The Improvement of Environment in Huaihe River Basin- a Perspective of Ecological Compensation

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Abstract. The article explores the approaches to improve the urban environment in Huaihe River basin from the perspective of the ecological compensation system. First, it expounds the origin of “ecological compensation” in ecology and economics and then discusses its legal connotations and reviews the courses of national ecological compensation legislation. Second, the article illustrates the necessity of ecological compensation legislation in Huaihe River basin from revealing the current status of its urban environment and the legislative process. Finally, the article proposes three interrelated macro approaches to improve urban environment in Huaihe River basin: decentralization of government administration, participation of public and private enterprises and involvement of social communities.

1. Preface
The deterioration of ecological environment and the limitation of natural resources have always aroused great concern from all walks of life. In the report delivered by President Xi Jinping at the 19th National Congress of the Communist Party of China, the ninth of the thirteen parts is entitled as “Speeding up Reform of the System for Developing an Ecological Civilization, and Building a Beautiful China”, in which the principle of “prioritizing resource conservation and environmental protection and letting nature restore itself” is clearly mentioned.[1] Moreover, various sections of the Report emphasizes the construction of economical, political, cultural, social and ecological civilizations and resonates the “the five-sphere integrated plan” proposed in the 18th National Congress Report, which demonstrates a rigid and consistent policy of preserving the environment of our government. In the 19th Congress Report, a prominent environmental problem mentioned by president Xi is water pollution, so he urges for speeding up prevention and control of water pollution, improving river basins and offshore areas and establishing diversified market-based mechanisms for ecological compensation.

The concept of “ecological compensation”, however, was originally used in Ecology and Economics and only at the end of the last century, the academia in China became to discuss the ecological compensation measures from the angle of ecology and economics, while the exploration of its connotation from the perspective of legal studies is only the matter of the recent decade. In addition, the legislation work lagged behind so that there is no a specific law or regulation concerning ecological compensation. The article begins with an introduction of the concept in the area of ecology and economics, then discusses its connotation as a legal system and finally puts forward three measures to improve the ecological environment of urban environment in Huaihe River basin, taking consideration of the origin, course and current status of the legislation of ecological compensation system in China.
2. The legal connotation of ecological compensation

2.1 The origin of the ecological compensation
The exploration of the concept of “ecological compensation” must start from understanding “the ecological system”, the concept of which was first presented by Arther Tansley, a British biologist in 1934. According to him, “An ecosystem is a community of living organisms (plants, animals and microbes) in conjunction with the nonliving components of their environment (things like air, water and mineral soil), interacting as a system”. [2] This theory of ecological balance, which maintains that the ecological system can compensate by itself after being disturbed or destructed without human behavior involvement is the very theoretical basis of the concept of ecological compensation in ecology; In economics, ecological compensation means the use of economical ways to protect ecological environment. The two meanings of ecological compensation both regard the ecological system or the natural environment as the main body, with no consideration of taking measures to balance the benefits and the sacrifices of different countries or regions owing to the exploitation of ecological environment. After World War II, with the rapid development of global industry, technology and economy, the over-exploitation and destruction of natural resources and ecological environment becomes increasingly severe, which intensifies the contradiction between the benefits developed countries gained from these exploitation and the sacrifices underdeveloped countries suffered from the destruction of ecological environment. Therefore, the United Nations proposed the strategy of sustainable development and the economical means of ecological compensation. In the Brundtland Report in 1987, Sustainable development is defined as the “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”[3]. From then on, ecological compensation was gradually recognized by the international society and various countries became to draft relevant laws and regulations to clarify compensation responsibility, means and criteria.

2.2 The legal connotation of ecological compensation
In order to standardize compensation measures, balance the economic profits of the providers of ecological services and beneficiary from these services, and finally realize the purpose of better protecting ecological environment, the academia of legal studies in China began to inquire the legal system of ecological compensation at the end of the last century. The inquiry aims to specify the connotation of the system as a legal concept and then provide theoretical support for the legislation of ecological compensation.

