Comprehensive Evaluation Index and Empirical Analysis of China's Six-in-One New Urbanization Based on Entropy Method

Xiang Wang[*], Chenglong Zhang, Baoguo Shan, Jiangtao Li
[*]Corresponding author: wangxiang@sgeri.sgcc.com.cn

zhangchenglong@sgeri.sgcc.com.cn; shanbaoguo@sgeri.sgcc.com.cn; lijiangtao@sgeri.sgcc.com.cn

State Grid Energy Research Institute Co., Ltd, 18 Binhe Avenue, Future Science Park, Changping, Beijing, China

Abstract—New-type urbanization is an important engine for my country's future economic growth, and an overall grasp of the process of new-type urbanization in various regions is an important prerequisite for the efficient promotion of new-type urbanization. This paper constructed a "six-in-one" comprehensive evaluation index system for new urbanization, used entropy method and principal component analysis to determine the objective weight of the indicators, and conducted a layered calculation of the quality of new urbanization development in each province from 2007 to 2018, and found from the coast to the inland, the quality of the development of new-type urbanization had gradually decreased, but the overall difference in the quality of the development of new-type urbanization among provinces across the country had decreased. Combined with historical changes, it is estimated that the country will basically complete new urbanization around 2040.

Keywords- New urbanization; high quality; index; empirical analysis

1 INTRODUCTION

In March 2014, Xinhua News Agency announced the "National New Urbanization Plan 2014-2020" issued by the Central Committee of the Communist Party of China and the State Council. "New urbanization" is regarded as an important engine and platform for future economic growth. At present, there is no uniform definition of "new urbanization" in the research field. Some scholars believe that the development of urbanization must achieve five major transformations, namely, the transformation from focusing on things to focusing on people; from the dual structure of urban citizens and migrant workers to the integration of residents' treatment; from extensive development to intensive development. Development in a green way; from simple urban scale to urban agglomerations and small and medium-sized cities; from uncoordinated development of the "four modernizations" to synchronous development; Some researchers think that the connotation and characteristics of new urbanization are: first, industrialization, informatization, urbanization, and The "four modernizations" of agricultural modernization are coordinated and interacted; the second is the coordination of population, economy, resources, and the environment; the third is to build an urban structure that is closely linked to regional economic development and industrial layout;

the fourth is to achieve the all-round development of people and build inclusiveness and harmony Style town.

The official expression of "new urbanization" is the conclusion made in the 18th Party Congress: "New urbanization is based on the basic characteristics of urban and rural integration, integration of urban and rural areas, interaction between industry and city, conservation and intensiveness, ecological livability, and harmonious development. The urbanization of China is a coordinated development of large, medium and small cities, small towns, and new rural communities, and mutual promotion and common progress." It clarifies the six characteristics of new urbanization and the basic path to achieve its goals. In this context, scientific evaluation of the process of new-type urbanization is an important prerequisite for effective development of new-type urbanization.

2 NEW URBANIZATION COMPREHENSIVE EVALUATION INDEX CONSTRUCTION

2.1 Comprehensive Evaluation Index Framework

Since the announcement of the "National New Urbanization Plan 2014-2020", more and more studies have focused on indicators such as "ecological environment", "urban-rural coordination", and "equality of public services". Professor Hu Biliang from Beijing Normal University proposed a "six in one" new urbanization path. The so-called "six in one" means that urbanization should include at least six subsystems and constitute a close system, including natural resource system, economic growth system, ecological environment system, social development system, spatial structure system and urban innovation system [1]. The new type of urbanization is to take a comprehensive urbanization path that takes into account the effects of these six system factors in a comprehensive manner, with effective use of resources, sustained economic growth, environmentally friendly protection, social fairness and harmony, reasonable spatial structure, and the creation of smart cities.

Drawing lessons from the above-mentioned "six major subsystems" theory, and closely combining the main ideas of urbanization construction ("people-oriented, synchronization of the four modernizations, optimized layout, ecological civilization, cultural heritage"), we believe that the more reasonable subsystems are: people-oriented, urban and rural Overall planning, intensive and efficient, ecological civilization, ecological layout, cultural inheritance.

2.2 Comprehensive evaluation index system construction

This research is based on the "six-in-one" new urbanization theory, strictly in accordance with the basic principles of indicator selection, referring to existing research at home and abroad, especially the "Comprehensive Evaluation Report on the Quality of China's Urbanization" by the Chinese Academy of Social Sciences, "China: Promoting Efficient, Inclusive, and Sustainable Urbanization" report, jointly researched by the Development Research Center of the State Council and the World Bank etc. [2-4], established an evaluation system with "people-oriented, urban and rural planning, intensive and efficient, ecological civilization, ecological layout, cultural technology" as the first-level indicators.

