

# Dynamic Comparative Evaluation Study of Governance Efficiency in the Beijing-Tianjin-Hebei Region

Dan Wu<sup>1</sup> Zhuling Pan<sup>2</sup>

<sup>1,2</sup> School of Economics and Management, North China University of Technology, Beijing 100144, China

<sup>1</sup> Corresponding author.

## ABSTRACT

This paper dynamically compares and evaluates the differences in governance in the Beijing-Tianjin-Hebei region during different periods, and analyzes the main factors that affect the governance efficiency there, which can play an important supporting role in improving the governance efficiency of the Beijing-Tianjin-Hebei region and accelerating the coordinated development process there. The study is based on the overall situation of the national economy and social development in the Beijing-Tianjin-Hebei region. From multiple perspectives such as technology, economy, society, and ecology, it clarifies the governance goal system of the Beijing-Tianjin-Hebei region and systematically designs the governance efficiency evaluation index system there. It also adopts the weighted comprehensive index method to construct a dynamic comparative evaluation method for governance efficiency in the Beijing-Tianjin-Hebei region, so as to compare and evaluate the governance efficiency there in different periods. Research shows that the governance efficiency of the Beijing-Tianjin-Hebei region is showing a sustained growth trend, with Hebei, Beijing, and Tianjin ranking in order of improvement speed. Among them, the technology dimension has the fastest growth, while the ecology dimension has the slowest growth. This evaluation method evaluates the governance practices in the Beijing-Tianjin-Hebei region from a comprehensive perspective, making up for the shortcomings of existing results from a single perspective analysis. Empirical research also further verifies the effectiveness of this method.

**Keywords:** *Beijing-Tianjin-Hebei region, Governance, Effectiveness, Dimension, Evaluation.*

## 1. INTRODUCTION

The Beijing-Tianjin-Hebei region accounts for 2.3% of the country's land area and supports 8% of the country's population, creating nearly 11% of the country's total economic output, being an important engine for promoting China's national economy and social development. The successive issuance of policy documents such as the "Outline of the Beijing-Tianjin-Hebei Coordinated Development Plan" and the "'13th Five-Year Plan' for the National Economic and Social Development of Beijing-Tianjin-Hebei" has established the significant national strategic position of Beijing-Tianjin-Hebei coordinated development, and clarified key development tasks such as innovative development, transformation and upgrading, as well as green development. At the same time, national ministries and commissions have formulated a series of special plans for technology,

industry, ecological environmental protection, transportation, education, etc., vigorously promoting innovation-driven development in the Beijing-Tianjin-Hebei region, enhancing its resource and energy security capabilities, and continuously narrowing the imbalance in development in the Beijing-Tianjin-Hebei region. These policy systems provide important policy support for strengthening the governance efficiency of the Beijing-Tianjin-Hebei region and accelerating the coordinated development there. In the context of the implementation of the Beijing-Tianjin-Hebei coordinated development strategy, based on the specific regional factors there, constructing a relatively complete governance efficiency evaluation system that is suitable for the economic and social development goals of the Beijing-Tianjin-Hebei region is conducive to providing theoretical guidance

and decision-making support for the practice of Beijing-Tianjin-Hebei coordinated development.

## 2. LITERATURE REVIEW

Regional governance emerged in Western countries in the 1940s and 1950s. Regional governance evaluation is an important tool for promoting the modernization of national governance systems and governance capabilities. The governance evaluation methods developed by international organizations and developed countries mainly include the World Bank's "Worldwide Governance Indicators"[1], the "Good Governance Indicators" and "Human Rights and Democratic Governance Indicators"[2] of the United Nations Development Program and the United Nations Oslo Governance Center, the "National Governance Assessment Indicators" and "Democracy and Governance Assessment Framework"[3][4] of the United Kingdom and the United States Agency for International Development, and the "Corruption Perceptions Index"[5] of Transparency International. Drawing on the governance evaluation methods developed by international organizations and developed countries, as well as the governance capacity evaluation practices[6] of developed countries such as the United States, the United States, and Japan, Chinese scholar Yu Keping[7] was the first to propose a national governance evaluation framework that is suitable for China's national conditions. Based on this, scholars have conducted in-depth research on regional governance practices in China, focusing on the perspectives of governance subjects, governance processes, and governance outcomes, based on the national and regional conditions of China, and have formed a batch of representative achievements. These achievements include economic and social governance evaluation methods such as local government economic governance capacity evaluation[8] and social governance level evaluation[9], as well as regional governance evaluation frameworks[10-14] that include dimensions such as financial capacity, infrastructure, education and culture, employment security, healthcare, and ecological environment, in order to continuously improve China's regional governance evaluation system.

