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Study on the Coupling Coordination Degree of Economy and Ecological Environment in the Yellow River Basin under the New Development Patterns

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Abstract

The Yellow River Basin is an important ecological barrier and economic zone in China, and the asynchronous development of socio-economic and ecological environments in the nine provinces along the Yellow River Basin has seriously impeded the goal of high-quality development of the Yellow River Basin, so there is an urgent need to study the synergy of ecological environment and economic development in the nine provinces along the Yellow River Basin. In this paper, we construct the ecological environment and economic development index system from the perspective of "PSR" and the new development pattern of "double cycle", analyze the ecological environment and economic development level of the nine provinces along the Yellow River Basin by combining subjective and objective weights, and apply the coupling coordination model to measure the synergy between ecological protection and economic development in the Yellow River Basin. The coupling coordination model is used to measure the degree of synergistic development of ecological protection and economic development in the Yellow River Basin, and the long-term synergistic development trend of the two is analyzed with the help of LSTM neural network model. The results of the study show that: the ecological environment and economic development index of the nine provinces and regions along the Yellow River Basin shows an increasing trend in general, with slight fluctuations in individual provinces and regions; the coupled coordination degree of ecological environment and economic development of the nine provinces and regions along the Yellow River Basin is in an increasing trend from 2011-2020, and the degree of coordination is in the state of moderate dislocation to primary coordination, and the coupled coordination degree is at a relatively low level.

Keywords

Yellow River Basin; Two-Loop Coupling; Coordinated; LSTM Neural Network.

1. Introduction

The Yellow River Basin flows through nine provinces and regions, namely Qinghai, Sichuan, Gansu, Ningxia, Inner Mongolia, Shanxi, Shaanxi and Shandong, and is an important area for population activities and economic development. However, rapid social-economic development will inevitably lead to the deterioration of the ecological environment, and the deterioration of the ecological environment will also hinder the high-quality development of the economy. Therefore, since the 18th National Congress of the Communist Party of China (CPC), the CPC Central Committee has put forward a series of policies and measures to promote the ecological protection and high-quality economic development of the Yellow River Basin. It is of great significance to explore the current situation of ecological environment and economic development in the Yellow River Basin, and study the synergy of the development of the two, in order to promote the provinces in the whole basin to grasp the ecological protection of the Yellow River according to their own conditions and development conditions, to promote the

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Yellow River management and economic development in synergy, and to narrow the difference between the east and the west.

Combing through the relevant literature on ecological environment and economic development at home and abroad, it is not difficult to find that the current research from the study of the relationship between ecological environment and economic development two0 and economic development, and gradually developed into the study of the coupling and coordination degree of the two[2]. It is not difficult to find that the current research has evolved from the study of the relationship between ecological environment and economic development to the study of the degree of coordination of their coupling. Among them, the research on the coupling and coordination degree of ecological environment and economic development mainly focuses on two aspects, on the one hand, from the theoretical aspect of the research, some scholars combined with the geographic location of the Yellow River Basin and the characteristics of economic development to construct the indicator system from different angles[3][4]. On the other hand, the research mainly focuses on empirical research, scholars analyze the coupling degree of coordination vertically and horizontally according to the indicator system and analyze its constraints[5]-[9]. Based on this, this paper analyzes the degree of coupling coordination from the new development pattern. Based on this, this paper explores the economic development status of the Yellow River Basin from the perspective of the new development pattern, analyzes the ecological environment development status of the nine provinces and regions in the Yellow River Basin from the perspective of the DPSIR, further understands the coupled and coordinated relationship between the ecological environment and the economic development of the Yellow River Basin from a new perspective, and predicts the degree of coupled coordination, speculates its future development trend and analyzes the constraints on its development on the basis of this perspective.

2. Study Design

2.1. Coupling Mechanism

As the core concept of China's ecological civilization construction in the new era, the "Two Mountains" theory points out the direction for research work related to coordinating China's economic development and ecological protection. As Jianing Cao[10] pointed out from the perspective of the unity of labor value and natural value, without the support of "green water and green mountains", the production of "gold and silver mountains" will not be guaranteed by the basic means of production, and without the guarantee of "gold and silver mountains", the production of "gold and silver mountains" will not be guaranteed by the basic means of production. Without the support of "green mountains", the production of "gold mountains" will not be guaranteed by the basic means of production, and without the guarantee of "gold mountains", the restoration and protection of "green mountains" will also be difficult. Linke Liu[11] In the literature on the coupling mechanism of the two further elaborated in detail, that is, ecological protection for the development of the economy to provide resource security, intensive orientation, wealth appreciation, power switching and so on, while the economic development of the ecological protection of the structural effect and technical effects from the source to reduce pollution generation play a role in the protection of the ecological environment. The Yellow River Basin has a fragile ecological environment, weak economic development, and a low level of overall openness to the outside world, so it is important to find the complementary paths between the two under different cyclic conditions, which is of some reference significance for the economic growth and ecological protection along the Yellow River Basin.