According to the searching of sector 1 of the social sciences in CNKI, the first article mentioning the term “ecological compensation” was “The revision of The Law of Land Administration and the tendency of the legislation of natural resources” published in China Legal Science in 1999, coauthored by Gan, Wei and Li. In section 4 of the second part, the authors mentioned that “the revised The Law of Forests establishes the forest ecological profit compensation fund system…the forest ecological compensation fund should be used for its specified purpose only, not for other uses” [4]. The first author using “ecological compensation” in article title was Zhang, who published a findings report “Practice and Thinking on Establishing Eco-compensation System” in Environment Protection in 2005, where he discussed the necessity, progress and suggestions of establishing the ecological compensation system, with an emphasis on the inquiry of the practice of establishing the system. [5] Nearly at the same period Du, a professor of Wuhan university, published an article “An analysis on legal components of ecological compensation and main issues of ecological compensation over natural resources and environmental legislation in PRC” in Modern Law Science, where she expounded the connotation of ecological compensation legal relations from a theoretical point of view and analyzed the measures and channels of ecological compensation execution and the existing problems in relevant legislation. [6]

The years after 2005 witnessed a sharp increase of interest in exploring the connotations and practices of ecological compensation. A search of “ecological compensation” in the article title in
CNKI resulted in nearly 5000 outcomes, which can be classified into three major topics: the theoretical inquiry into the legal system of ecological compensation, the prospect of ecological compensation legislation and the discussion of ecological compensation measures. As presented in Cheng, ecological compensation is a legal compensation behavior in either economic or other forms from the country, local governments and other beneficiary to those who make contributions to resource exploration and ecological protection and those whose profits are damaged. [7]

3. The current situation and legal protection of ecological environment in Huaihe River Basin

3.1 General situation of ecological environment in Huaihe River Basin

Huaihe River Basin is located in the east of China, between the Yangtze River and the Yellow River basins. It originates from Tai Bai Ding, the main peak of Tong Bai mountain in the south of Henan Province, and flows through 181 counties (cities) in 40 provinces of Hubei, Henan, Anhui, Shandong and Jiangsu, covering an area of 270000 square kilometers. The Huaihe River Basin, with its vast area and abundant resources, plays an important role in China’s national economic and social development. However, the cold and warm air flow from North to South competes fiercely in the basin, which results in the changeable climate in summer, uneven distribution of rainfall in time and space, frequent floods, poor natural ecological environment, fragile ecosystem, low environmental carrying capacity and limited environmental capacity. The volume of water resource can be revealed from table 1.

| Area       | waterfall | surface water | underground water | non repetitive amount | Total   |
|------------|-----------|---------------|-------------------|-----------------------|---------|
| The basin  | 253.62    | 66.21         | 36.04             | 22.50                 | 88.70   |
| Hubei      | 1.18      | 0.31          | 0.11              | 0.00                  | 0.31    |
| Henan      | 70.60     | 15.28         | 10.67             | 5.91                  | 21.19   |
| Anhui      | 78.62     | 27.85         | 10.14             | 5.54                  | 33.39   |
| Jiangsu    | 63.65     | 14.57         | 7.84              | 6.85                  | 21.43   |
| Shandong   | 39.57     | 8.20          | 7.29              | 4.19                  | 12.39   |

Generally, the basin is located in the underdeveloped area, which has a serious phenomenon of emphasizing economic development while ignoring environmental protection. Most cities in the Huaihe River Basin focus on the development of coal, electric power industry and food and textile industry with agricultural and sideline products as raw materials. In the past decade, coal chemical industry, building materials, electric power, machinery manufacturing and other light and heavy industries have also developed greatly. But with the development of industry and urbanization, the ecological environment of Huaihe River Basin has been greatly damaged. In 2018, Huaihe River Basin is 20991.8 km long. Water quality evaluation is officially conducted by evaluating 22 items: water temperature, pH value, dissolved oxygen, permanganate index (CODmnn), chemical oxygen demand (COD), five-day biochemical oxygen demand (BOD5), ammonia nitrogen, total phosphorus, copper, zinc, fluoride, selenium, mercury, cadmium, hexavalent chromium, lead, cyanide, volatile phenol, anion detergent, sulfide and petroleum. The result is that the river length of water quality Class I, II, III, IV, V, V- is respectively148.4, 3710.5, 9331.2, 4849, 11891 and 1061.7 km, which we can see medium water quality (III & IV) occupies the majority. The percentage is shown from the Figure 1[ibid].
Figure 1. Water quality in Huaihe River Basin in 2018 (%)

Water quality is to a large extent related to the discharge of waste water from main cities and towns into rivers, shown form statistics of 2018 in Table 2 [ibid]. Therefore, it is urgent to control the water pollution of Huaihe River and improve the ecological environment of industrial cities.

