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Discussion on Land Use Mode Reform in Coal Opencast Mining

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Abstract The existing land supply mode of opencast mining is "land requisition first, then transfer", which lacks an effective recovery and withdrawal mechanism, and the reclaimed mining land is difficult to withdraw. According to the regular rules of coal opencast mining and the periodic characteristics of land use, this paper puts forward a new mode of temporary land use for coal opencast mining. It is conducive to improving the quality and scale of land use and reclamation utilization of opencast coal mining, and is of great significance for exploring and formulating reasonable land use policies for mineral resources development projects.

Key words Opencast mine, Temporary land use, Land requisition, Reclamation, Withdrawal mechanism

1 Introduction

In the world, opencast mining is the mainstream mining method in the world. In recent years, the proportion of opencast mining in China has also gradually increased[1]. In 2021, the output of opencast mines in China reached 720 million t, accounting for 17.5% of the total annual coal output. The opencast coal mining industry in China has entered a new stage of development[2]. With the gradual increase in the scale of coal opencast mining in China, the problem of land security for opencast mining has become increasingly prominent, which has become a bottleneck restricting the rapid development of opencast mining, and even led to the failure of stable continuous production of some opencast mines.

Based on the specific attributes of opencast mining, the connotation of life-cycle projects such as construction, production, and pit closure, and the approval and management methods of construction land, we considered the relevant policies of "occupation and compensation balance" of farmland, cultivated land, and forest land in China. Combining the remarkable results achieved in the first pilot reform of temporary land for opencast mining in China, we proposed a new model of "temporary land" for opencast mines. It is expected to solve the dilemma of opencast mining land from the source, guarantee the opencast mining land, farmers' compensation and cultivated land protection, and promote the virtuous circle of opencast mining land.

2 Existing land use pattern for open pit mining

At present, opencast mining land is a separate site selection land, which involves a series of bottom-line constraints stipulated by law, such as construction land indicator, land requisition compensation and resettlement, cultivated land occupation and compensation balance, and permanent capital farmland rezoning. Therefore, the acquisition of construction land needs to go through multiple links such as project land pre-examination, construction land approval, land acquisition and supply, *etc.*, which are complex, long-term, costly, and difficult to coordinate expropriation, which increases the economic and time cost of land used by mining enterprises, and even restricts the supply of opencast mines to continue production on a stable scale. The existing model is particularly prominent in terms of the term of construction land and the balance between cultivated land occupation and compensation.

(i) The term of construction land for opencast mining: the term of land transfer for opencast mining is generally 50 years, the service life of new opencast mines is generally 30 to 100 years, and the service life of existing production mines is less than 40 years. In the early stage of opencast mining, the excavation site and waste dump occupy a large amount of land in stages. If they are managed according to the construction land, the mining construction land will be idle after the pit is closed, resulting in a great waste of land resources.

(ii) The problem of the balance of occupation and compensation of cultivated land: if the land for opencast mining is managed according to the mode of construction land, it will fall into the development dilemma that the land for opencast mining can not be requisitioned or the balance of occupation and compensation of cultivated land can not be realized. In addition, if the indicators can not be replaced in time after the reclamation of the occupied opencast mining land, it will also cause a great waste of land resources.

3 Bottleneck restricting the development of opencast mining

While great achievements have been made in opencast mining, we should also face up to the safety of blasting, excavation,

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transportation and dumping in opencast mining, the possible landslide in the excavation area[3], the geological disaster of debris flow in the dump around the mountain[4], the harm of dust and coal dust to workers, nearby residents and crop growth[5], and the unsatisfactory effect of land occupation, reclamation and ecological restoration. Under the background of rapid development of green mining technology and "double carbon", we should follow the principles of scientific, green, economic, safe and efficient development[6], and promote the system construction of green mines[7]. Therefore, the safety, environmental protection and ecological restoration problems involved in the process of opencast mining are improving day by day. However, it is difficult to use land for opencast mining, which directly "restricts" the stability of production capacity of large opencast coal mines, and to a certain extent, it has brought an impact on coal supply and coal price stability. For example, due to the difficulty of land requisition, the high-quality production capacity of opencast mines such as Heidaigou, Haerwusu, Baorixile, Shengli No. 1, Baoqing, Pingshuo and Baiyinhua No. 1 can not be released, and the difficulty of land acquisition for mining land has become a common problem of opencast coal mines in China, which seriously restricts the development of opencast coal mines. The crux of the land acquisition problem lies in the fact that due to the periodicity of opencast mining, if temporary land use is adopted, it is impossible to complete "mining → reclamation → land return" within 5 years, and only permanent land use can be selected.