Since the establishment and implementation of the Beijing-Tianjin-Hebei coordinated development strategy, the government management departments and academic circles of the Beijing-Tianjin-Hebei region have conducted a large number of empirical studies on governance in the Beijing-Tianjin-Hebei

region. The first is to explore the challenges and implementation mechanisms faced by governance in the Beijing-Tianjin-Hebei region. By reviewing the process and stage characteristics of economic and social development in the Beijing-Tianjin-Hebei region[15][16], it is clear that the obstacles to coordinated development there lie in the large gap in development levels among the three regions and the imperfect policies and laws[17]. It is proposed to strengthen Beijing's core leading role and urban disease control, accelerate the upgrading of industrial structure in the Tianjin-Hebei region, and undertake non-capital functions[18][19]. The second is to study countermeasures and suggestions for governance in the Beijing-Tianjin-Hebei region from different perspectives such as industry and ecology. This mainly includes clarifying the problems and countermeasures for the coordinated development of industries in the Beijing-Tianjin-Hebei region[20], proposing important measures such as driving population transfer through industrial dispersion, optimizing the allocation of human resources in the Beijing-Tianjin-Hebei region[21], exploring the energy synergy strategy to strengthen energy consumption control in the Beijing-Tianjin-Hebei region, analyzing the ecological pollution and compensation mechanisms faced by the Beijing-Tianjin-Hebei region, formulating the Beijing-Tianjin-Hebei ecological synergy development plan[22][23], and conducting collaborative strategic research in the fields of technology, education, transportation, and other fields in the Beijing-Tianjin-Hebei region[24][25].

The third is to conduct research on governance evaluation in the Beijing-Tianjin-Hebei region. Scholars have explored methods for evaluating the governance in the Beijing-Tianjin-Hebei region by drawing on international practical experiences such as the evaluation of the current situation of governance in Northeast Asia[26], the importance of information technology in governance in the South Pacific region[27] [28], the evaluation of technology spillover effects in urban area governance in Sweden[29], and the evaluation of cluster effects in regional governance in Romania[30] and so on. On the one hand, existing research focuses on designing and integrating evaluation index from dimensions such as economic and industrial development, technological innovation capabilities, social support, and ecological environment construction. On the other hand, existing research has established a coupling evaluation model based on principal component analysis, coordination degree method, entropy weight method, technique for order

preference by similarity to ideal solution, etc., to evaluate the change rules and spatiotemporal evolution characteristics of the coupling and coordinated development relationship among scientific and technological innovation, economic and industrial development, and ecological environment construction in the Beijing-Tianjin-Hebei region[31-39]. Among them, the evaluation of scientific and technological innovation highlights the knowledge creation and acquisition ability, technological innovation and application ability, innovation collaborative allocation ability, innovation environment support ability, and innovation economic spillover ability of the Beijing-Tianjin-Hebei region from the aspects of scientific and technological resource stock, output, and technological output performance. The evaluation of economic and industrial development focuses on extracting key elements that promote the development of the ecological industry system in the Beijing-Tianjin-Hebei region from aspects such as economic scale, efficiency, structure, and environment. The evaluation of ecological environment construction reflects the resource and energy security capacity of the Beijing-Tianjin-Hebei region from aspects such as ecological nature, ecological economy, and ecological society[35][36][38][39].

In summary, the fundamental driving force for governance in the Beijing-Tianjin-Hebei region lies in innovation, and its overall content and key support lie in accelerating the transformation and upgrading of economic industries. Ecological environment construction provides important guarantees for promoting the coordinated development of the Beijing-Tianjin-Hebei region. The key to solving the governance difficulties in the Beijing-Tianjin-Hebei region is to build a relatively complete governance efficiency evaluation system that is suitable for the economic and social development goals of the Beijing-Tianjin-Hebei region to provide theoretical guidance and decision-making support for the practice of Beijing-Tianjin-Hebei coordinated development. Based on existing research literature, it has been found that there are 2 main shortcomings in the evaluation of governance efficiency in the Beijing-Tianjin-Hebei region. Firstly, scholars have not yet established a unified standard dimension for the design of the governance evaluation index system in the Beijing-Tianjin-Hebei region, and tend to construct corresponding evaluation indexes from a single dimension perspective such as technological innovation, economic industry, and ecological environment. Few scholars have incorporated

technology, economy, society, and ecology into a unified framework system, and established a more comprehensive governance efficiency evaluation system from a comprehensive perspective that is compatible with the development goals of the Beijing-Tianjin-Hebei region. Secondly, existing evaluation methods emphasize the static evaluation of governance efficiency in different dimensions of the Beijing-Tianjin-Hebei region in specific years, lacking dynamic comparative analysis of governance efficiency in different dimensions there in different periods.

