The Impact of Environmental Degradation Costs on the Economic Benefits of Mining Areas

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Abstract: Most land-use projects do not take into account the impact on ecosystems. Based on the type of land project in the ecological mining area, this paper studies the impact on the economic benefits of ecological mining areas after considering the cost of environmental degradation. When calculating the cost of environmental degradation in the ecological mining area, I considered the cost of the damage caused by the construction of the land project and the cost of pollution control. Then I constructed an environmental cost measurement model of the ecological mine, and the real environmental degradation cost of the ecological project land project was measured.

1. Introduction

I chose the ecological mining area E as the representative. Analysis of cost-benefit from two aspects: economic significance and environmental significance. The environmental cost in the economic sense refers to the value of environmental products and environmental services used in economic activities; Environmental costs in the environmental sense refer to costs associated with actual or potential deterioration of environmental resources caused by human activities.

2. Hypothesis and rationality analysis

In the real world, we need to make the necessary assumptions before building a model, and my assumptions are as follows:

• The environmental pollutions generated by ecological mine mainly consider five categories: water pollution, air pollution, soil pollution, light pollution and noise pollution. After consulting the data, the main pollutions generated by the land use projects are the above five types. The proportion of other pollution is very small and can be ignored.

• Losses from environmental pollution are measured only in terms of money, regardless of other factors. Because the target is the cost of loss, it is mainly considered from the economic benefits, it is reasonable to use the price to measure.

• When using monetary to quantify environmental costs, I use the RMB.

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3. Organization of the Text

3.1 Cost-benefit analysis of ecological mining areas

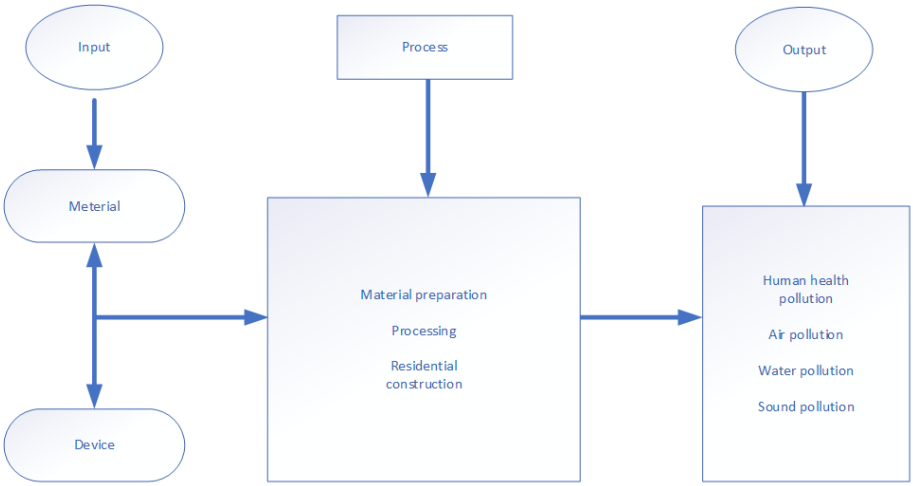

Figure 1. Type of pollution produced

3.2 Establishing ecological mine loss cost calculation

3.2.1 Human health loss

$$H_1 = E_1 * GDP_{pco} * \sum \frac{(1+\alpha)^t}{(1+r)^i} \tag{1}$$

$$t = \frac{\sum e_x * d_x}{\sum d_x} \tag{2}$$

The total average life lost life of Chinese respiratory diseases is based on the research conclusions of Xiao Min et al. (2009): the total average life lost life of Chinese respiratory diseases, heart disease and cerebrovascular diseases is 16.68 years, 18.15 years and 18.03 years respectively. The loss life year E1 calculated in this paper is 18 years. According to the relevant data of China Urban Statistical Yearbook (2017), the GDP is calculated to be 2,6753.7 yuan/person. According to relevant statistics, the average GDP growth rate of the residential area is 13.7%, and the population growth rate is controlled at 3.32%. The number of premature deaths in the E mine was 4 due to atmospheric pollution. Because the factors affecting the social discount rate α are more complicated, for the sake of simple calculation, the bank's annual loan interest rate of 6.14% has been selected instead.

$$H_1 = 26753.7 * 4 * \sum \frac{(1+\alpha)^t}{(1+r)^i} = 1.8499(million\ yuan) \tag{3}$$

3.2.2 Agricultural loss

$$H_2 = P * Q_1 = 1.1455(million\ yuan) \tag{4}$$

3.2.3 Industrial loss

$$H_3 = V * Q = 1.64(million\ yuan) \tag{5}$$

3.2.4 Water quality loss

$$H_4 = R * Q_s * (W_s - W_y) * k = 0.6213(million\ yuan) \tag{6}$$

3.2.5 Forestry loss

$$H_5 = S_1 * R * P * A = 0.6213(million\ yuan) \tag{7}$$

According to principal component analysis, we can know the total cost of loss is 8.039 $million\ yuan$.

3.3 Governance cost calculation

The cost of water pollution control cost is $0.9349(million\ yuan)$.
The cost of air pollution control is $0.6213(million\ yuan)$.
The cost of soil pollution control is $2.3492(million\ yuan)$.
The cost of soil pollution control is $1.64(million\ yuan)$.
Total cost = loss cost + governance cost.
The total cost of governance is $5.5354(million\ yuan)$.