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2.2. Construction of the Indicator System

Table 1. Construction of the indicator system

layer A	Layer B	Index layer	unit
ecological environment	stresses	Industrial solid waste generation	tons
		Industrial wastewater discharge	tons
		Industrial sulphur dioxide emissions	tons
		Zero domestic garbage removal	tons
		Municipal sewage discharges	cubic meter
	state of affairs	Water resources per capital	Cubic meters/person
		Greening coverage in built-up areas	%
		Agricultural fertilizers, pure	tons
		Forest stock	billion cubic meters
		Number of environmental emergencies	substandard
	responsive	Completed investment in industrial pollution control	ten thousand dollars
		Soil erosion control area	hectares
		Non-hazardous treatment rate of domestic waste	%
		Total afforestation area	thousand hectares
economic development	"Internal circulation" system	Per capital disposable income	Person/$
		Consumption expenditure per capital	Person/$
		Secondary sector as a share of GDP	%
		Tertiary sector as a share of GDP	%
		Average labor productivity in the primary sector	/
		Average labor productivity in the secondary sector	/
		Average labor productivity in the tertiary sector	/
	"External circulation" system	Foreign investment as a percentage of GDP	%
		Import trade as a share of GDP	%
		Export trade as a share of GDP	%

The construction of ecological environment indicator system adopts the model of "Pressure-State-Response", and the pressure indicator represents the damage to the environment caused by human economic and social activities, so this paper mainly measures the pollution from the aspects of human industrial production and domestic emission when constructing the pressure indicator. Therefore, the pressure indicators in this paper are constructed mainly from the human industrial production and living emissions to measure the pollution size. The pressure indicator contains five sub-indicators, namely, industrial solid waste generation, industrial wastewater emissions, industrial sulfur dioxide emissions, zero domestic garbage removal, and urban sewage emissions; the state indicator shows the condition of the natural environment and the quality of human existence in a certain period of time, so this paper selects the pure amount of agricultural fertilizers, the per capital amount of water resources, the greening coverage of built-up areas, the amount of forest storage, and the number of environmental

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emergencies to measure; the response indicator is measured by the number of environmental events; and the response indicator is measured by the number of environmental emergencies. Response indicators refer to the corresponding actions taken by human beings to reduce the pressure to improve the state, so the response indicators in this paper include the amount of investment in industrial pollution control, soil erosion control area, the rate of harmless treatment of domestic garbage, and the total area of afforestation.

Based on reading a large amount of literature, the economic development indicator system is constructed according to the concept of the new development pattern, with reference to the double-cycle coupling system constructed by Wenju Zhao[12]. Based on the concept of the new development pattern, we refer to the double-cycle coupling system constructed. The indicators of "inner cycle" are mainly constructed from four aspects, namely, the consumption base and the willingness to consume, the production structure and the production efficiency. The production efficiency is measured by the average labor productivity of the primary, secondary and tertiary sectors, which is calculated by dividing the value added of each sector by the number of people employed in each sector. The structure of the "outer-cycle" economy is measured by the proportion of import and export trade in GDP and the proportion of foreign investment in GDP respectively, and the dependence of the "outer-cycle" economy is reflected by the proportion of foreign investment in GDP, As shown in Table 1.