Therefore, this study, from multiple perspectives such as technology, economy, society, and ecology, clarifies the governance goal system of the Beijing-Tianjin-Hebei region and systematically designs the governance efficiency evaluation index there. And it also uses the coefficient of variation method to determine the weight of indexes. At the same time, it adopts the weighted comprehensive index method to construct a corresponding dynamic evaluation model as the main method for evaluating the governance efficiency of the Beijing-Tianjin-Hebei region, dynamically comparing and evaluating the governance efficiency there in different periods, exploring the key constraints of governance efficiency there, and exploring countermeasures and suggestions to improve governance efficiency there according to local conditions, in order to guide the practice of coordinated development there .

### **3. CONSTRUCTION OF RESEARCH METHODS**

The setting of governance evaluation indexes in the Beijing-Tianjin-Hebei region depends on the governance target system and determines the core elements of governance there. Based on the overall economic and social development of the Beijing-Tianjin-Hebei region, the governance goals of the Beijing-Tianjin-Hebei region include multidimensional governance goals such as technology, economy, society, and ecology. Among them, the goal of scientific and technological governance is to enhance the ability of scientific and technological innovation, covering 4 criteria of scientific and technological innovation investment, scientific and technological innovation environment, scientific and technological innovation output, and scientific and technological innovation effectiveness. The goal of economic governance is to improve the quality and efficiency of economic growth, covering 3 criteria of economic development scale, industrial structure upgrading, and economic development

quality. The goal of social governance is to improve the level of public services, covering 6 criteria of livelihood security, education governance, medical improvement, insurance scale, transportation scale, and post and telecommunications scale. The goal of ecological governance is to enhance the capacity for resource and environmental protection, covering 3 criteria of resource consumption, ecological protection, and environmental governance.

Based on the governance goal system of the Beijing-Tianjin-Hebei region, this study adopts the policy literature review method to systematically review policy documents such as the "Outline of the Beijing-Tianjin-Hebei Coordinated Development Plan" and the "'13th Five-Year Plan' for the National Economic and Social Development of Beijing-Tianjin-Hebei", as well as core journal literature with the theme of "Beijing-Tianjin-Hebei governance". Based on multi-dimensional perspectives such as technology, economy, society, and ecology, it determines the initial indexes for evaluating governance efficiency in the Beijing-Tianjin-Hebei region from 2 aspects: policy orientation and literature reference. And it obtains initial index data for the years 2009 to 2018 from the "National Statistical Yearbook" and the "Economic Statistical Yearbook" of the Beijing-Tianjin-Hebei region. It uses principal component analysis-correlation analysis to quantitatively screen the initial indexes and ultimately determine the evaluation indexes for governance efficiency in the Beijing-Tianjin-Hebei region. That is, through KMO and Bartlett tests, researchers select indexes with the first principal component factor load greater than 0.9 and the absolute value of the second or third principal component factor load being the highest. Researchers then calculate the correlation coefficients between any two indexes in different dimensions in the Beijing-Tianjin-Hebei region, and set a threshold  $M$  ( $0 < M < 1$ ) for the correlation coefficient of the indexes. In this paper, the threshold  $M$  is 0.9. If the correlation coefficient between two indexes in a single dimension is less than the threshold  $M$ , then both indexes are retained simultaneously; if the correlation coefficient between two indexes in a single dimension is greater than the threshold  $M$ , the index with a small absolute value of factor load (i.e. the index with a small impact on the evaluation result) will be deleted from the two indexes.

The evaluation index system for governance efficiency in the Beijing-Tianjin-Hebei region is divided into 4 layers of dimension layer, goal layer, criterion layer, and index layer, which include 4

dimensions and goals, 16 criteria, and 28 indexes, as shown in "Table 1".

Table 1. Evaluation indexes for governance efficiency in the Beijing-Tianjin-Hebei region