4 Pilot reform of temporary land use for opencast mines

In 2005, Guangxi Pingguo Bauxite Opencast Mine was the first pilot project in China to reform temporary land for opencast mines, changing the permanent land use method to "temporary leased land". Opencast mining enterprises should reclaim and return the land in time after opencast mining. After more than ten years of continuous exploration and practice, the temporary land use system of opencast mines has gradually matured and improved, forming the first complete cycle of "land lease → opencast mining → reclamation → land return", which not only ensures the stability of the lives of residents around opencast mines, but also achieves the purpose of intensive land use and land protection, and ultimately achieves the goal of "land return to the people". The Ministry of Land and Resources has identified the temporary land use method for mining as the first batch of "four innovations" demonstration sites for land resource conservation and intensification, providing replicable and generalizable experience and practices for domestic opencast mining land. In 2011, Ordos City carried out the pilot work of opencast mining land reform in the five banner districts under its jurisdiction, that is, to adopt "one-time requisition, implementation by stages and return at maturity " to handle mining land procedures without changing the land planning use and land nature[8]. Compensation for temporary land use in the pilot work shall be implemented according to the local compensation standard for construction land. The main points of its implementation include:

(i) Adopting the supporting policy of "prior approval → land lease → surface clearance → opencast mining → process supervision → reclamation and greening → acceptance on schedule → land return".

(ii) Areas such as excavation sites, waste dumps and industrial sites for opencast mining are leased to save land.

(iii) Within 10 years of "supervision" by relevant departments, a virtuous cycle of "opencast mining and leasing land → reclamation and land return" will be completed.

(iv) The land lease of opencast mining enterprises does not need to pay land transfer taxes and fees, so as to reduce the land cost of enterprises.

(v) Changing the original landform, the reclaimed land belongs to the enterprise, as long as the quality of the reclaimed land meets the relevant national requirements, the reclaimed land can be "returned" to achieve a "balance of occupation and compensation". For example, the Heidaigou and Harwusu opencast mines have transformed opencast mining land and unused ravines, complex terrain, undulating terrain, ravines and mountainous areas into excellent agricultural land.

At present, the pilot work of temporary land use carried out in the five flag areas under the jurisdiction of Pingguo bauxite mine and Ordos has achieved good results in exploring the guarantee of opencast mine land. However, the current policy implementation, the number of pilots and the scope of pilot areas for opencast mining temporary land are limited, which cannot fundamentally alleviate the outstanding contradiction between the difficulty of opencast coal mine land in various regions and the heavy task of ensuring coal supply. Therefore, the reform of temporary land for opencast mining in Inner Mongolia, Shanxi, Shaanxi, Xinjiang, Yunnan, Henan, Hunan, Guizhou, Gansu, Ningxia, Jilin, Heilongjiang, Liaoning and other provinces (autonomous regions) can play a positive role in ensuring the supply of opencast mining land, and ultimately provide effective land element guarantee for national energy supply security and high-quality development.

5 Recommendations for the new mode of temporary land use for opencast mining

(i) Exploring zoning and implementing classified use management. Firstly, it is suggested that the opencast mining land should be classified according to the dominant use, which can be divided into two types: production facilities and auxiliary production facilities, and the differentiated use control mode should be implemented. Secondly, it is recommended to organize the compilation of special planning for coal mining land, clarify the layout and scale of opencast mining land in the past five years, distin-

guish the two types of land use for production facilities and auxiliary production facilities, and incorporate the layout and scale of coal opencast mining land into the "one map" of territorial spatial planning to implement use control, so as to effectively avoid spatial conflicts. Thirdly, it is suggested that the land for opencast mining, waste dump and non-permanent buildings (structures) should be used in accordance with the principle of "first agree to use, then accept reclamation and restoration", and that permanent basic farmland, Grade I protected forest land and basic grassland should not be occupied.

(ii) Supporting policies that allow open pit mine land to be used on a temporary basis. Opencast mining can solve the problems of mining land in planning, implementation, reclamation, exit and other links by leasing land, and ensure the rational use of land resources. After the revision of the *Mineral Resources Law of the People's Republic of China*, it is recommended to formulate and introduce supporting policies and regulations such as "prior approval→ land leasing→ surface clearing→ opencast mining→ process supervision→ reclamation and greening→ final acceptance → return of cultivated land" for opencast mining.

(iii) Properly handling the contradiction between opencast mining land and permanent capital farmland protection. Under the condition of ensuring a balance between the amount of cultivated land and permanent basic farmland after reclamation, it is indeed difficult to avoid permanent basic farmland for coal mining projects included in the list of major national construction projects, which can be reported to the State Council for approval, such as the Baoqing opencast coal mine.

(iv) Land lease for quarries, waste dumps and land for non-permanent buildings (structures). For the land reclamation work in the future in the reclamation area, attention should be paid to land acquisition to lease land, slope reduction, vegetation conservation, biodiversity investigation and research, *etc.*, among which quarries, waste dumps and non-permanent buildings (structures) can be signed by the land owner and the land user to sign a collective or state-owned land lease contract, the contract stipulates the land use mode, reclamation and restoration status, return method, lease price, liability for breach of contract and other related matters, the lease price should comprehensively consider the local land requisition compensation standard, factors such as land use and environmental pollution.