3.4 Calculation of benefits

The coal resource value measurement model and coal recoverable reserves and their coal resource grades. It can be seen that the value of coal resources in the mining area is the comprehensive price of coal P is $781\ yuan/ton$; The calculation formula is:

$$V_T = 0.0688 * Q_T + 0.065r \sum_{i=1}^{n} {PQ_i}/{(1+r)^i} \tag{8}$$

$$n = {Q_T}/{Q_i} \tag{9}$$

The value of coal resources in the mining area is the comprehensive selling price of coal, which is $781\ yuan/ton$; r is equal to 6.14%, which is the loan interest rate of more than five years in the national financial institution loan interest rate adjustment table. Substitute:

$$V_T = 0.0688 * 1.5715.7 + 0.065 * 1.39 \sum_{i=1}^{n} 781 * {Q_i}/{(1+r)^i} \tag{10}$$

$$n = \frac{15715.7}{375} = 42 \tag{11}$$

Therefore, the total coal resource value of the ecological mining area is: $39676.97(ten\ thousand\ yuan)$

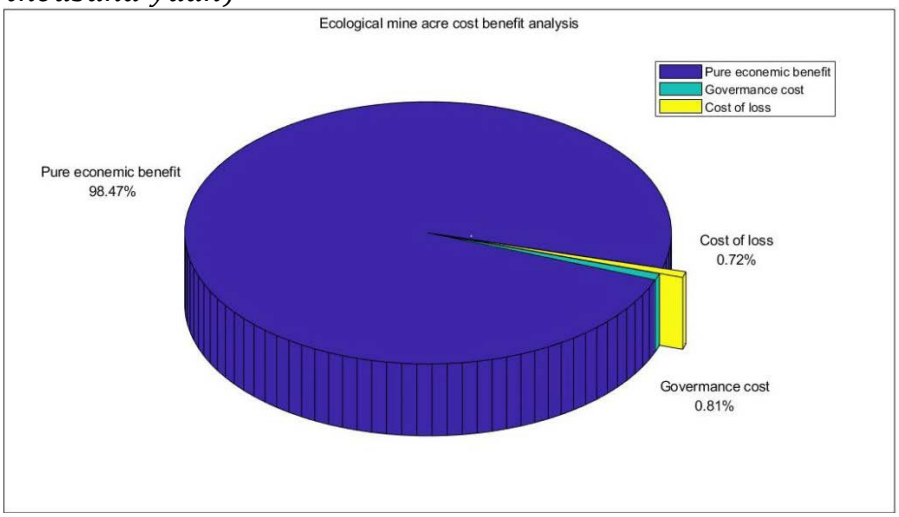

Figure 2. Cost-effective proportion

4. Conclusion

After our calculation, the cost of loss in this mine is about $8.039(million\ yuan)$, the cost of treatment is about $5.5354(million\ yuan)$ and the total value of coal resources in the ecological mine area is $396.7697(million\ yuan)$. The total ecological cost accounts for about 1.53% of the total revenue.

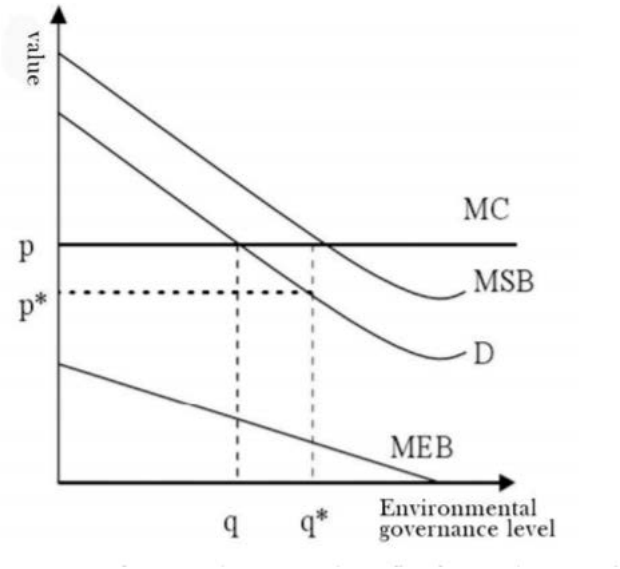

Figure 3. Curve of external costs and profits for coal enterprises

The figure shows the environmental governance decisions of coal companies in a competitive market. As shown in the figure, when the coal enterprise has negative externalities, the marginal social cost MSC is greater than the marginal private cost MC, and the difference between the two is the marginal external cost 1. The coal production with the largest profit of the coal enterprise is q, and the price P is equal to the marginal cost is MC, but the effective output is q* when the price P is equal to the marginal social cost MSC. From a social point of view, the actual output of coal enterprises is not the optimal output (q instead of q*), which has caused too much environmental burden and increased the ecological load of the mining area. In the process of production and management, coal enterprises sometimes carry out some activities related to environmental governance in consideration of their own interests. This has a positive externality, that is, the accounting of ecological environment costs will affect the maximum benefit of mine projects.

Ecosystem services are an important part of the total contribution of human well-being on this planet. We must begin to give sufficient attention to the natural capital stock that generates these services in the decision-making process, otherwise not only the current, but also the future, human well-being may suffer huge losses. Therefore, it is particularly important to establish a reasonable ecological service assessment model in the planning of land resource projects. We believe that it is unreasonable to quantify the ecological cost. It ignores the fact that many ecosystem services are virtually irreplaceable.

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