Dimension layer	Goal layer	Criterion layer	Index layer	Index unit	Index weight		
Technology		Technological innovation investment	R&D personnel	People	0.136		
		Enhance technological innovation capability	Technological innovation environment	Local fiscal expenditure on technology	100 million yuan	0.163	
			Technological innovation output	Number of Chinese patent applications accepted	Piece	0.172	
			Technological innovation achievement	Technology market turnover	100 million yuan	0.210	
				Patent ownership per 10,000 people	Piece/10,000 people	0.176	
				Sales revenue of new products in high-tech industries	100 million yuan	0.143	
Economy	Improve the quality and efficiency of economic growth	Economic development scale	GDP growth rate	%	0.208		
				Total retail sales of social consumer goods	100 million yuan	0.268	
				Industrial output	100 million yuan	0.260	
		Upgrading of industrial structure	The proportion of tertiary industry output value to GDP	%	0.104		
		Quality of economic development	Total labor productivity	Yuan/person	0.160		
Society	Improve the level of public services	Livelihood security	Urban registered unemployment rate	%	0.062		
				Year-end balance of RMB savings deposits for urban and rural residents	100 million yuan	0.134	
		Education governance		Enrollment number of ordinary higher education institutions	10,000 people	0.121	
				Student-teacher ratio in ordinary universities	-	0.008	
				Local fiscal expenditure on education	100 million yuan	0.134	
				Medical improvement	Number of beds in medical and health institutions	10,000 beds	0.140
				Insurance scale	Number of participants in basic medical insurance for urban employees at the end of the year	10,000 people	0.120
					Traffic scale	Length of railroad lines in service	10,000 kilometers
				Post and telecommunications scale	Year-end mobile phone users	10,000 households	0.134
					Ecology	Resource consumption	Energy consumption
Ecological protection	Forest cover rate	%	0.064				
		Forest stock	100 million cubic meters	0.140			
		Local fiscal expenditure on environmental protection	100 million yuan	0.149			
		Wastewater discharge amount	10,000 tons	0.106			
Environmental governance		Chemical oxygen demand emissions	10,000 tons	0.150			
			Sulfur dioxide emissions	Ton	0.143		
			Ammonia nitrogen emissions	10,000 tons	0.132		

In "Table 1", the weights of indexes in different dimensions are determined using the coefficient of variation method, which can be expressed as:

$$\left\{ \begin{aligned} w_{ki} &= \frac{V_{ki}}{\sum_{i=1}^m V_{ki}} \\ V_{ki} &= \frac{\sigma_{ki}}{\frac{1}{n} \sum_{i=1}^n x_{ki}} \end{aligned} \right. \quad (1)$$

In equation (1),  $w_{ki}$  is the weight of the  $i$ -th index in the  $k$ -th dimension ( $k=1, k=2, k=3, k=4$  represent the four dimensions of technology, economy, society, and ecology, respectively).  $V_{ki}$  is the coefficient of variation of the  $i$ -th index in the  $k$ -th dimension.  $\sum_{i=1}^m V_{ki}$  is the sum of the coefficient of variation for each index in the  $k$ -th dimension,  $\sigma_{ki}$  is the standard deviation for the  $i$ -th index in the  $k$ -th dimension, and  $\frac{1}{n} \sum_{i=1}^n x_{ki}$  is the mean of the  $i$ -th index in the  $k$ -th dimension.

Based on the designed governance efficiency evaluation indexes for the Beijing-Tianjin-Hebei region, the researchers use the weighted comprehensive index method to determine the governance efficiency of different dimensions in the Beijing-Tianjin-Hebei region, which can be expressed as:

$$Z_{jk}(t) = \sum_{i=1}^m [w_{ki} \cdot x_{jki}(t)]$$

$$x_{jki}(t) = \begin{cases} \frac{a_{jki}(t)}{\max a_{jki}(t)} & a_{jki} \text{ is the benefit index} \\ \frac{\min a_{jki}(t)}{a_{jki}(t)} & a_{jki} \text{ is the cost index} \end{cases} \quad (2)$$

In equation (2),  $Z_{jk}(t)$  represents the governance efficiency of the  $k$ -th dimension in region  $j$  of period  $t$  ( $j=1, j=2, j=3, \text{ and } j=4$  represent Beijing, Tianjin, Hebei, and Beijing-Tianjin-Hebei as a whole);  $x_{jki}(t)$  is the dimensionless value of the  $i$ -th index in the  $k$ -th dimension of the  $j$ -th region in the  $t$ -th period.  $a_{jki}(t)$  is the  $i$ -th index value of the  $k$ -th dimension in region  $j$  of period  $t$ .  $\max a_{jki}(t)$  and  $\min a_{jki}(t)$  represent the optimal and worst values of the  $i$ -th index in the  $k$ -th dimension of the  $j$ -th region in the  $t$ -th period, respectively.

#### 4. EMPIRICAL RESEARCH

According to "Table 1" and equation (2), researchers use the weighted comprehensive index method to measure the governance efficiency of different dimensions in the Beijing-Tianjin-Hebei region from 2009 to 2018, as shown in "Figure 1".