(v) Preparing a long-term and short-term land reclamation and ecological restoration plan. The ecological reconstruction and reclamation of the mining land is fundamental to the sustainable development of the mining area, which will gradually restore the damaged land or establish a relatively permanent use that is sustainable and stable and in harmony with the surrounding environment and anthropogenic landscape values[9]. The current mine geological environmental protection and land reclamation plan is usually 5 years, which is not conducive to the overall planning of land reclamation and ecological restoration projects. Based on the experiences and practices at home and abroad, it is recommended to make a plan of land reclamation and ecological restoration in the whole life cycle of opencast coal mines and the current five-year implementation scheme of land reclamation and ecological restoration. The reclamation and restoration of opencast mining land should be combined with the natural conditions of the region to determine the land use according to local conditions. The land quality after reclamation and restoration should meet the requirements of the *Quality Control Standard for Land Reclamation*. If the land is restored to woodland and grassland, it should adapt to the native species, give priority to the reuse of the original topsoil, and rebuild the plant community coordinated with the surrounding natural ecology. In addition, it is necessary to integrate the existing separate mine geological environment protection and land reclamation schemes and forest and grass vegetation restoration schemes into land reclamation and ecological restoration schemes, and make arrangements for reclamation and restoration work and fund guarantee according to the principle of "reclamation and restoration while mining".

(vi) Special land use planning for coal opencast mining. It is necessary to make clear that the planning period of the special planning for coal opencast mining land is nearly 10 years or the whole life cycle.

(vii) Opencast coal mine land use indicator policy. The opencast coal mine land use indicator policy should reflect the long-term consistency of the policies of various ministries and commissions of the state at the examination and approval level. It is required to adhere to the principle of "one-time planning, simultaneous approval, total amount control, phased use, reclamation and restoration, determining the use with return". If the state approves the development project of opencast coal mine, it should be regarded as giving the whole life cycle land use indicator, and the opencast coal mine only needs to go through the formalities and pay the use fee in stages during the mining process. At present, when the construction of opencast coal mine projects is approved, the approval of land use indicators is not synchronized, and only the land of previous years is acquired during construction, and there is no long-term agreement on the land use of the whole life cycle, and the landowner and government departments have no commitment to the land use indicator of opencast coal mine. In recent years, some local governments have arranged other construction projects within the scope of opencast mining areas that have been approved by the state for development, construction and production, which has brought difficulties to the land use of opencast coal mines during the production period or later production stage. In the context of limited national land resources and the increase in land required for construction and development, on the one hand, it is necessary to save intensive land and ensure the security of energy and resource supply, but on the other hand, it is difficult to achieve the synchronous approval of the land use index of the whole life cycle of opencast coal mines, so it is the key to for-

mulate a reasonable opencast mining land policy.

(viii) New opencast mines should be planned, designed, constructed and operated according to green mine standards. The construction of green mines has become a major battle for the further development of China's coal industry. New opencast mines must follow the principles of scientific, green, economic, safe and efficient development[10], run the green mine standards through the whole life cycle of opencast mines, and create a good situation for the coordinated development of economic benefits and ecological construction of mines.

(ix) Improving the integrated operation of land reclamation and the incentive and supervision system for land restoration. At present, the opencast mine land reclamation is mainly to carry out general reclamation and greening for the waste dump to the boundary or a part of it to the boundary[11]. It is suggested to gradually establish an integrated operation mode of "stripping → dumping → land reclamation → reclamation". If the land for opencast mining is reclaimed and returned into grassland, cultivated land, or forest land, the experience that meets the requirements shall be included into the relevant management database, and can be used for incentive measures such as the balance of cultivated land occupation and compensation within the provincial capital and the reduction of forest land use indicators, and the restoration of construction land obtained in accordance with the law can be used for industrial and commercial purposes. It is necessary to establish a supervision system for temporary land use for opencast mining, on-site verification, and punishment (fines, non-approval of new mining licenses, *etc.*), as well as strict law enforcement supervision[12-17].

6 Conclusions

The exploration and reform of temporary land use for opencast mining can effectively solve the problem of guaranteeing land use for opencast mining, reduce the phenomenon of "building without approval" in coal mines, realize the effective linkage of factor allocation in opencast mining, and ensure the safety of energy resources supply. The successful practice of adopting the temporary land use model in opencast development has played a positive role in ensuring the security of opencast mining land, and accumulated experience, and finally provided effective land element guarantee for national energy supply security and high-quality development, which is also of important and far-reaching significance for exploring and formulating reasonable land use policies for mineral resource development projects.

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