global Resource Curse: A Review of the Literature" *Journal of Economic Surveys* Vol 37 No 10 2014 pp 1424 - 1440

⁷ Halvor Mehlum, Karl Moene and Ragnar Torvik "Institutions and the Resource Curse" in *Economic Journal* Vol 116 No 508 2006 pp 1 - 20

⁸ Nuno Torres, Óscar Afonso and Isabel Soares "Oil Abundance and Economic Growth - a Panel Data Analysis" in *The Energy Journal* Vol 33 2 2012

⁹ Zheng Yi, Qin Bingtao: «Political system, resource endowment and economic growth—Experiences from 85 major countries around the world», ed. «World Economic Research», Issue 4, 2016, Page 135.

¹⁰ Anne D Boschini, Jane Petersson and Jesper Roine "Resource Curse or Not: A Question of Appropriability" in *The Scandinavian Journal of Economics* Vol 109 No 3 2007

Curse phenomenon. Abdullahi and others examined the nonlinear relationship between resource rent and economic growth under the resource curse theory by using institutional quality as a threshold variable. They confirmed that economies will cause resource curse problems when the institutional quality is too low. Within the range of good institutional quality, resource rent can have a positive promoting effect on economic growth. Yipo and Farha divided the institutional quality of the economy into legal system, regulatory quality, governance effectiveness, corruption control, political stability and discourse. Six indicators of rights and accountability were used to analyze the role of institutions in improving the nonlinear relationship between natural resources and economic growth. The results show that there is a threshold for these institutional variables that improves the insignificant impact of natural resources on growth, that is, improving institutional quality can boost The positive effect of natural resources on economic growth

Through existing research, it is found that countries and regions suffering from the resource curse all have institutional defects. If this control variable is ignored, the economic growth decline caused by institutional defects will be passed on to the resources. It is not so much a resource curse as an institutional curse. The flaws of the system itself are the decisive factor of the resource curse. Resources are not inherently innocent. They are a necessary element of economic development. Whether resources can be successfully converted into capital and contribute to sustainable economic development depends on whether the system is perfect or not.

In short, a sound system can curb the occurrence of the above-mentioned resource curse: first, it can prevent the economy from over-relying on the export of abundant resources and falling into the comparative advantage trap, leading to impoverished growth; second, it can avoid the mining economy from being the only one, and the diversified development of industries can ensure that the economy Sustainable growth. The third is to help stabilize the price mechanism and improve the economy's ability to resist risks. The fourth is to avoid rent-seeking and corruption from encroaching on resource rents. The fifth is to help invest resource rents in public services such as education and technology. Promote sustainable economic growth. Therefore, whether resource-rich countries and regions can play a key role in the institutional system? Institutional innovation based on resource endowments will determine whether abundant mineral resources are a "blessing" or a "curse."

Institutional guarantee for promoting economic development through three key mineral resources

Key mineral resources are elements for an economy to achieve high-quality economic development. They can not only create

I Ndjokou and P C Tsopmo "The Effects on Economic Growth of Natural Resources in Sub-Saharan Africa: Does the Quality of Institutions Matter?" p 248 - 263

Mohammed Elyas Abdulahi and Asif Khan "Resource Rents, Economic Growth and the Resource Curse: A Threshold Analysis" in Resources Policies 61 (2019) pp 293 - 303

Boniface Ngah Epo and Dief Reagen Nochi Fahaj "Natural Resources and Economic Growth: An African Tale" in The European Journal of Development Research Vol 32 (2020) pp 99-128

It has huge economic value and can also support the development of multiple key industries and improve the international competitiveness of a country and region. However, healthy and sustainable economic development requires sound and efficient institutional support. The effective transformation of resources into capital is a long-term and complex process. The process requires a strong government to formulate and implement a series of systematic and continuous systems to ensure its realization. For scarce key mineral resources, the risk of "stuck neck" must be controlled and the security of resource supply must be ensured. For superior key mineral resources, avoidance of "Resource Curse": Convert resource advantages into strategic advantages.