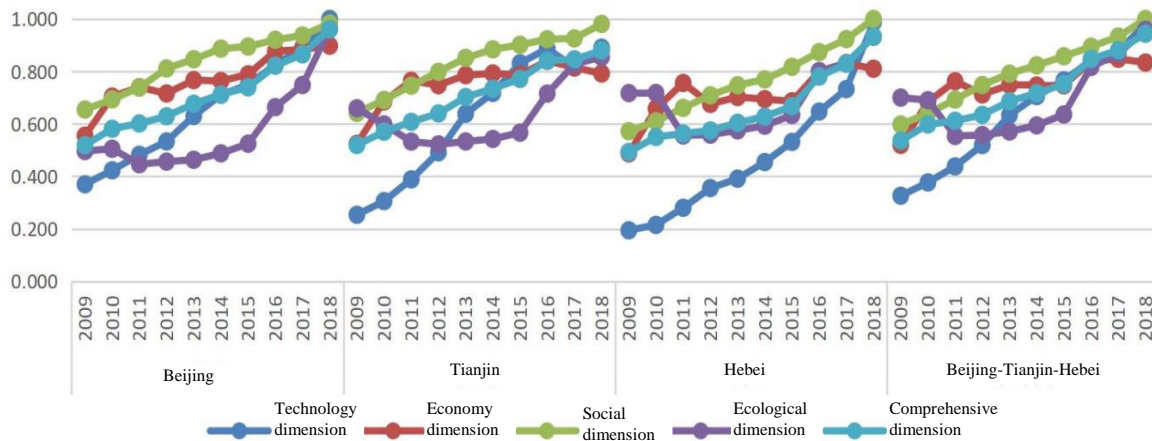


Figure 1 Governance efficiency in the Beijing-Tianjin-Hebei region from a multidimensional perspective from 2009 to 2018.

According to "Figure 1", from 2009 to 2018, with the continuous improvement of technological innovation capacity, acceleration of economic and

industrial transformation and upgrading, gradual improvement of social security system, and continuous improvement of ecological environment

in the Beijing-Tianjin-Hebei region, the governance efficiency indexes of the Beijing-Tianjin-Hebei region showed a continuous growth trend, and the overall governance efficiency indexes there had an average annual growth rate of 6.5%. Hebei had the fastest growth rate, followed by Beijing and Tianjin, with an average annual growth rate of 7.3%, 7.1%, and 6.0% respectively (see "Figure 2"). Among them, from 2009 to 2013, Tianjin had the fastest growth rate and Hebei had the slowest growth rate, with an average annual growth rate of 7.8% and 5.2%,

respectively. From 2014 to 2018, Hebei had the fastest growth rate and Tianjin had the slowest growth rate, with an average annual growth rate of 10.4% and 4.6%, respectively. Compared with the period from 2009 to 2013, the governance efficiency indexes of the Beijing-Tianjin-Hebei region further improved from 2014 to 2018. The overall average annual growth rate of Beijing, Hebei, and Beijing-Tianjin-Hebei all increased, while the average annual growth rate of Tianjin decreased.

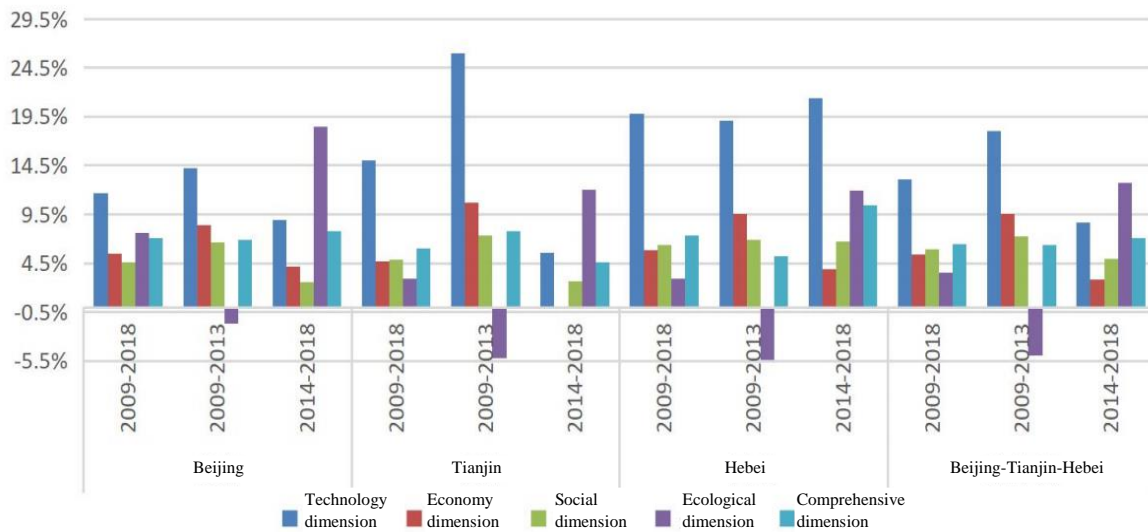


Figure 2 Average annual growth rate of governance efficiency indexes in the Beijing-Tianjin-Hebei region from 2009 to 2018.

