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THE ENVIRONMENTAL PROBLEMS AND COUNTERMEASURES OF MINERAL RESOURCES UTILIZATION IN CHINA

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ABSTRACT: The environmental problems caused by mineral resources utilization means those problems that affect ecological balance and environment when mineral resources are used (including mining, transporting, processing and consuming), which are actual problems in the rapid development of the Chinese economic construction. After discussing the environmental effect in every aspect, the author analyses some charactristics of the Chinese mineral resources environment and puts forward some countermeasures and proposals.
KEY WORDS: mineral resources, environmental affection, resource utilization, environment pollution

I. THE INFLUENCE OF MINERAL RESOURCES UTILIZATION UPON ENVIRONMENT

Industrialized process inevitably leads to a great increase in the requirement of mineral resources. The utilization of mineral resources is an important means to realize economic increase and development. When man has obtained amazing profits, he violently has destroyed his environment, threatening man's existing space. The environmental problems caused by mineral resources utilization means those problems that affect ecological balance and environment when mineral resources are used (including: mining, transporting, processing and consuming). The influence upon environment by mineral resources utilization is mainly reflected in the following respects.

1. The Influences of Mining Mineral Resources upon Environment[1]

1.1 *Uneven ground*

Mining mineral resources underground brings about serious ground falling, especially those minerals with soft lithologic character such as coal, kaolin, bentonite. According to the data from coal industrial areas in China, the coal mining areas which have been mined for 5 years all have such serious uneven ground falling. The uneven falling makes the buildings on the surface crack, even collapse, a large area full of water, highways destroyed, etc.

1.2 *Destroying ecosystem balance both underground and surface*

Usually open cast mining strips topsoil, which destroys surface vegetation and water system; makes the local eco-environment worse, and causes landslide, earthquake and debris flow. Underground mining makes crustal stress poorly balances, which often leads to earthquakes.

1.3 *Destructive influence upon groundwater resources*

On the one hand, underground retaining water structure is destroyed, ground water lose and water sources are in short of supply; on the other hand, water sources are partially polluted. For example, mining sulfide deposit can cause the sulfide content of ground water and surface water to increase evidently, and the water can not be drunk because of containing excessive contents of arsenic, lead, and copper.

1.4 *Polluting air*

Polluting air displays mainly in two respects: on the one hand the explosive used in mining and demolishing the dust produced by dynamiting earth material pollute air; on the other hand harmful gases between orebeds are released to air when ores are mined (e.g. coal gas, associate gas H_2S, etc.)

1.5 *Waste rock pollution*

In the process of mining, large amounts of waste rock is inevitably produced. The waste rock is transported onto the surface to cover farmland, polluting environment, destroying ecosystem. For instance, when black shale ore deposit is mined, the waste rock cover land, at the same time radioactive elements produce radioactive pollution because a certain amount of radioactive elements exist between wall rock and dunn-bass.

1.6 *Noise pollution*

The noise produced during mining often compels some animals to change their habitats, which affects ecological balance; in residential area it seriously affects people's biogenic rhythm and makes people have some diseases.

2. The Influence of Transporting Ore on Environment

In China ore transport has two main kinds: opening transport and closed

transport. Opening transport such as transport by trucks, trains and ships, the ore dust floats in the air to pollute the air as ore contacts directly the air during transport. It is very common to pollute the soil and water along the transport roads because of rain leakage and road bumping. For example, the streets, roads and their sides in Pangjiapu and Xuanhua, Hebei Province, are often dyed in crimson, which results from the falling of red iron ore(powder) when transported. According to calculation, ore with ordinary size loses by more than 2%. The pollution is very serious.

The closed transport is mainly in form of piping transport. Sine the connection of the pipes is not jointed properly or rusted, leading to gas escaping, liquid leakage and solid falling down, which often directly pollute the air, water body and soil of the area the pipes pass through. In addition, the dissolved material having radioactive elements (such as radium) in petroleum associated with water also produces light radioactive pollution to the area where the pipes pass through. Some ore, when transferred and stocked on the way, have spontaneous combustion and sublimation, which also pollute the environment.