(1) Improve the supply guarantee system for scarce key mineral resources. Due to the

development needs of high-tech and emerging industries, the global contradiction between supply and demand for key mineral resources has become increasingly prominent. Disruption of the supply chain of key mineral resources will affect national and regional mineral resource security and economic security. At present, Western developed economies such as the United States and Europe occupy a dominant position in the global key mineral resources management system. my country's scarce mineral resources are highly dependent on foreign countries and are more susceptible to the geopolitical and economic games of resource countries. In order to ensure the security of resource supply, Systematic national policy support is needed.

First, dynamic selection of the catalog of critical mineral resources. The catalog of critical mineral resources must conform to the current economic structure, resource base, development strategy, etc. of the economy. The dynamic selection of the catalog not only helps the government understand the current supply and demand situation of critical mineral resources, adjust the direction of resource development in a timely manner to avoid resource waste and environmental damage, and also provide a solid foundation for achieving sustainable economic development. The government must also establish a regulatory mechanism to ensure that the dynamic selection of the directory is implemented fairly, justly and effectively, and to avoid manipulation. and arbitrarily modify the catalog to ensure the

fairness and impartiality of the policy. Second, the global allocation of key mineral resources. In order to stabilize the overseas supply chain of key mineral resources, we must seek to diversify the sources of imports. In view of the different resource endowments of each economy, each Economies inevitably need to fill each other's gaps, realize the utilization and sharing of key mineral resources, and maintain the supply security of domestic key mineral resources through the flexibility of resource supply. It can also guide overseas investment in mineral development, but attention must be paid to the host country's response Potential risks of local resource nationalism

Third, the development, utilization and recycling of key mineral resources. The government should establish and improve the management system of key mineral resources, strengthen the supervision and control of key mineral resources, standardize the development and utilization of key mineral resources, and prevent over-exploitation and waste of resources. We should be committed to the refining, recovery and recycling of key mineral resources and the research on substitutes to achieve the maximum economic benefits of resource development, while minimizing the negative impact of waste on the environment to achieve dual economic and environmental benefits.

Fourth, build a risk early warning mechanism and emergency reserve system for key mineral resources. Key mineral resources

J Bielecki "Energy Security: Is the Wolf at t his Door?" in The Quarterly Review of Economics and Finance Vol 42 No 2 2002 pp 235 - 250

Due to its limited quantity and unlimited potential, demand will exceed supply for a long time. ̄ Establish a multi-level risk monitoring system at the domestic and international levels to comprehensively understand the supply and demand status, price fluctuations, geopolitical factors, etc. of key mineral resource markets. At the same time, carry out risk assessments Research, analyze the fragile links and potential risks in the supply chain of key mineral resources, and provide scientific basis for emergency reserves. Based on factors such as the supply and demand relationship of domestic and international key mineral resources, the substitutability and recovery rate of resources, determine the dynamic balance of different mineral types, and a reasonable and effective reserve scale. ̄ In addition, it is also necessary to strengthen cooperation with relevant departments and enterprises, formulate emergency plans, conduct response training in advance, and improve emergency response capabilities and disposal efficiency.

Key mineral resource reserves are an important basis for maintaining economic and social stability. Transform part of the foreign exchange reserve funds into key mineral resource reserves that play an important role in the economy's development strategy and development potential. Implement a linkage reserve mechanism between foreign exchange reserves and key mineral resource reserves. It can not only ensure the relatively stable supply of key mineral resources, meet the resource needs of domestic economic and social development, and adjust the energy structure, but also be conducive to the diversification, preservation and appreciation of foreign exchange reserve assets, safeguard national and regional strategic security, and enhance international discourse power. In an increasingly complex and ever-changing global situation, we must seize the initiative for development. Of course, increasing the holdings of key mineral resource reserves is a long-term process. The timing and scale of purchases should be reasonably grasped to reduce international market fluctuations.

(2) Avoid the "curse" of abundant key mineral resources. Nearly half of

China's key mineral resources are advantageous minerals, which can provide convenient innate advantages and strong boost to the country's economic development. However, systems and policies should learn from history and effectively utilize key mineral resources. ̄ Realize the transformation of resource advantages into technological advantages and economic advantages, and avoid the occurrence of the "resource curse".

1 Create a strategic emerging industry highland

It is urgent to seize the key strategic period for the development of strategic emerging industries and combine the endowment conditions of China's key mineral resources to drive the development of strategic emerging industries. Strategic emerging industries are mainly characterized by high and new technologies. In the early stages of development, they are infant industries of the country and are subject to international competition. If the industry is not strong enough, it needs the support of relevant policies. After the technology and operation and management capabilities are improved, the degree of protection will be gradually reduced with the growth of the industry until it is able to face the competition in the international market.