2.3. Research Methodology

2.3.1. Coupled Coordination Degree Model

In this paper, the entropy weight TOPSIS method is used to measure the ecological environment development level, economic "inner cycle" development level and economic "double cycle" development level of each of the nine provinces in the Yellow River Basin. This paper adopts the entropy weight TOPSIS method to measure the ecological environment development level, the development level of economic "inner cycle" and the development level of economic "double cycle" of each of the nine provinces in the Yellow River Basin, and constructs the coupling coordination degree model to calculate the coupling coordination degree of the economy and ecology under different conditions. The coupling coordination degree model is constructed to calculate the coupling coordination degree of economy and ecology under different conditions. The following calculation procedure is for a specific year in a province, and the specific steps are shown below:

Step 1: The raw data were standardized using the method of polar deviation standardization:

Positive indicators:

$$Y_{ij} = \frac{X_{ij} - \min(X_{ij})}{\max(X_{ij}) - \min(X_{ij})} \tag{1}$$

Negative indicators:

$$Y_{ij} = \frac{\max(X_{ij}) - X_{ij}}{\max(X_{ij}) - \min(X_{ij})} \tag{2}$$

Where i denotes province, j denotes the measurement indicator, X_{ij} and Y_{ij} denote the first i province, the first j values of the original measurement indicators and the standardized values of each indicator.

Step 2: Calculate the entropy value of each indicator after standardization E_j and weights W_j :

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$$E_j = In(1/n)\sum_{i=1}^{n}[(Y_{ij}/\sum_{i=1}^{n}Y_{ij})In(Y_{ij}/\sum_{i=1}^{n}Y_{ij})] \quad (3)$$

$$W_j = (1-E_j)/\sum_{j=1}^{m}(1-E_j) \quad (4)$$

Where n denotes the number of provinces, and m indicates the number of indicators.

Step 3:Calculate the combined level index of economy and ecology S_1、S_2 :

$$S = \sum_{j=1}^{m} W_j Y_{ij} \quad (5)$$

$$T_i = \frac{1}{2}(S_1 + S_2) \quad (6)$$

Step 4:Calculate the coupling degree and coordination degree under the condition of "inner loop". C_i and Coordination Degree T_i and coupling coordination D_i :

$$C_i = 2\sqrt{(S_1 + S_2)/(S_1 + S_2)^2} \quad (7)$$

$$D_i = \sqrt{C_i T_i} \quad (8)$$

Step 5: Under the condition of "double cycle", the comprehensive level index of ecology is calculated as shown in step 3.S_2 Calculation is shown in step 3, and the comprehensive level index of economy is set as 0.7 The weight of the internal circular economy is set to 0.7, and the weight of the external circular economy is set to 0.3.

$$S_1^{'} = 0.7S_N + 0.3S_W \quad (9)$$

$$T_i^{'} = \frac{1}{2}(S_1^{'} + S_2) \quad (10)$$

$$C_i^{'} = 2\sqrt{(S_1^{'} + S_2)/(S_1^{'} + S_2)^2} \quad (11)$$

$$D_i^{'} = \sqrt{C_i^{'} T_i^{'}} \quad (12)$$

2.3.2. Classification of Coupling Coordination Degree

Referring to the existing literature[7] , the coupled coordination degree level of economic development and ecological environment in the Yellow River Basin is divided into five levels, as shown in Table 2:

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Table 2. Coupling Harmonization Level Classification

degree of coupling coordination	hierarchy
[0.2,0.399]	severe disorder
[0.4,0.499]	moderate disorder
[0.5,0.599]	on the verge of becoming dysfunctional
[0.6,0.699]	Primary coordination
[0.7,0.799]	Intermediate level coordination
[0.8,1]	Quality coordination

2.4. Data Sources and Processing

In this paper, the data of 24 indicators from 2011 to 2020 were collected from nine provinces in the Yellow River Basin, and the sources of the data were the National Bureau of Statistics, the statistical yearbooks of nine provinces in the Yellow River Basin, and the China Environmental Statistical Yearbook. After the data collection, the missing value data were interpolated and stata17.0 was applied to calculate the coupling coordination degree.

3. Results and Analysis

3.1. Measurement of Composite Indices

According to the index system constructed above, this paper adopts the method of combining subjective and objective assignment to determine the weights, specifically, the three-level indexes of ecological environment, economic "inner cycle" and economic "double cycle" use the entropy weighting method to give corresponding weights, and the two-level indexes of economic "inner cycle" and "outer cycle" use the subjective assignment method to determine the weights, and calculate the comprehensive index of economic development and the comprehensive index of ecological environment. Specifically, the three-level indicators of ecological environment, economic "inner cycle" and economic "double cycle" are given corresponding weights by entropy weighting method, and the second-level indicators of economic "inner cycle" and "outer cycle" are given weights by subjective weighting method, and then the composite index of economic development and the composite index of ecological environment are calculated, and the results of the composite index are shown in Table 3.

