



Research Article

ISSN : 0975-7384  
CODEN(USA) : JCPRC5

## Research of Hebei Ecological Compensation System Based on the Main Functional Area

Jingpo Yang<sup>1</sup>, Fei Lu<sup>2</sup> and Yuanjie Zhao<sup>3</sup>

<sup>1</sup>*School of Environmental Science & Engineering, Hebei University of Science and Technology*

<sup>2</sup>*Hebei Provincial Environmental Scientific Research*

<sup>3</sup>*Collegel of Resources and Environmental Science, Hebei normal University*

---

### ABSTRACT

*To establish and improve the ecological compensation system is an important part of the ecological civilization construction. At present, the construction of ecological compensation system has some weaknesses, such as the compensation fields, methods and standards are not clearly defined, which will be the difficulty of promoting the paid use system of resources and the ecological compensation system in the following work. Based on the major function zoning in Hebei province, this study suggests that the core task of improving the provincial ecological compensation mechanism lies in the perfection of pollution discharge management.*

**Key words:** Hebei Province, Ecological Compensation System, Main Functional Area

---

### INTRODUCTION

#### THE CONCEPT OF ECOLOGICAL COMPENSATION

The concept of Ecological Compensation derives from the ecology theory. Generally speaking, Ecological Compensation should include the following main aspects. Firstly, Ecological Compensation is to compensate the cost of the damage for the ecosystem itself (recovery). Secondly, Ecological Compensation is to internalize the externalities of the economic benefits through economic means. Thirdly, Ecological Compensation is to offer the economic compensation for personal or regional ecological protection system and the loss of the in or giving up of the environment. Fourthly, Ecological Compensation is to put into protective invest for the important ecological valuable region or object<sup>[1]</sup>. As one of the current hot spots, establishing and improving the ecological compensation mechanism has been written into the *Report on the Work of the State Council Government in 2012* ---- "Promote the ecological construction, establish and improve the ecological compensation mechanism, promote the ecological protection and restoration, consolidate the "return grazing land to protect natural forests, returning farmland to forest and grass, achievements, to strengthen the construction of grassland ecology, vigorously carry out afforestation, advancing desertification and desertification, farmland management, strictly protect Jiang Heyuan important eco-function areas, wetlands, lakes"<sup>[2]</sup>.

"Ecological Compensation" in the world mostly refers to the "Payment for Ecosystem Services" (PES) or Payment for Ecological Benefit (PEB). And it mainly consists of direct public compensation, a cap-and-trade scheme, private direct compensation and ecological product certification scheme. Research and practice on ecological compensation in China began in the early 1990s. In the practice of ecological compensation, carrying out the work can be summarized as several aspects. Firstly, it is driven by the relevant ministries and commissions through the form of a national policy on the implementation of ecological compensation. Secondly, the local autonomy also does the exploration practice. Thirdly, in recent years the international ecological compensation began to anticipate

the market trade. In brief, the current practice is mainly concentrated in the forest, basin and mineral resources development ecological compensation.

The author thinks that the ecological compensation is the general term that describes economic compensation for the restoration and reconstruction of ecological system, restoration of ecological environment functions, prevention of ecological imbalance and the cost of comprehensive treatment of environmental pollution.

## **ANALYSIS ON THE CURRENT ECOLOGICAL COMPENSATION SYSTEM IN HEBEI PROVINCE**

### **2.1 Main Methods in Hebei Province**

Hebei province has implemented the policy of withholding the ecological compensation in the Ziya River system since 2008. In 2009, the policy of ecological compensation has been extended to the seven major river systems including 201 river cross sections in the whole province. In 2010, Hebei province launched the "double increase" policy of the eco compensation, that is, to improve the standards of water quality and charges. In 2011, the government added the assessment of ammonia and nitrogen indexes, increased the withholding amount of ecological compensation, and further improved the assessment of water quality target and the withholding system of ecological compensation for all the river cross sections. In 2012, the withholding system of ecological compensation has been improved and extended to the county level. In 2013, the policy has extended from the water pollution penalties to the protection of drinking water.

Up to now, the money which has been withheld totally in the whole province as the ecological compensation fund is used totally for projects to which the compensation shall be given because pollution of river water quality leads to the financial loss in the downstream. It is also used for project of drinking water safety by digging deep wells and emission reduction project of comprehensive improving the water pollution. These play an important for strengthening the water resources protection in Haihe basin, containing the tendency of ecological deterioration and improving the adjustment of industrial structure and distribution.

### **2.2 Current System Analysis**

At present, there are some shortcomings in terms of the ecological compensation model in Hebei Province.