Strategic emerging industries such as high-tech industries, information technology industries, and new energy industries can provide new impetus and growth points for economic growth, and improve the technological and industrial competitiveness of economies in related fields.

̄ Wang Yongzhong: «New Trends and Possible Impacts of the Game of Key Minerals in Resource Countries», published in «People's Forum», Issue 15, 2022, pp. 90-95.

̄ Cheng Jinhua, Yi Jiahui, Wu Qiaosheng: «Carbon Neutral, Strategic Development of Emerging Industries and Management of Key Mineral Resources», Published in "China's Population Resources and Environment", Issue 9, 2021, Pages 135-142.

It has a major leading role in the overall economic and social development and long-term development. In addition, strategic emerging industries have high technological content, great development potential, and potential profits, attracting more high-quality production factors to gather in them, which will reversely promote the development of key mineral resources. Application and development. The effective development and utilization of mineral resources can provide local social employment opportunities, drive the development of surrounding related industries, optimize the regional industrial structure, stabilize regional production and life, etc., form a virtuous development cycle, and promote national and regional economic development.

2 Diversified development and structural upgrading of science-led industries

Key minerals are a necessary source of power for industrial upgrading. By introducing new industries and upgrading modern With the technological level of the industry, the economy gradually realizes the transformation and upgrading from traditional industries to high-tech industries. High-tech industries have the characteristics of high added value and strong development potential. They can not only realize the transformation and upgrading of the industrial structure of the economy, but also achieve high economic development. Quality and sustainable development lay the foundation, and the quality and scale of a country's economic strength are the reflection of its international competitiveness.

3. Optimize trade structure and terms of trade. Due to the

scarcity of key mineral resources and the imbalance of geographical distribution, global key mineral resources present a serious imbalance between supply and demand, and no country or region can achieve self-sufficiency in minerals. This has prompted This has led to the occurrence of international trade in key mineral resources between countries and regions. Economies rich in key mineral resources can obtain foreign exchange income by exporting key mineral resources. However, it is necessary to diversify the export market. How can resource advantages be transformed into trade advantages and promote sustainable economic development? , to achieve the improvement of international competitiveness and national voice, it is necessary for government departments to guide the expansion of the upstream and downstream industrial chains of key mineral resources, and by increasing technological research and development and innovation, process key mineral resources into high-end high value-added products to help achieve domestic Upgrading the quality of the mineral industry, enhancing the competitiveness of export products, and improving trade conditions.

4. Improve the resource property rights

system. A sound resource property rights system is an important institutional guarantee for the effective utilization of resources and sustained and healthy economic development. This is because a complete property rights system can clarify the specific ownership of resources and can eliminate disorderly exploitation and waste of resources in resource development. As well as the "tragedy of the commons". Resource owners can also reasonably allocate resource extraction among generations to achieve intergenerational equity, optimize the extraction and use of resources, and ensure sustainable development of the economy and society. Although our country clearly stipulates that natural resources Resources are owned by the state, that is, owned by the whole people. However, in fact, the ownership of resource property rights is not clear. The development of key mineral resources often requires government approval, licensing and supervision, which can easily lead to resource rent-seeking behavior. This will not only distort market competition, but also hinder the effective allocation of resources. ̄ It will also weaken the efficiency and fairness of the economy. It will bring uncertainty and unpredictability to the investment environment.

[̄] Liang Fushan: «Research on the effect of improving the internal development of strategic emerging industries—an empirical analysis based on classic statistical methods from a financial perspective», published in «Tax Economic Research», Issue 3, 2014, pp. 84-89.