According to the results of the ecological environment and economic development composite index of the nine provinces and regions in the Yellow River Basin, it can be found that the ecological environment composite index and economic development composite index show an overall increasing trend during the period of 2011-2022, with slight fluctuations individually. From the perspective of the upstream region, the ecological environment composite index of the four provinces and regions of Qinghai, Sichuan, Gansu and Ningxia show an overall upward trend, respectively, from 0.365, 0.413, 0.196, 0.150 in 2011 to 0.427, 0.493, 0.251, 0.164 in 2020, with the growth rate of 16.99%, 19.37%, 28.06%, respectively, 9.33%; the economic development index of the four provinces and districts in the upstream region have become an upward trend, with varying changes in the rate of increase, respectively, from 0.131, 0.120, 0.151, 0.189 in 2011 to 0.184, 0.284, 0.170, 0.209 in 2020, with a growth rate of 40.46%, 136.67%, and 12.58%, respectively, 10.58%. From the midstream region, the ecological environment composite index of Inner Mongolia, Shaanxi and Shanxi provinces and regions shows a rising and then declining trend, changing from 0.412, 0.312 and 0.191 in 2011 to 0.447, 0.299 and 0.218 in 2020, with a rate of change of 8.50%, -4.17% and 14.14%, respectively; the composite index of economic development of the midstream region Generally showing an upward trend, respectively, from 0.175, 0.152, 0.170 in 2011 to 0.283, 0.304, 0.217 in 2020, an increase of 61.71%, 100.00%, 27.65%. From the downstream region, the ecological environment composite index of Henan and Shandong provinces is in a fluctuating state, but

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overall shows an upward trend, respectively, from 0.160 and 0.161 in 2011 to 0.195 and 0.172 in 2020, with a growth rate of 21.88% and 6.83%; the economic development composite index of the two downstream provinces shows a continuous upward trend, respectively, from 0.121 and 0.164 in 2011 to 0.164 in 2020, with an increase of 61.71%, 100.00%, and 27.65%, respectively. 0.121 and 0.166 in 2011 to 0.193 and 0.242 in 2020, with growth rates of 59.50% and 45.78% respectively.

Table 3. Measurement Results of the Comprehensive Index of Ecological Environment and Economic Development of Provinces in the Yellow River Basin

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Economic Development	QH	0.13	0.13	0.14	0.14	0.15	0.16	0.17	0.18	0.19	0.18
	SC	0.12	0.13	0.14	0.15	0.20	0.20	0.23	0.25	0.27	0.28
	GS	0.15	0.16	0.17	0.17	0.17	0.16	0.16	0.17	0.17	0.17
	NX	0.19	0.20	0.21	0.21	0.20	0.21	0.23	0.24	0.24	0.21
	NMG	0.18	0.18	0.17	0.17	0.19	0.21	0.24	0.27	0.29	0.28
	SAX	0.15	0.24	0.25	0.29	0.29	0.30	0.34	0.37	0.36	0.30
	SX	0.17	0.17	0.17	0.17	0.17	0.17	0.20	0.21	0.23	0.22
	HN	0.12	0.13	0.13	0.14	0.14	0.15	0.16	0.17	0.18	0.19
	SD	0.17	0.17	0.18	0.19	0.19	0.20	0.20	0.22	0.23	0.24
Ecological Environment	QH	0.37	0.40	0.33	0.37	0.31	0.33	0.37	0.42	0.41	0.43
	SC	0.41	0.41	0.41	0.44	0.46	0.49	0.51	0.49	0.48	0.49
	GS	0.20	0.20	0.20	0.21	0.21	0.23	0.24	0.25	0.25	0.25
	NX	0.15	0.21	0.17	0.17	0.16	0.18	0.16	0.17	0.17	0.16
	NMG	0.41	0.42	0.49	0.44	0.44	0.43	0.45	0.45	0.45	0.45
	SAX	0.31	0.30	0.30	0.31	0.42	0.30	0.32	0.32	0.33	0.30
	SX	0.19	0.19	0.21	0.21	0.20	0.22	0.24	0.23	0.23	0.22
	HN	0.16	0.17	0.18	0.20	0.18	0.22	0.22	0.21	0.21	0.20
	SD	0.16	0.16	0.18	0.22	0.18	0.21	0.21	0.18	0.20	0.17

3.2. Calculation of the Degree of Coupling Coordination

The coupling coordination degree between the two is derived from the coupling coordination degree model, and the specific calculation results of the coupling coordination degree are shown in Table 4.