(1)The unitary compensatory form and the lack of assessment mechanism. The current system more embodied a sort of penalty for unfulfilling the goal of environment protection to the government in district cities. The compensatory measures and specific requirements are not accurately enacted; neither formed the compensatory assessment system, which leads to the failure of its effect of compensation and the adjustment of the compensatory measure and direction

(2)The horizontal linkage and vertical linkages are both not adequacy in position. The ecological compensation is solely existed by the coordination of the government of province between the governments of district cities. Hebei Province, which adjacent to five other provinces and two cities, has only existed a certain proportion of compensation to Beijing. Furthermore, the compensation is a single-line link, practiced in the forestry and department of irrigation. This will bring about the phenomena of omission and duplication for its insufficiency in trans-departmental cooperation and systematic accounting. Besides, the access has not been established to the residents who are influenced, especially the compensation is not sent into the people directly.

(3) The way of compensation and its function are single, and correlational studies are weak. The present compensation model mainly takes the method of the direct cash compensation, lacking the variety such as the industrial-supporting model, ecological-supporting model, the model of changing of the mode of production and the adjustment of structure of energy. And the distribution in time, space and grade compartment are inaccurate. Besides that, there is insufficient in the research of the further distribution of the grade of compensation and the aspect of its scope and importance. The supporting of the skill on 3S technology is disappointing.

## **BASIC THEORY OF THE COMPENSATION IN THE MAIN FUNCTIONAL AREA**

The phrase "the Main Functional Area" is originally proposed in *The Opinions on Some Issues of System Reform of Planning* in 2002<sup>[3]</sup>, later, which is officially proposed in *The Law of the People's Republic of China on the National Economic and Social Development of the Eleventh Five-year Plan Outline* in 2006, and the questions about the main functional area planning and positioning, principles, main tasks and dividing of four types of main zones are clarified, in *The Opinions Regarding the Compilation of the Main Functional Area Planning under the State Council* in the year of 2007. According to the exploration form and the contents of land developing in Hebei Province, the main functional area is divided into five parts: optimized development area, key development area, agriculture and economic zone, key ecological functional zone and the forbidden developing zone. By 2020, it is that the optimized development area is basically formed by coastal area, Yanshan Mountain piedmont plain area

and northern central plains region of Hebei; the key development area is formed by the Beijing-Guangzhou area, the northern of Heilong Harbor and Zhangcheng valley basin; the agricultural economic zone is made by the southern area of Heilong Harbor; the key ecological functional area is comprised by the northern plateau mountainous area and the western mountainous area of Hebei; the forbidden developing zone is made up by the natural and cultural resources reserves of all kinds and the basic farmland.

### 3.1 Theoretical Basis of Ecological Compensation Model Building in Main Functional Area

The classical basic theory of traditional ecological compensation includes ecological environment axiology, externality theory and public product theory. As a new-type compensation way<sup>[4]</sup>, ecological compensation in the main functional area endows the ecological compensation theory with newer connotation<sup>[4]</sup>. From the perspective of the main functional area, analysis of these three basic theories can provide theoretical basis for building ecological compensation model in the main functional area:

(1) Ecological Environment Axiology. Ecological environment provides human the functions<sup>[5]</sup> of adjusting service, supporting service, supplying service, cultural service and so on. As people obtain a lot from it, they shall pay for using it. Analyzing the main functional area zoning, on one hand, environment in key ecological functional area and the forbidden exploitation area is protected and improved. It shall be compensated reasonably or the long-term enthusiasm for protecting the ecological environment would be weaken or fade away little by little. On the other hand, because optimized exploitation area and key exploitation area profit from the ecological environment, they shall pay for the supporter of ecological products. Ecological compensation is an important way to realize the ecological environment value.

2) Externality Theory. From the perspective of ecological environmental protection in the main functional area, the key ecological functional area and the forbidden exploitation area create the ecological value with positive external economic efficiency, but it can't gain economic benefit directly from the market. While the optimization exploitation area and key exploitation area destroy the environment, and the resource is used. Both of these actions generate external diseconomy and no relevant costing is paid. In order to solve the ecological protection "market failure" caused by the two different actions of the two kinds of area, ecological compensation shall be considered first.

3) Public Product Theory. As the ecological product of the public product, its non-competitiveness will lead to the overuse of ecological product and its non-excludability will make the optimization exploitation area and forbidden exploitation area more likely to "thumb a lift". Actually, there is obligation for the key ecological functional area and forbidden exploitation area to provide the public product for free, or it will lead to insufficient supplying. The increase of the ecological products using and the decrease of supplying will finally lead to destroying the ecological environment and exhausting the resource, and these will influence the sustainable development of the area. In the ecological protection, the optimization exploitation area and forbidden exploitation area pay for the provider of the ecological product, the key ecological functional area and the forbidden exploitation, thereby they will weaken its non-competitiveness and non-excludability.