| Area   | Towns | Sewage outlet | Waste water volume (billion t/a) | Chemical oxygen demand (thousand t/a) |
|--------|-------|---------------|----------------------------------|--------------------------------------|
| Henan  | 64    | 467           | 2.10                             | 84.9                                 |
| Anhui  | 39    | 1158          | 1.54                             | 39.3                                 |
| Jiangsu| 34    | 494           | 1.61                             | 51                                   |
| Shandong| 35    | 267           | 1.21                             | 31.7                                 |
| Total  | 172   | 2386          | 6.46                             | 206.9                                |

3.2 Legal protection of ecological environment improvement in Huaihe River Basin

According to the textual research of Professor Zhang, “after the Southern Song Dynasty, the Yellow River seized the Huaihe River in an all-round way. The water ecological environment in the Huaihe River began to change in a disordered way: the rivers and lakes were silted up; the river mouth moved eastward; the Hongze Lake area expanded; the Huaihe River was forced to flow into the Yangtze River in the south; and a group of “rivers and lakes” formed on both sides of the middle reaches; the flood disaster in the river basin intensified.” [9] Since then, the governance of the Huaihe River has become an unavoidable livelihood project for the governments of all dynasties. The governance of the Huaihe River is also the first comprehensive and systematic River after the founding of new China, which has become the beginning of large-scale water control in New China. In the summer of 1950, there was a heavy rain in the Huaihe River Basin. Chairman Mao issued important instructions for four times in a row, demanding that the Huaihe River be harnessed as soon as possible. In August, Premier Zhou presided over the first Huaihe River governance meeting and made a major decision on the governance of the Huaihe River. In May 1951, Chairman Mao wrote the inscription “we must repair the Huaihe River”, and asked Henan, Anhui and Jiangsu to “jointly protect and work together”.

After nearly 30 years’ efforts from the central government to the local government, after the reform and opening up, “the Huaihe River has been comprehensively managed. However, with the modernization, industrialization and urbanization of agriculture, the problems of people and water competing for land, soil erosion and water pollution are becoming more and more prominent, and the water ecological environment is deteriorating.” [ibid] In order to strengthen the prevention and control of water pollution in the Huaihe River Basin, protect and improve the water quality, and ensure the people’s living and production water, the State Council issued The Interim Regulations on Prevention and Control of Water Pollution in the Huaihe River Basin (Order No. 183 of the State Council) on August 8, 1995, which opened a new chapter of Huaihe River treatment, from the treatment of water disasters to the treatment of water pollution and the improvement of ecological environment. The regulations have become the specific legal regulation for improving the ecological environment of the Huaihe River Basin in China in the near future. At the end of 2005, Article 12 of The Decision of the
State Council on Implementing the Scientific Outlook on Development and Strengthening Environmental Protection stipulated that “we should focus on strengthening pollution prevention and control and strengthen urban environmental protection. We need to strengthen the construction of urban infrastructure. By 2010, the treatment rate of municipal sewage and domestic garbage in China will be no less than 70% and 60% respectively. We will strive to solve the pollution of particulate matter, noise and catering industry, and encourage the development of energy-saving and environmental friendly cars. Soil risk assessment and remediation should be carried out for the original site after relocation. Urban construction should pay attention to natural and ecological conditions, preserve natural forest and grass, river and lake systems, beach wetlands, natural landforms, wildlife and other natural heritage as much as possible, and strive to maintain urban ecological balance.” [10] This decision has become the main basis for the improvement of ecological environment and ecological compensation of river basin cities in China in the past few years. In August 2012, the State Council issued The Notice of the State Council on Printing and Distributing the 12th Five Year Plan for Energy Conservation and Emission Reduction (GF [2012] No. 40). It proposed four principles for energy conservation and emission reduction and improvement of ecological environment during the 12th Five Year Plan Period: strengthening constraints and promoting transformation; controlling increment and optimizing stock; improving Mechanism and promoting innovation; classified guidance and focus. The notice also specifies three major tasks of energy conservation and emission reduction during the 12th Five Year Plan Period: adjusting and optimizing the industrial structure, promoting the improvement of energy efficiency level, strengthening major pollutant emission reduction and energy conservation renovation projects, constructing urban domestic sewage treatment projects, and water pollution prevention projects in key basins and promoting circular economy demonstration. [11] These programmatic documents have become an important guide to explore ways to improve ecological environment in the Huaihe River Basin.