According to the results of the coupling coordination degree measurement, it can be found that the coupling coordination degree of the nine provinces and regions in the Yellow River Basin from 2011 to 2020 is concentrated in the range of 0.4 to 0.6, and the degree of coordination is in the range of moderate functionality and primary coordination.During the period of 2011 to 2020, the coupling coordination degree of the nine provinces and regions in the Yellow River Basin shows an upward trend, but the increase rate is slightly smaller. From the upstream area, the coupling coordination degree of Qinghai, Sichuan, Gansu and Ningxia fluctuates, among which Qinghai and Sichuan change a lot, with Qinghai changing from moderate dissonance to near dissonance, Sichuan changing from moderate dissonance to primary coordination, and Gansu and Ningxia remaining in the stage of moderate dissonance. From the midstream region, the coupling coordination degree of Inner Mongolia, Shaanxi and Shanxi provinces and regions have different changes, among which, the coupling coordination degree of Inner Mongolia shows a trend of increasing and then decreasing, but in general shows an increasing trend, and its rank changes from near-disorder to primary coordination and then to near-disorder; the coupling coordination degree of Shaanxi has a larger change than the remaining two provinces, and its rank changes from moderate disorders to near-disorders; the coupling coordination

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degree of Shanxi has a smaller change, and its rank changes from moderate disorders to near-disorders; and the coupling coordination degree of Shanxi has a smaller change, and its rank changes from moderate disorders to primary coordination; and the coupling coordination degree of Sichuan has been in the moderate disorders stage. coordination degree changes are smaller, and its rank has been in the state of moderate dissonance. In terms of downstream regions, the coupling coordination degrees of Henan and Shandong both show an upward trend, with Henan's rank changing from severely dysfunctional to moderately dysfunctional, and Shandong's rank remaining in a state of intermediate dysfunction.

Table 4. Degree of coupling and harmonization of ecological environment and economic development of provinces in the Yellow River Basin, 2011-2020

		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
QH	C	0.881	0.861	0.914	0.900	0.945	0.945	0.930	0.919	0.926	0.918
	T	0.248	0.268	0.235	0.260	0.234	0.249	0.273	0.302	0.298	0.306
	D	0.467	0.480	0.464	0.484	0.470	0.485	0.504	0.527	0.526	0.530
	H	moderate disorder						on the verge of becoming dysfunctional			
SC	C	0.835	0.862	0.875	0.869	0.919	0.909	0.926	0.946	0.958	0.963
	T	0.267	0.271	0.277	0.292	0.331	0.347	0.368	0.372	0.373	0.389
	D	0.472	0.483	0.492	0.504	0.552	0.561	0.584	0.593	0.598	0.612
	H	moderate disorder			on the verge of becoming dysfunctional						
GS	C	0.991	0.993	0.996	0.996	0.994	0.987	0.983	0.982	0.985	0.981
	T	0.174	0.182	0.184	0.189	0.189	0.195	0.200	0.211	0.211	0.210
	D	0.415	0.425	0.428	0.434	0.434	0.439	0.444	0.455	0.455	0.454
	H	moderate disorder									
NX	C	0.993	1.000	0.995	0.996	0.994	0.997	0.987	0.985	0.981	0.993
	T	0.170	0.202	0.186	0.190	0.181	0.192	0.195	0.200	0.204	0.187
	D	0.410	0.450	0.430	0.436	0.424	0.437	0.439	0.444	0.448	0.430
	H	moderate disorder									
NMG	C	0.915	0.916	0.876	0.901	0.923	0.940	0.952	0.968	0.976	0.975
	T	0.294	0.299	0.327	0.307	0.315	0.319	0.344	0.356	0.372	0.365
	D	0.518	0.523	0.535	0.526	0.539	0.548	0.572	0.587	0.603	0.596
	H	on the verge of becoming dysfunctional									
SAX	C	0.939	0.995	0.997	1.000	0.982	1.000	0.999	0.997	0.999	1.000
	T	0.232	0.272	0.274	0.300	0.355	0.301	0.330	0.343	0.342	0.301
	D	0.467	0.521	0.523	0.547	0.590	0.549	0.574	0.584	0.585	0.549
	H		on the verge of becoming dysfunctional								
SX	C	0.998	0.998	0.994	0.996	0.996	0.994	0.996	0.999	1.000	1.000
	T	0.181	0.183	0.192	0.189	0.188	0.195	0.218	0.222	0.231	0.218
	D	0.425	0.428	0.437	0.434	0.433	0.440	0.466	0.471	0.481	0.467
	H	moderate disorder									
HN	C	0.990	0.989	0.988	0.983	0.993	0.982	0.987	0.996	0.997	1.000
	T	0.140	0.149	0.155	0.171	0.163	0.185	0.190	0.190	0.197	0.194
	D	0.373	0.384	0.392	0.410	0.403	0.426	0.432	0.435	0.443	0.441
	H	severe disorder			moderate disorder						
SD	C	1.000	1.000	1.000	0.996	1.000	0.999	1.000	0.994	0.996	0.986
	T	0.164	0.168	0.179	0.204	0.186	0.204	0.205	0.198	0.213	0.207
	D	0.405	0.410	0.423	0.450	0.432	0.451	0.453	0.443	0.461	0.451
	H	moderate disorder									