### 3.2 Ecological Compensation Model's Construction Method in the Main Functional Area

At present, the ecological compensation standards have not been formed a unified, authoritative accounting method, and major accounting methods include ecosystem services value, opportunity cost, willingness to pay, and ecological footprint, etc. The characteristics of the different main functional area determine their rights and obligations, make clear ecological compensation's both sides and their direction, namely that the optimized development region and the key development region give compensation to the ecological function areas and the prohibited development regions<sup>[4]</sup>. To realize the internalization of external benefit, it should comprehensive consider ecological benefit, social acceptance and realistic feasibility<sup>[6]</sup>, and the combination of several approaches to construct ecological compensation model of the main functional area.

It should be considered the willingness to pay and the capacity to pay as beneficiary of the optimized development area and key development area to provide ecological compensation. The characteristics of the optimized development region and key development region are the denser population, more resource consumption, and the prominent environment problems<sup>[4]</sup>, so willingness to pay (WTP) for its ecological compensation can be determined by its needs. Using ecological footprint method can measure the influencing scale of population for the ecological environment and continued survival demand which put forward for ecological environment under established technical conditions and level of consumption. At the same time, because China has the distance from the turning point of environmental Kuznets Curve in a long time, although the optimized development region and key development region have better economic foundation, the relationship between the destruction of the ecological environment and economic development will be still in the rising stage<sup>[7]</sup>, whose main function is

gathering population and economy<sup>[4]</sup>, so the direct consequences brought by the industrialization development and urbanization development are still the consumption of resources and environmental damage. The ecological footprint method can measure dynamically its contradiction between ecological demand and supply.

The ecological compensation which is from the optimized development area and key development area, for the key ecological function area as ecological service protected party and prohibited development areas, needs to consider ecological benefits which it provides for areas. The main function of key ecological functional area and prohibited development areas is to protect the ecological environment and provide ecological products, in which the process is the process of creating value<sup>[4]</sup>. This kind of value can be determined through value method of the ecosystem services, which is the most reasonable explanation for ecological compensation standard. But because assessment results are numerical through the ecosystem service value, which have exceed the value of social production<sup>[6]</sup>, so it is difficult to directly as compensation basis, but often be as the reference standards for proportion distribution of ecological compensation.

On the other hand, for ecological compensation of main functional area, there are multiple protected areas and development areas within a certain region, so how to determine the compensation is the key to the implementation of the compensation on both sides. This problem can be solved through spatial circulation model of ecosystem service function. From the macro perspectives, ecological services provide by the ecosystem are "living", in which some ones can take effect in outside of the area, and its beneficiaries have layers, whose influential scope will decrease with the increase of distance<sup>[8-11]</sup>. That's to say, the ecological services provided by the key ecological areas and prohibited development areas are taking effect in the province, at the same time, producing different sizes' effectiveness for different optimized development areas and key development areas. For the optimized of development area and key development area, the need to pay was the part of the ecosystem service gained through the spatial circulation, that is the affected range of ecosystem services provided by the key ecological functional areas and prohibited development regions.

### 3.3 Detail Design of Hebei Province's Ecological Compensation System under the Framework of the Main Functional Area

The main idea of this detail design focus on perfecting pollution discharge and environmental management under the framework of Hebei Province's main functional area, and it will improve the current ecological compensation system further more.

**Tab.1: Design of the Important Ecological Compensation System in Hebei Province**

	River Basin	Minerals	Minerals	Natural Conservation Area
Subject Confirm	All regions and groups which benefit from the water resource of the river basin; pollutant treatment measures such as sewage treatment plant and refuse landfill in the forbidden constructing community and restrictive constructing area of the main functional area; all the individuals, enterprises or units who discharge the pollutant in life or production process thus influencing the water yield and water quality of the river basin. The responsibilities and obligations of the stakeholder will be confirmed according to the size of the river basin and scope of the upstream and downstream.	The ecological environment pollution caused by the abandoned mining area and the old mining area will be governed by the nation by means of establishing the recovering and governing fund of ecological environment of abandoned mining area; the destruction caused by the new mining area shall be loaded by the enterprise.	The government, units and individuals who conserve the forest resource; The units and individuals who benefit from forest ecological effect and work on production and operation activities; The enterprises and individuals who destroy the forest resource.	Ecological service bought by the government in the conservation area The limited exploitation on condition of the protection shall pay by the units or individuals in authority
Compensation Methods	The government set up the stage for the stakeholder to negotiate. It's the interior negotiation in the administrative area with	Cash compensation and repairing restoration.	The transferring payment, reduction or remission of taxes, Immigration subsidies, market trade, ecological mark and so on.	Government purchasing, national finance payment transferring, preferential policies, tax deduction and exemption, subsidies, setting up ecological