3. The Influence of Ore Processing on Environment

3.1 *The environmental pollution caused by physical smash*

Most of metals and nonmetals are to be smashed before being further processed, which seriously pollute the air, water body and the soil around. The dust produced by smash usually floats in the air and repeatedly enters the air by outside force(e.g. wind), which is the direct reason to cause the workers and local residents to have silicosis and lung cancer at a high rate.

3.2 *The environmental pollution caused by ore dressing*

The common ways for ore dressing are: heavy mineral seperation, floatation, magnetic separation, electrical separation, chemical separation, etc., each of which can create a certain environmental pollution. For example, separating kaolin by hydropower turbin is heavy mineral seperation, since silt is so fine to flow into river with water, polluting surface water body, causing fishes and shrimp dead, making lake and riverbeds deposited. If sorting medium displaces heavy medium, the medium itself will also be polluted to some extent. Another example, floatation is an effective way for ore dressing, but usually it needs a certain amount of floating medication, whose pollution upon environment is one of the chief drawbacks of floatation. Calcine is a way of chemical separation, by which a lot of ore is processed. Some calcine of ore doesn't do much harm to environment, but most of it pollutes environment seriously. For example, in sulfur ore, burning way is mainly adopted to refine sulfur. The

gas SO_2 produced during the burning makes no plants live around the area, which is a common phenomenon.

4. The Influence upon Environment in the Process of Consuming Ore

Ore consuming concludes two kinds: one is as means of production, the other is as means of livelihood. While consuming obtains profit it also pollutes the surroundings. For example, the petrol or diesel oil used by car produces a lot of gas and matter resulting in cancer, which seriously threatens human bodies, especially urban residents. Another example, the use of a large quantity of inorganic compound fertilizer and farm chemical destroys the natural texture of soil, causing the nutritious components of grain crops and vegetables to change slightly. The fertilizer, which permeates the waterbody of surface and underground, is often assimilated directly or indirectly by human being, becoming one of the reasons for high cancer occourrence.

Other environmental problems such as acid rain, heavy metal pollution of animals and the extinction of living beings are mostly caused by pollution produced in mineral products production and use[2]. While the mineral resources are being mined, transported, processed and used, the accidents caused by natural calamity and man-made factors, the bad effect upon environment occasionally take place. Though they are not common phenomena, once they happen, their harmful effect is very tremendous. The typical examples are the Nuclear leakage in Qierrubeili nuclear Power Station in the former Soviet Union and the crude oil pollution during Persian Gulf war.

II. THE CHARACTER AND COUNTERMEASURES FOR ENVIRONMENTAL PROBLEMS OF MINERAL RESOURCES UTILIZATION IN CHINA

1. Characteristics of Environmental Problems for Mineral Resources Utilization

China is very rich in mineral resources in the world. 163 minerals have been already known, of which 149 have been proved to have a certain reserve. The value of proved reserve of 45 main mineral resources occupy the 3rd place in the world. However, as to the average possession of mineral resources per capita, China is poor in mineral resources. The average possession per capita in China is less than half of that in the world, coming in the 80th place, and there are more poor ores, less rich ores, more accompanying ores, less

monomineral ores more medium-and small-sized ores and less large ore, which make the environmental problems caused in using mineral resources have some characteristics different from those of other countries. The main points as follow:

1.1 *The most seriously environmental problem caused in using mineral resources in China is coal environmental problem*

Mineral energy is the most important and the largest consumed mineral resources. The mineral energy in the world is mainly petroleum, while petroleum resources in China are always poor. Therefore the traditional energy ore——coal always occupies more than 70% in the total output of one-time commercial energy product and consumption. In the process of economic development in China, coal plays a decisive role, being the food of industry. However, as an energy, coal's pollution is much more serious than petroleum. According to statistics, among the pollutants released from fuel burning, 96% comes from coal, for example, 99% of smoke, 97% of CO, 93% of SO_2, 87% of hydroxide all directly come from coal burning. So coal environmental problem is the most serious one in mineral resources utilization. Whether it is dealt with properly or not directly affects the solution to environmental problem of mineral resources utilization.