4. Current status of ecological compensation legislation and practice in China

With the acceleration of industrialization and economic growth in Huaihe River Basin, the urban population is expanding day by day, and the urban ecological environment is facing great challenges. On the one hand, the growing urban population and economic activities put forward higher requirements for the already fragile natural environment resources; on the other hand, countries and regions must first guarantee the safe water use, solid pollutant treatment and air quality monitoring of industrial cities in river basins, so it is necessary to formulate quick and appropriate measures and provide sufficient funds to improve environmental infrastructure and services quality. In order to solve this contradiction, the central and local governments have accelerated the legislative process of ecological compensation.

4.1 The legislative process of ecological compensation

After the analysis of the legal connotation of ecological compensation and the conception of the legislation of ecological compensation, our country and the governments at all levels have started to draft the laws and regulations of ecological compensation, paying attention to the protection of the ecological environment while developing the economy. In addition, the more developed areas present economic compensation to regions providing the ecological and environmental services to reach a regional balance, which is also an urgent requirement for the implementation of scientific development concept and sustainable development strategy.

In December 2005, the State Council promulgated The Decision of the State Council on Implementing the Scientific Outlook on Development and Strengthening Environmental Protection (GF [2005] No. 39). The decision includes six major points and 32 provisions, which clearly put forward: “we should improve the ecological compensation policy and establish the ecological compensation mechanism as soon as possible”. [12] On August 24, 2007, the State Environmental Protection Administration issued The Guiding Opinions on the Pilot Work of Ecological
Compensation, which decided to carry out the pilot work of ecological compensation in the four key areas of natural reserves, important ecological functional areas, mineral resources and water environment protection of river basins. In October 2010, the National Development and Reform Commission held an international seminar on ecological compensation legislation and watershed ecological compensation in Ya'an, Sichuan Province, and the ecological compensation legislation work has been fully launched. In April 2015, *The Opinions on Accelerating the Construction of Ecological Civilization* (ZF [2015] No. 12) issued by the CPC Central Committee and the State Council took “improving the compensation mechanism of ecological protection” as one of the important contents of “improving the system of ecological civilization”. In May 2016, *The Opinions on Improving the Compensation Mechanism for Ecological Protection* (GBF [2016] No. 31) systematically and comprehensively deployed the ecological compensation, which is an important progress in the top-level design of the ecological compensation mechanism in China. It has drawn a system innovation roadmap for the ecological compensation in China and provided a target guidance for the specific actions of the current and future ecological compensation.[14] In December 2016, the Ministry of Finance, the former Ministry of Environmental Protection, the National Development and Reform Commission and the Ministry of Water Resources jointly issued *The Guidance on Accelerating the Establishment of Compensation Mechanism for Horizontal Ecological Protection in the Upper and Lower Reaches of the River Basin* (CJ [2016] No. 928), making it clear that a cross provincial horizontal ecological compensation mechanism will be established.[15] The top-level design of ecological compensation system in China is becoming increasingly perfect.

4.2 The current status of ecological compensation practice

With the intensive implementation of policies, the framework of ecological compensation system in China is becoming clearer and clearer and the practice of ecological compensation takes on three characteristics.

(1) Broader areas: from regional compensation to comprehensive compensation

Since the “The Transfer Payment (Pilot) Measures for National Key Ecological Functional Areas” issued by the Ministry of Finance in 2009, the central government has continuously increased the transfer payment, expanded the scope of subsidies, and increased the total amount of subsidies. By 2018, the scope of subsidy will be expanded from the initial 221 counties to 818 counties. Meanwhile, the total amount of transfer payment funds will continue to increase, from the initial 6.051 billion yuan to 72.1 billion yuan. In 10 years, the amount of funds will increase 10 times, details are revealed from the Figure 2.

![Figure 2. transfer payment funds in key ecological functional areas](image)

(2) Deeper extensions: from intra-provincial compensation to inter-provincial compensation

The “Chinese model” of basin ecological compensation is taking shape. In recent years, China has accumulated rich practical experience in watershed ecological compensation. Watershed ecological compensation is an important means to carry out comprehensive management in China, which has
become the consensus of all levels of government. Up to now, 19 provinces (autonomous regions and municipalities directly under the central government) including Guangdong, Shaanxi, Shanxi, Beijing, Jiangsu, Jiangxi, Yunnan, Hubei, Hebei, Anhui, Ningxia, Liaoning, Zhejiang, Fujian, Henan, Hainan, Chongqing and Tianjin have issued policies related to ecological compensation of river basins.