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4. Conclusion

In this paper, from the perspective of new development pattern, we construct the index system of economic "inner cycle" and "outer cycle" of the nine provinces and regions in the Yellow River Basin, and from the perspective of DPSIR, we construct the index system of ecological environment of the nine provinces and regions in the Yellow River Basin, and we utilize the objective assignment method and the subjective assignment method to calculate the comprehensive index of ecological environment and the comprehensive index of economic development of the nine provinces and regions of the Yellow River Basin, respectively. The objective and subjective weighting methods are utilized to calculate the ecological environment index and economic development index of the nine provinces and regions in the Yellow River Basin respectively, and the coupling coordination model is used to calculate the coupling coordination of the two, and the following conclusions are finally drawn.

According to the results of the ecological environment and economic development index of the nine provinces and regions in the Yellow River Basin, it can be found that the ecological environment index of the nine provinces and regions in the Yellow River Basin is on an upward trend in general, and the individual provinces, such as Shaanxi Province, are on a downward trend, which indicates that the ecological environment of the Yellow River Basin is trending upward as a whole, and the decrease of the individual provinces is probably due to the fact that the industrial transformation of Shaanxi Province is still more difficult, and the industrial solid and wastewater emissions are high while the comprehensive utilization rate is low. The nine provinces and regions of the Yellow River Basin economic development index are showing a rising trend, and the fluctuation of individual provinces is larger, which is due to the fact that China is in the process of expanding the level of economic demand and opening up to the outside world, so as to make the domestic and international double-cycle, and to realize the smooth operation of economic development. Although both of them show an upward trend overall, the combined index of ecological environment and economic development ranges from 0.1 to 0.4, and the level of the combined index is still at a relatively low level, so the level of ecological environment and economic development of the nine provinces and regions in the Yellow River Basin still need to be strengthened.

According to the results of the coupling coordination degree measurement of ecological environment and economic development in the nine provinces and regions of the Yellow River Basin, it can be seen that the coupling coordination degree of ecological environment and economic development in the nine provinces and regions of the Yellow River Basin shows an increasing trend in general, with the coupling coordination degree concentrating in the range of 0.4-0.6, and the coupling coordination grade is in the range of moderate dysfunctions to primary coordination, which suggests that the synergistic nature of the ecological environment and economic development of the nine provinces and regions of the Yellow River Basin is still at a relatively low level . This is due to the fact that the upper and middle reaches of the Yellow River Basin are still dominated by primary and secondary industries, mainly heavy industry, slow development of the real economy, low level of opening up to the outside world, and difficulty in realizing the transformation of the economy and industry, and at the same time, the ecological environment of the upper and middle reaches of the region is fragile, and the development of the heavy industry economy will inevitably lead to the deterioration of the ecological environment. And the lower reaches of the Yellow River Basin rapid economic development, the coastal provinces open to the outside world at a higher level, but due to the upper and middle reaches of the ecological environment of the governance effect of the lower reaches of the region need to pay a great price to improve the ecological environment, which is also a major factor in pulling down the development of the economy. Therefore, in order to realize the high coupling and high coordination of ecological environment and economic

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development of the nine provinces and regions in the Yellow River Basin, it is necessary to accelerate the transformation of economic development of the upstream and midstream regions, improve the ecological environment while economic growth, and the downstream regions should accelerate the technological innovation, strengthen the green ecological and healthy development, and realize the upstream and downstream mutual aid in the economy, and improve the ecology.

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