From 2009 to 2018, the governance efficiency of technology, economy, and society in the Beijing-Tianjin-Hebei region showed a slight fluctuation and growth trend. However, the ecological dimension of the Beijing-Tianjin-Hebei region was affected by key indexes such as energy consumption, total wastewater discharge, chemical oxygen demand emissions, sulfur dioxide emissions, and ammonia nitrogen emissions, resulting in a "first decline, then growth" trend in its governance efficiency. From the changes in the average annual growth rate of governance efficiency in various dimensions (see "Figure 2"), the technology dimension in the Beijing-Tianjin-Hebei region had the fastest growth, while the ecological dimension had the slowest growth. Among them, the average annual growth rate of the overall technology dimension in Beijing, Tianjin, Hebei, and Beijing-Tianjin-Hebei was 11.7%, 15.0%, 19.8%, and 13.0%, respectively, and the corresponding ecological dimension had an average annual growth rate of 7.6%, 2.9%, 3.0%, and 3.6%, respectively. Through a comparative analysis of

governance efficiency of 4 dimensions in the Beijing-Tianjin-Hebei region, Hebei had the fastest growth rate in terms of technology, economy, and society, with an average annual growth rate of 19.8%, 5.8%, and 6.4%, respectively. From an ecological perspective alone, Beijing had the fastest growth rate, with an average annual growth rate of 7.6%.

From 2014 to 2018, compared with 2009 to 2013, the governance efficiency of the 4 dimensions in the Beijing-Tianjin-Hebei region was further improved, but the average annual growth rate of the 3 dimensions of technology, economy, and society decreased (only the average annual growth rate of technology dimension of Hebei increased), while the average annual growth rate of the ecological dimension increased and "changed from negative to positive". From 2009 to 2013, the Beijing-Tianjin-Hebei region showed the fastest growth in the technology dimension. From 2014 to 2018, the Beijing-Tianjin-Hebei region showed the fastest growth in the ecological dimension (only Hebei's

technological dimension exceeded the growth rate of the ecological dimension).

## 5. CONCLUSION

Based on relevant literature research and empirical exploration, as well as the overall situation of the national economy and social development in the Beijing-Tianjin-Hebei region, and from multiple perspectives such as technology, economy, society, and ecology, this study clarifies the governance goal system of the Beijing-Tianjin-Hebei region and systematically designs the governance efficiency evaluation index system there. This evaluation index system effectively overcomes scholars' analysis of the governance situation in the Beijing-Tianjin-Hebei region from a single dimension perspective, and reflects the governance efficiency of the Beijing-Tianjin-Hebei region more comprehensively from a comprehensive perspective. On this basis, researchers use the weighted comprehensive index method to construct an evaluation method for governance efficiency in the Beijing-Tianjin-Hebei region. This method effectively overcomes the evaluation of different dimensions of governance efficiency in the Beijing-Tianjin-Hebei region in a specific year from a static perspective, reflects the dynamic trend of governance efficiency in the Beijing-Tianjin-Hebei region in different periods, and better grasps the comprehensive problems existing in governance in the Beijing-Tianjin-Hebei region.

The evaluation results show that from 2009 to 2018, the governance efficiency of the 4 dimensions in the Beijing-Tianjin-Hebei region improved to varying degrees, with the fastest growth in the technology dimension and the slowest growth in the ecological dimension. Regarding the 3 dimensions of technology, economy, and society, Hebei had the fastest growth rate, and only in the ecological dimension, Beijing had the fastest growth rate. Since the implementation of coordinated development practices in the Beijing-Tianjin-Hebei region, the governance efficiency of the Beijing-Tianjin-Hebei region has been relatively significant. Compared with 2009 to 2013, the governance efficiency of the Beijing-Tianjin-Hebei region showed the fastest growth in the ecological dimension from 2014 to 2018 (only the growth rate in the technological dimension of Hebei exceeded the growth rate in the ecological dimension). Research has shown that in order to improve the governance efficiency of the Beijing-Tianjin-Hebei region and accelerate the practice of coordinated development of Beijing-Tianjin-Hebei, the key is to improve the weak links,

that is, to accelerate the implementation of the innovation-driven development strategy in the Beijing-Tianjin-Hebei region, to enhance the scientific and technological support capacity of the Beijing-Tianjin-Hebei region, and to increase the intensity of ecological governance in the Beijing-Tianjin-Hebei region.

## ACKNOWLEDGMENTS

Fund projects: Humanities and Social Sciences Research Youth Fund Project of the Ministry of Education (21YJCZH176); Supported By the Beijing Urban Governance Research Base of North China University of Technology (2023CSZL01); North China University of Technology National-level Project Supporting Special Project (110051360023XN217).

CLC number: C939; F127.