(3) More channels: from fund compensation to multiple compensation

The organic combination of ecological poverty alleviation and ecological compensation is being explored. China’s important ecological function regions and underdeveloped regions are intertwined, and the protection of ecological environment is accompanied by regional poverty reduction and poverty alleviation. Therefore, the implementation of ecological compensation mechanism construction is also an important measure for poverty alleviation; besides, external funds compensation began to transform into self-development mechanism, and social participation has gradually become an important supplement to financial transfer payment.

5. Approaches to environment improvement in Huaihe River Basin

Based on the analyses of the legislative process and the current practice status of ecological compensation in recent years, we agree with such four directions of ecological compensation reform and innovation as “diversification, systematization, marketization and legalization put forward by Liu Guihuan and Wen Yihui [ibid]. In view of the continuous deterioration of the ecological environment in the Huaihe River Basin, the state should speed up the process of ecological compensation legislation. The author believes that under the premise of this legal guarantee, the reform should also be carried out in the practical measures of environmental improvement, and the efficiency and effectiveness of ecological environment improvement should be promoted from three dimensions: the decentralization of ecological environment management, the participation of public and private enterprises, and the participation of society. Their roles and relationships can be demonstrated in Figure 3.

![Figure 3. The role of government, public and private enterprises and society](image)

First of all, the decentralization of the superior government in the process of ecological environment improvement refers to the implementation of flexible management in the four aspects of macro-control, legal system formulation, economic intervention means and the formulation of compensation measures. It aims at providing more appropriate public services and more livable environmental quality with policy guarantee. The decentralization of the superior government in macro-control aims to improve the local government and relevant departments to build appropriate control programs in combination with the local situation, so as to protect public health and natural environment, and minimize the harm of environmental pollution; the decentralization of the superior government in the process of legislation and system formulation can enable the local governments to formulate regional laws and regulations, so as to ensure the law and law To regulate the interpretability and credibility of local residents and public service audiences; the decentralization of intervening economic means aims to enable local governments to formulate economic intervention...
policies and measures suitable for the local ecological environment governance state, ensure the consistent investment with the ecological environment governance focused by the local public, and avoid the misuse of compensation funds or special funds for environmental governance.

The joining of public and private enterprises in the process of ecological compensation and environmental improvement has four reasons: first, these enterprises are to some extent the direct causes of environmental and ecological deterioration; second, as social enterprises, they must take corresponding social responsibility and use part of the profits to provide large amount of funds needed to improve the environment; third, the current private economy enterprises are involved in many fields related to the quality of ecological environment: industrial and domestic water supply, industrial pollutant treatment, public transportation, etc.; fourthly, the understanding of local ecological environment and natural resources also ensures the possibility of their better improvement of ecological environment. Therefore, it is very important to fully mobilize these enterprises' awareness of participation in environmental improvement and supervise their level of environmental improvement.

The participation of social groups and residents in environmental improvement has four merits: first, social groups or residents can provide environmental services and improve basic living settings for the poorer areas of the city through certain means of payment; second, society and residents are not only groups and individuals living in the environment passively, but also actively pay attention to environmental protection and publicity, to ensure the overall green and environment-friendly life style of society; third, the participation of society and residents in environmental improvement can play its regulatory role, so as to improve the public trust level of environmental improvement measures taken by enterprises; fourth, the active participation of social groups or residents can also be reflected in the combination with public and private enterprises, forming a virtuous circle.

6. Conclusion
In recent decades, driven by industrialization, urbanization and agricultural modernization, Huaihe River Basin cities have made rapid economic development, but at the same time, the ecological environment has also been greatly damaged. How to protect the ecological balance and improve the urban environment while promoting the sustainable and high-speed development of economy is an important topic worthy of long-term consideration and research. As an effective measure to coordinate regional development, promote social equity and ultimately realize ecological environment protection, ecological compensation legal system plays an important role in the process of improving the urban ecological environment of Huaihe River Basin. We should give full play to the decentralization of government administration to ensure the flexibility and appropriateness of environmental improvement policies and measures; we should explicitly require public and private enterprises to join in order to ensure the fulfillment of enterprises' environmental responsibility and technical support; we should constantly encourage the participation of society and residents to ensure the social atmosphere for environmental awareness publicity.

We must be optimistic to see that since the 18th CPC National Congress, general secretary Xi Jinping has put forward a series of new ideas and new strategies for the construction of ecological civilization, environmental protection, and compensation mechanism. Ecological compensation has been upgraded to an unprecedented level, and an ecological compensation system with Chinese characteristics is being formed.

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