	commonality payment, one-to-one trade, compensation object, policy compensation, ecological mark and so on.			compensation special project fund for the natural conservation area, project compensation, international supporting.
Source of the Compensation Funds	Collect the ecological compensation tax of the river basin, set up ecological compensation fund of the river basin, carry out the credit and loan privileges, introduce the foreign fund and project, and so on.	The main source of recovering and governing fund of the mine ecological environment is the government financial appropriation, the "ecological environment compensation fee of the abandoned mine" collected from mine in operation and repairing cash deposit of the ecological environment.	The government continuously devotes for the forest ecological engineering and increases the payment strength; sets up the ecological protection and constructs the special project with directed association; cultivates and develops the forest ecological effect to compensate the diversified financing channels; establishes the "ecological tax" system.	The property of the conservation belongs to public, which shall be focused on the financial investment. Meanwhile, social raised capital system shall be extended positively.
Confirm of the Compensation Standard	Based on the direct input in the upstream area, the loss of development opportunity in the upstream area, the basin water environment protection facilities constructed newly in the upstream area and the received water yield and quality in the benefiting areas.	The lost value caused by the ecological environment resource destruction in the mine area. Actually, it shall be based on the cost of recovering the ecological environment.	According to the newly constructed forest and the current forest, the compensation standard shall be considered together with the direct input of forestation and forest management, the opportunity cost of protecting the forest ecological function by abandoning the economic development and the benefit of the forest ecological system service function.	Value assessment confirm is based on the ecological system service; based on protection cost confirm; based on the loss confirm caused by the protection.

## SUGGESTION

Under the framework of the main functional area in Hebei Province, it's meaningful to research the ecological compensation accorded with Hebei Province's local feature in detail. It's a kind of beneficial supplement for the traditional resources allocation methods under the multivariate purposes of environment, society and economy, which will benefit the sound development of environmental protection industry, the social harmony and the improvement of the public's ecological awareness. It's also the powerful guarantee to promote the construction of resource-saving and environment-friendly society. According to Hebei Province's features, the establishment of the following ecological compensation system shall be strengthened and the relevant research work shall be carried out:

- (1) Research on the value of ecosystem service and compensation standard of the forestland of Tai-hang Mountains and Yanshang Mountain, wet land, grassland of the upper dam and connect-dam, and all kinds of natural conservation areas with national level and provincial level and so on.
- (2) Research on compensation model of resource development such as mineral products especially the iron mine, coal mine exploitation, land rehabilitation, vegetation restoration and so on.
- (3) Research on the inter region compensation standard and model of the drainage basin in Haihe and Luanhe river system.
- (4) Research on the social economy effect and environmental influence of the ecological compensation, such as poverty, regional disparities, species diversity and so on.
- (5) Research on the function and grading divisions of ecological compensation within the cities' administrative area, especially the GIS space-time allocation model achieved by ecological compensation standard.
- (6) Research on the ecological compensation system among different carbon intensity areas.

---

**ACKNOWLEDGMENT**

The authors wish to thank Hebei Provincial department of Science and Technology for contract 14454208D, Supported by which the present work was possible.

**REFERENCES**

- [1] Editorial Committee, *Environmental Science Dictionary*, Beijing: China Environmental Science Press, **1991**.326.
- [2] Research Group, *Eco-compensation Mechanisms and Policies in China*, Science Press, **2007**.4.
- [3] Duo Lan-na, Liang Ge&Na Ri-su, *Reviews on the Research Progress of Constructing Ecological Compensation in the Main Functional Area*, Macroeconomic [M], **2011**, 11.
- [4] Meng Zhao-yi, ZHU Chuan-geng, QU Ai-xue et al. *Ecological Compensation of the Major Function Oriented Zoning of China* [J]. China Population, Resources and Environment, 2008,18 (2) .
- [5] Reid W V, Mooney H A. *Ecosystem and Human Well-being* [M]. Beijing: China Environmental Science Press, **2007**.
- [6] Yan Shou-guang, SHen Wei-shou, ZOU Chang-xin et al. *Research on Ecological Compensation in the key ecological function areas* [J]. China Population, Resources and Environment, **2010**, 20 (3) .
- [7] ZHao Xi-kang, Li Jian-min, Wang Jin-ying et al. *Environmental Kuznets Curve and Its Test in China* [J]. Nankai Economic Studies, **2005**,3 (3) .
- [8] Fan Xiao-shan, Gao Ji-xi, WenWen. *Research of Environmental Sciences*, **2007**, 20 (5).
- [9] Fan Xiao-shan, Gao Ji-xi, Yu Yong. *Ecological Economy*, **2007** (4).
- [10] Qiao Xu-ning, Yang Shui-ju, Yang De-gang. *Journal of Desert Research*, **2011**, 31 (4).
- [11] Cai Bang-cheng, Lu Gen-sheng, Song Li-juan et al. *Acta Ecologica Sinica*, **2008**, 28 (5).