## REFERENCES

- [1] Kaufmann D, Mastruzzi A K M. The Worldwide Governance Indicators: Methodology and Analytical Issues [J]. *Hague Journal on the Rule of Law*, 2011, 3(2):220-246.
- [2] UNDP. *Concepts of Governance and Sustainable Human Development*, 1996.
- [3] Institute O D. *Governance assessment: overview of governance assessment frameworks and results from the 2006 World Governance Assessment*[R]. Overseas Development Institute, 2007: 1-22.
- [4] Hirschmann D. *Thermometer or sauna?: Performance measurement and democratic assistance in the United States Agency for International Development(USAID)*[J]. *Public Administration*, 2002, 80(2):235-255.
- [5] Maria W D. *Measurements and markets: Deconstructing the corruption perception index* [J]. *International Journal of Public Sector Management*, 2008, 21(7):777-797.
- [6] Zhou Wei, Lian Lei. *Local governance capability evaluation: Britain, American and Japan's practice and enlightenment* [J]. *Journal of Anhui Polytechnic University*, 2015, 30 (3): 18-22. (in Chinese)
- [7] Yu Keping. *China Governance Assessment Framework* [J]. *Comparative Economic & Social Systems*, 2008 (6): 1-9. (in Chinese)



- [8] Li Hua, Wang Yin, Sun Qiubai. Evaluation of Local Government Economic Governance Capability: An Empirical Study Based on Liaoning Province [J]. *Statistics & Decision*, 2019 (10): 94-97. (in Chinese)
- [9] Nan Rui, Wang Dahai. An Empirical Study on the Evaluation of Provincial Social Governance Level Based on the TOPSIS Model [J]. *Journal of Northeastern University (Social Science Edition)*, 2017, 19 (3): 284-291. (in Chinese)
- [10] Guo Yong, Cheng Wenhao. Evaluation of Urban Governance Level: An Empirical Study Based on Five Cities [J]. *Urban Development Studies*, 2010, 17 (12): 113-118. (in Chinese)
- [11] Wang Jun, Xia Hongwu. An Evaluation of Capability of Administration in Five Regional Center Cities [J]. *China Opening Journal*, 2015 (3): 16-19. (in Chinese)
- [12] Jin Hao, Li Ruijing. Governance Performance Evaluation in Beijing-Tianjin-Hebei Region: Combination Evaluation Method [J]. *Journal of Hebei University of Technology (Social Science Edition)*, 2018, 10 (2): 7-12. (in Chinese)
- [13] Zhang Ye, Mireayi Mijiti. Construction of an Evaluation System for Urban Comprehensive Governance Capacity in Xinjiang: Analysis Based on a Coupled Coordination Model [J]. *Journal of the Party School of XPCPC of C.P.C.*, 2020 (3): 86-94. (in Chinese)
- [14] Wu Dan. Contribution Measurement and Coordinated Development Ability of Multidimensional Performance of National Governance in China [J]. *Management Review*, 31 (12): 264-272. (in Chinese)
- [15] Wei Lihua. Coordinated Development of Beijing, Tianjin and Hebei and its Features of Different Stages since the Founding of New China [J]. *Journal of Shenzhen University (Humanities and Social Sciences Edition)*, 2016, 66: 143-150. (in Chinese)
- [16] Zhang Zhanbin. The significant strategic significance of coordinated development of Beijing, Tianjin, and Hebei [J]. *Environmental Protection*, 2014,17:18-20. (in Chinese)
- [17] Bo Wenguang, Chen Fei. Collaborative Development of Beijing, Tianjin and Hebei: Challenges and Dilemmas [J]. *Journal of Nankai University (Philosophy and Social Sciences Edition)*, 2015 (1): 110-118. (in Chinese)
- [18] Sun Jiuwen. Goals, Tasks, and Implementation Paths for the Coordinated Development of Beijing, Tianjin and Hebei [J]. *Comparative Economic & Social Systems*, 2016 (3): 5-9. (in Chinese)
- [19] Sun Jiuwen, Yao Peng. Industrial Relocation in Jing-Jin-Ji Region,Regional Specialization and Coordinated Development:An Analysis Based on the Framework of New Economic Geography [J]. *Journal of Nankai University (Philosophy and Social Sciences Edition)*, 2015 (1): 81-89. (in Chinese)
- [20] Sun Hu, Qiao Biao. Study on Problems in Beijing,Tianjin and Hebei Coordinated Industrial Development and Recommendations [J]. *China Soft Science*, 2015 (7): 68-74. (in Chinese)
- [21] Wang Jiyuan, Chen Zhang, Hu Guoliang. Beijing Population Control Under Beijing-Tianjin-Hebei-Coordinated Development: Population Distributing by Industrial Transfer [J]. *China Population, Resources and Environment*, 2015, 25 (10): 111-117. (in Chinese)
- [22] Xiao Hongwei, Wei Qijia. Research on the Strategy of Energy Collaborative Development in Beijing-Tianjin-Hebei [J]. *Macroeconomic Management*, 2015 (12): 53-55. (in Chinese)
- [23] Feng Haibo, Wang Wei, Wan Baochun, et al. Main Ecological Environmental Problems and Countermeasures in Hebei Province under the Background of the Collaborative Development of Beijing-Tianjin-Hebei Region [J]. *Economy and Management*, 2015,41 (5): 19-24. (in Chinese)
- [24] Xu Aiping. Research on Beijing-Tianjin-Hebei Science and Technology Innovation Collaborative Development Strategy [J]. *Technoeconomics & Management Research*, 2014,37 (10): 119-123. (in Chinese)
- [25] Wang Huan'an, Cai Chun. Innovating Regional Education Governance Structure and Promoting the Coordinated Development of Education in Beijing-Tianjin-Hebei: Summary of the "Coordinated Development of Education in Beijing-Tianjin-Hebei" Summit Forum [J]. *Journal of Capital Normal University (Social Science Edition)*, 2016 (1): 122-126. (in Chinese)