1.2 *Large excavation and low utilization ratio of mineral resources in China is a direct reason for pollution and ecological destruction*

The total amount of ore excavation of China occupies the third place in the world, being a nation of large ore excavation. With the Chinese economic construction remaining at a suitable high speed, the need for mineral resources is increasing, the total ore excavation will also continue to increase. Large-scale excavation will intensify environmental pollution. Low utilization ratio of resources will increase the chance of environmental pollution in another respect. Since both the reclamation ratio of ore dressing and smelting and the rate of reclamation and utilization of metals are low, a large quantity of waste rock, unused ore having certain grade, deserted ore during processing, leftover bits and pieces waste project of metals and so on will be produced, which can exert serious influence upon eco-environment. For instance, the reutilization ratio of metals is only about 20% in China, while in western developed countries it usually is about 60%.

1.3 *Widely-distributed minerals, less large and overlarge-sized mineral deposits, and decentralized investment in environmental protection affect the effect of investment*

The region of mineral resources in China is widespread, and mineral deposits, mineral sites spread all over the country, which is the most important

resources foundation for villages and towns to deviate major efforts to develop mining industry. But at the same time the scattered minerals also bring about serious environmental problem, especially the difficulty of management of environment and the problem of scattered investment. In China there are less large and overlarge-sized deposits. For example only Dexing Copper Mine, Jiangxi and Yulong Copper Mine, Xizang (Tibet) are known as world-level large mines, and the large-scale mining in Yulong Copper Mine will not start in short period of time. This resource condition, on the one hand, restricts economic development, on the other hand makes environmental investment scattered, environment deterioration. In addition, what the mining industry of villages and towns pay more attention to is economic benefit of enterprises. In such a developing country as China, the laws and regulations are imperfect, environmental deterioration is still not fully realized, there inevitably exists many problems.

1.4 *Overmining mineral resources under the pressure of population intensifies environmental problem of mineral resources*

China has a population of 1200 million. Under such tremendous pressure of population, in order to rapidly develop economy, it is inevitable to have over utilizalion of mineral resources. The environmental problem of mineral resources becomes more and more prominent. Fox example, those cities, such as steel cities, coal cities, copper cities, tin cities formed with Chinese minerals being exploited and used, all have more serious atmospheric pollution, water pollution, the waste pollution, noise pollution, land accupation and so on, directly affecting people's living quality, restricting sustaibable economic development.

1.5 *Lacking integrative management of resources environment*

In China, the management of mineral resources and environment is separately run by several departments, macroscopically lacking integrative management, which brings about the contradiction in the management of mineral resources environment[3]. On the one hand, the departments of production and management of mineral resources pay more attention to resources benefit and economic benefit; on the other hand, environmental departments pay attention to environmental benefit. No unified departments make efforts to coordinate the conflict between general interests and partial and local interests.

2. Developing Trend and Countermeasures for Environment of Mineral Resources

When China carries out the socialist market economic system, the eco-

nomic development will speed up. With economic growth, the need for mineral resources will further increase. According to predictive calculation, by the end of this century China will need annual output of coal 1400—1500 million tons, petroleum and natural gas 200 million tons, iron and steel 90 million tons, which can only satisfy the basic need of development. Apparently in China the technology of environmental protection has not been qualified, without much attention, the whole level of environment of mineral resources will further deteriorate. The environmental problem of mineral resources will become one of the major problems restricting economic growth. Therefore, the following policies and suggestions for the environmental problem of mineral resources utihization are put forward.

1) In order to ensure the sustainable utilization of resources, first a long-term-goal planning for resources excavation must be made, only the sustainable utilization can make environmental, ecological, economic and resource benefits unification.

2) Properly importing foreign countries' high-quality resources, restricting the mineral mining of low grade and complex components.

3) Strengthening the recultivating of mine.

4) Strengthening the prediction and evaluation of environmental influence

5) Strengthening integrative evaluation and management for resources environment

6) Strengthening the technological development of nonpolluted separation and refining, the technological development of harnessing the environmental pollution of coal resources.

7) Perfecting laws and regulations of resources environment.

8) Establishing the system of harnessing environment by making joint efforts of central and local governments, enterprises, state, collective and individual.

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