nature, hindering the inflow of capital and the introduction of technology, and limiting the potential of economic development. On the other hand, the realization of positive government effects in economies that are rich in resources and have not fallen into the "resource curse" is to strengthen institutional and regulatory supervision and control rent-seeking and corruption. It is realized on the basis of rent-seeking. Whether rent-seeking depends on the cost of rent-seeking and the benefits brought by rent-seeking. The space for rent-seeking should be minimized, the supervision mechanism

should be strengthened, and the risks and costs of rent-

seeking should be increased at the same time. 5. Establish reasonable resources For governments in economies rich in key mineral

resources, the income distribution mechanism focuses on how to rationally use "resource rents" for productive investments that can stably stimulate economic growth, such as investment in education, health, and technological innovation, and develop Knowledge, technology, and capital-intensive industrial sectors are required to transform the economic structure from a resource-based economy to a knowledge-based economy to effectively promote long-term economic development. However, productive capital investment has inter-temporal returns and requires long-term institutional planning and guidance. The success of the United States as a resource-rich country lies in its national innovation system, which uses resource gains to enhance innovation and uses advanced technology to develop the mining industry into a technology-intensive industry. In addition, the development of key mineral resource industries can bring benefits to the economy. To generate abundant tax revenue, the government reformed the tax system and used the tax system to fairly distribute resource income, achieve income sharing, improve the welfare level of residents, narrow the social income gap and maintain social stability, and provide a stable domestic environment for economic development. Social environmental protection. At the same time, the education system must meet the requirements of the industrialization development stage and technology development model.

Our country is entering the middle and late stages of industrialization development. The demand for high-level

talents in basic research must be considered. 6 Sustainable Development Strategy

Sustainable development does not negate economic growth, but must stand from the standpoint of environmental protection and promote the coordinated development of economic growth and environmental carrying capacity. It must not only adapt to current development needs, but also ensure that future long-term development is not affected. In terms of resources Under environmental constraints, China's realization of the "double carbon" goal means the need for a large-scale energy transformation, including increasing the proportion of renewable energy, promoting energy efficiency improvements, and promoting the research and development and deployment of clean energy technologies to minimize resource and environmental costs. Improve resource utilization efficiency and production efficiency, and build an environmentally friendly and resource-saving society.

The development and utilization of key mineral resources has promoted green technology innovation to a certain extent. Not only

William F Maloney, Osmel Manzano and Andrew Warner "Missed Opportunities: Innovation and Resource - Based on Growth in Latin America" in *E conomiá* Vol 11 1997 pp 111 - 167

Fraser Rob and Ross Kingwely "Can Expected Tax" an Source Rent Tax?" o 3y 1997y pp 103-108 Guo Fuyou, Hou Ailing, Tong Lianjun, etc.: « Spatiotemporal

differentiation and influencing factors of green development levels in Northeast restricted development zones since revitalization "Economic Geography", No. 8, 2018, pp. 58-66.

It will help achieve the "double carbon" goal, and will also help promote high-quality and sustainable economic development. The resource pricing mechanism needs to be further improved. The cost of mining must not only reflect the opportunity cost (the cost of future mining) caused by the scarcity of non-renewable resources. Low cost and high profit), the cost of environmental damage should also be included to prevent resource waste caused by low prices. In addition, strict environmental protection regulations and standards should be formulated to restrict the development and utilization of key mineral resources, and establish corresponding regulatory mechanisms and Departments, strengthen the environmental assessment and management mechanism of mining areas, implement effective supervision and punishment systems, implement an environmental impact assessment system, assess the degree of damage to the environment caused by the development and utilization of key mineral resources and propose detailed measures, including prevention and control of environmental pollution, resource utilization and responsibility Environmental protection responsibility and other plans to ensure that the development and utilization of key mineral resources do not affect the ecological environment and human health.

Four Conclusions

Due to their special natural and economic attributes, key mineral resources occupy a pivotal strategic position in maintaining national economic security and achieving sustainable economic development. They have increasingly received great attention from all economies around the world and have become a key factor in the new round of great power competition. Focus areas. At this stage, China's dependence on scarce key mineral resources remains high. There is also a common resource curse problem in areas with domestic advantageous key mineral resources. In order to ensure China's resource security and economic stability, it is necessary to improve its strategic focus on key mineral resources. There is no delay in coordinating capabilities. China must attach great importance to the development and utilization of key mineral resources based on its national conditions. From the perspective of institutional guarantees, strengthen the government's leading role in the allocation of key mineral resources, improve relevant institutional arrangements, and based on dual perspectives at home and abroad. ̄ Realize the domestic and international dual circulation of key mineral resources, and give full play to the strong role of key mineral resources in achieving sustainable economic development.

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