- [26] Kim EBWB, Yeung Y M, Choe SC. Collaborative Regional Development in Northeast Asia [M]. Hongkong: Chinese University Press, 2011.
- [27] Prasad A, Finau G, Samuwai J, et al. Regional integration 2.0: Facilitating regional integration and development with collaborative technologies [J]. Australasian Conference on Information Systems, 2012:1-11.
- [28] Prasad A, Finau G, Samuwai J, et al. On facilitating regional integration and economic development with collaborative technologies in the South Pacific [J]. Pacific Asia Journal of the Association for Information Systems, 2013(5):23-37.
- [29] Svensson P. Exploiting Science: An In-depth Study of a Regional Collaborative Development Strategy [J]. Research Gate, 2010 (1):1-22.
- [30] Mănescu G, Kifor C. The Clusters - Collaborative Models of Sustainable Regional Development [J]. Acta Universitatis Cibiniensis. 2015, 65(1): 58-63.
- [31] Lu Jitong. Measurement and Evaluation of Beijing- Tianjin- Hebei Regional Collaborative Innovation Ability Based on Coordinating Measurement Model with Respect to Composite System [J]. Science and Technology Management Research, 2015, 24: 165-170+176. (in Chinese)
- [32] Sun Liwen, Du Juan. Development Environment Evaluation of Beijing-Tianjin-Hebei Eco-industrial System Based on Entropy Weight TOPSIS Method [J]. Journal of Tianjin University (Social Science Edition), 2016, 18 (5): 412-417. (in Chinese)
- [33] Yu Ru, Cheng Jinhua. Evaluation of Regional Ecological Civilization Based on AHP-Fuzzy Model: A Study on the Panel Data of 13 Cities in Jing-Jin-Ji Region [J]. Areal Research and Development, 2019, 38 (6): 11-15. (in Chinese)
- [34] Ye Tanglin, Mao Ruochong. Coupling of Science and Technology Innovation and Industrial Upgrading in Beijing-Tianjin-Hebei [J]. Journal of Capital University of Economics and Business, 2019, 21 (6): 68-79. (in Chinese)
- [35] Liu Yufeng, Gao Liangmou. Analysis of the Coupled and Coordinated Development and Spatiotemporal Evolution of the Economy and Environment in the Beijing-Tianjin-Hebei Urban Agglomeration [J]. Statistics & Decision, 2019, 35 (10): 134-137. (in Chinese)
- [36] Wang Sha, Tong Lei, He Yude. Quantitative Measurement of the Coupling Relationship between Industrial Structure and Ecological Environment in Beijing, Tianjin and Hebei [J]. Soft Science, 2019, 33 (3): 75-79. (in Chinese)
- [37] He Sanwei, Shao Xi. Spatial Clustering and Coupling Coordination of Population-Land-Economic Urbanization in Beijing-Tianjin-Hebei Region [J]. Economic Geography, 2018, 38 (1): 95-102. (in Chinese)
- [38] Zhou Jingkui, Wang Wenbo, Zhang Yanyan. The Spatial-temporal Evolution of Coordinated Development of Industry Transportation-Environment: A Case Study of the Beijing-Tianjin-Hebei Urban Agglomeration [J]. Journal of East China Normal University (Philosophy and Social Sciences Edition), 2019, 51 (5): 118-134+240. (in Chinese)
- [39] Wang Shujia, Ren Liang, Kong Wei, Tang Shuhui. A Study on the Coordinated Development of Ecological Environment-Economy-New Urbanization in Beijing-Tianjin-Hebei Region [J]. East China Economic Management, 2018, 32 (10): 61-69. (in Chinese)