Analysis of Water Pollution and Calculation of Ecological Compensation Standards in Huangshui River Basin Based on Ecological Footprint

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Abstract. With the intensification of China's industrialization process in recent years, various types of industrial waste, waste oil, chemical waste, etc. have been continuously discharged into the rivers, lakes and seas that are related to people's lives, causing serious pollution. Therefore, it is necessary to adopt a compensation method to deal with it, but after all, the funds that the state can provide to ecological compensation are limited and it is still necessary to maintain the laws of economic market operation and strengthen the role of market regulation. Through the active guidance of the country, explore and develop more market-based ecological compensation models, give full play to the market's regulatory function, eliminate old processes, old equipment and industries with low capacity and high energy consumption, advocate the development of a circular economy and gradually pay the main players from the country. The transfer to the harmer and the beneficiary, while reducing the burden on the country, is also in line with the concept of fair and just socialist rule of law.

Keywords: Ecological Footprint, Water Pollution, Compensation

1. Introduction
Ecological compensation is divided into broad sense and narrow sense. Eco-compensation in the narrow sense refers to compensation, treatment and restoration of pollution and damage to environmental resources caused by human subsistence and management activities and in a broad sense should also include physical and financial compensation for people who have lost development opportunities due to environmental protection. Policy preferences and even education and research expenditures for environmental protection. China's ecological compensation system started late and it
began to conduct pilot operations in some areas after the 1990s and at the same time began to formulate related laws and regulations. At first, China's ecological compensation work mainly focused on forest and grassland protection. After years of discoveries, it has now expanded to agriculture, minerals, wetlands, nature reserves, water resources and other fields. A typical successful case is the policy of returning farmland to forests. This policy compensates farmers through state transfer payments and converts cultivated land back to forest land, which objectively plays a positive role in protecting the environment[1].

2. Ecological footprint theory

The Ecological Footprint method summarizes the global population, income, resource, application and resource effectiveness into a simple, universal and quantitative indicator that can be compared between countries. This method measures the area by proportionally converting the amount of natural resources consumed to maintain human normal production and life and the amount of natural resources that the natural environment can provide into the area of the ecological production space area and comparing it with the ecological carrying capacity of a given population. Ability for sustainable development. After the Canadian economist REES proposed the method in 1992, scholars from various countries have studied and perfected the method and have now formed a more systematic theoretical method and calculation steps.

Ecological carrying capacity refers to the ability of the ecosystem to self-maintain and self-regulate, the capacity of resources and environmental subsystems, the intensity of socio-economic activities it can sustain and the number of people with a certain standard of living. Ecological carrying capacity, not only reflects the overall carrying capacity of the ecosystem, but also the basis of the theory of green sustainable development. Ecological carrying capacity includes not only the largest population that can be supported by land in the area, but also the largest ecological function that the ecosystem can provide. It is an indispensable part of the ecological footprint study. The ecological productive land is a standard for measuring the ecological footprint method. The advantage of converting the ecological footprint into ecologically productive land for calculation is to embody the natural resources consumed by human production and life and the natural resources that the natural environment can provide. In theory, ecological productive land is generally divided into 6 categories: arable land, pasture grassland, forest land, fossil energy land, construction land and water areas[2].

Because the ecological productivity of 6 types of land is different, the land areas cannot be directly added. Using world average productivity, all ecologically productive land is uniformly converted into "the area of biological production land based on the average world productivity" through the equilibrium factor, yield factor and conversion factor of the fossil energy footprint of ecologically productive land as a basic measure Units are used in conversion calculations. The equilibrium factor of ecologically productive land refers to the value obtained by dividing the average productivity of the ecologically productive land and the average productivity of all ecologically productive land in the world. The specific values are shown in the table below.

| Table 1. Equilibrium Factor |
|-----------------------------|
| Land type       | Equilibrium factor |
| Arable land     | 2.82               |
| woodland        | 1.14               |
3. Pollution analysis of water resources in the Huangshui River Basin

3.1. Water pollution costs

Judging from the results of the calculation of the loss of water resource consumption costs, the losses caused by water pollution in the Huangshui River amounted to 1.2 billion yuan, accounting for 1.78% of the region's GDP in that year. This result basically reflects the water resources in the Huangshui River Basin. According to the actual situation of pollution loss, the proportion of regional GDP of water pollution of the Huangshui River is at a moderately low level[3].

We use 20 sampling sites for unified processing and the distribution and clustering relationship is as shown below. The above calculation results are only due to the loss of water resources due to pollution. If combined with the economic losses caused by water pollution to the first, second and third industries of the Huangshui River and other indirect losses, the pollution losses will be even greater.

Figure 1. Sampling Sites Distribution

However, the results can still be used as an important reference for water resources, accounting and its reference to the Huangshuihe National Economic Accounting System. The causes of water pollution in Qiushui mainly include three aspects. One is the pollution of planting and animal husbandry. The total water consumption of the Huangshui River is 5.2 billion m$^3$, of which 4.6 billion m$^3$ is used for agriculture, accounting for more than 90% of the total water consumption. The second is industrial wastewater pollution. The water consumption per 10,000 yuan of industrial GDP in this area was 142.56 m$^3$ and the national average water consumption per 10,000 yuan of industrial GDP was 43.11 m$^3$. The amount is 175 million tons, the industrial wastewater treatment volume is only 46 million tons, the wastewater treatment rate is 26.29% and the industrial water pollution treatment
capacity is insufficient. The third is urban sewage pollution. The amount of urban sewage discharged increased to 652 million tons, which puts greater pressure on water environmental protection in the basin.

3.2. Solutions to water pollution
First, speed up the adjustment of industrial structure, including the overall adjustment of the primary, secondary and tertiary industries and the internal adjustment of the industrial structure. At present, the water resources of the Huangshui River are mainly used for agricultural production and the ratio of industrial water and domestic water is low, but the efficiency and benefit of agricultural water resources are obviously insufficient. Industrial structure adjustment is needed to promote the transfer of agricultural water to industrial and domestic water. Secondly, industries with high consumption and low output value must realize low consumption and high output value through technological reform and innovation.

Second, increase efforts to control non-point source pollution. The investment of water resource pollution treatment facilities often requires supporting funds, which has higher requirements on the fiscal capacity of local governments. On the basis of continuing to improve the treatment of point source, water pollution, the focus should gradually shift to non-point source water pollution control[4].

Third, strengthen the water pollution treatment capacity of the river basin. Introduce advanced sewage treatment technology to enhance the sewage treatment capacity and treatment efficiency of the original facilities. In areas with frequent socio-economic activities, social funds will be introduced, large-scale water pollution treatment facilities will be built intensively and comprehensive water pollution treatment capabilities will be enhanced[5].

4. Ecological compensation analysis of water resources in the Huangshui River Basin
Ecological surplus or deficit reflects the degree of sustainable development of the region. The ecological deficit indicates that the amount of ecological resources per capita in this region is greater than its own ecological carrying capacity and its ecological resource needs cannot be continuously met. Therefore, from the perspective of sustainable regional development, ecological products and services provided by the ecological surplus area to other areas are measured through the ecological footprint model, that is, relative ecological compensation standards, combined with the regional relative fiscal revenue and the Engel coefficient, are the actual ecological compensation payment standards[6].

Ecological footprint and ecosystem service value are the theoretical basis of ecological economics established by this model. At present, these two fields are also new research hotspots. The relevant accounting methods and coefficients have not yet formed a unified standard. Therefore, the region's ecological footprint and ecosystem services The value-related research needs to be explored in combination with regional reality. This is the specific application and improvement of ecological compensation accounting methods and coefficients. The total amount of development-type regional payment ecological compensation funds was calculated to be 102.38 million yuan.

5. Conclusion
Regionalized water pollution control requires the government's full support and the formation of evidence-based laws and regulations. At the same time, micro-groups—enterprises and the public—are required to be included in the scope of water pollution control. Enterprises should pay attention to the use of water resources and the discharge of pollution in the production process and strictly abide by the water environmental protection system; the public in their own lives should save water and discharge polluted garbage in order to support pollution control at the grassroots' level. In the principle of complementary advantages, win-win cooperation and mutual benefit, the overall goal of the transformation and upgrading of the service industry must be considered and the relationship between water resources and the water environment must be considered as a whole to reflect the role of pollution compensation in regulating the ecological environment.

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