After initial selection of indicators, confirmation of data sources, and indicator screening, it was finally determined that there are 15 secondary indicators and 36 tertiary indicators under the system. On the one hand, the system is sufficient to cover the content of all dimensions of the connotation of new urbanization; on the other hand, the index system is closely related to the entire research topic, while strictly following the principles of data availability, accuracy and comparability. Specific indicators are shown in Table 1 below.

Compared with the existing urbanization comprehensive evaluation index system, the index system of this article has the following characteristics: First, it fully reflects the characteristics of new urbanization; second, most of the indexes are data indicators directly related to urban development, and many other evaluation indicators The system involves more indicators at the provincial level and separate from urbanization itself; third, all data indicators can be compared between regions; fourth, all indicators are from publicly released objective data, and the data is available and continuous.

3 NEW URBANIZATION COMPREHENSIVE EVALUATION INDEX APPLICATION

With reference to related evaluation methods and data processing procedures, the application of the new urbanization indicator system in this study is mainly divided into three steps: first, data collection, sorting, and deficiencies; the second is the calculation preparation, including the normalization of indicators and the entropy method to determine the weight; the third is the synthesis of the comprehensive index of new urbanization in each province. In addition, in order to show the scientific nature of the entropy method, the evaluation method of principal component analysis will also be adopted to compare the two methods.

3.1 Data Sources

The following will comprehensively evaluate the development quality of new urbanization in 31 provinces (cities, districts) across the country from 2007 to 2018. Most of the data comes from the website of the National Bureau of Statistics. Other data come from the Ministry of Housing and Urban-Rural Development, the Ministry of Industry and Information Technology, The Ministry of Public Security, the Ministry of Civil Affairs, the Ministry of Environmental Protection, the General Administration of Customs and other government departments, the "Statistics of the Electric Power Industry", "China City Statistical Yearbook" and local statistical yearbooks and other statistical data over the years, Wind Information Database and State Grid Corporation "one database" "Three Centers" and other databases, etc.

3.2 Empirical analysis

First, Measurement based on entropy weight method

The indicators are objectively weighted through the entropy method, and the new urbanization index of each province is calculated according to the above calculation process.
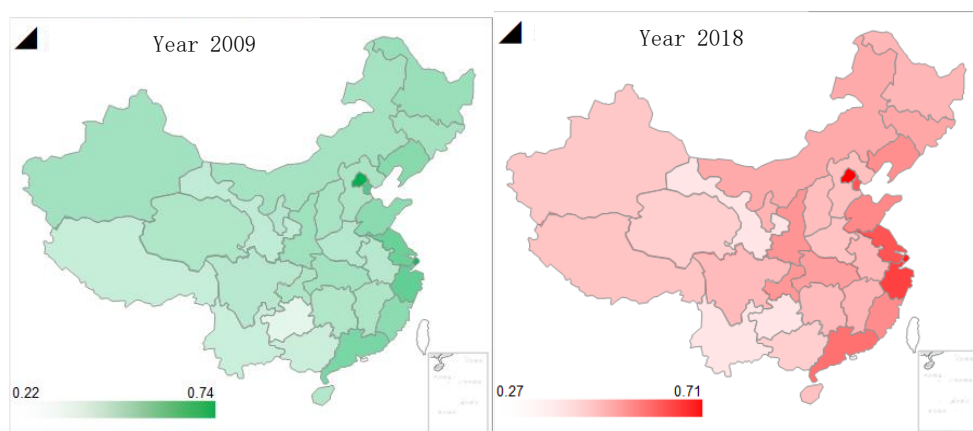
Figure 1 comparison of the development of new urbanization in 31 provinces in the mainland

Table 1 Three-Level Indicators, Data Sources and Attributes

Number	First level	Second Level	Third Level	Sources	Attributes
1	People oriented	Standard of living	Per capita disposable income of urban residents	BNS	+
2			Per capita housing area of urban residents	BNS, MHURD	+
3			Urban electricity consumption per capita	BNS, Compilation of statistics for the electric power industry	+
4			Private car ownership by urban residents	BNS	+
5		Demographic status	Urbanization rate of permanent population	BNS	+
6			Urban population growth rate	BNS	+
7		Insurance protection	Urban basic pension insurance participation rate	BNS	+
8			Urban medical insurance participation rate	BNS	+
9		medical hygiene	Number of medical and health institutions per 10,000 people	BNS	+
10			Number of health technicians per 10,000 people	BNS	+

Number	First level	Second Level	Third Level	Sources	Attributes
11		Public safety	Traffic accidents per 10,000 people	BNS	-
12			Number of criminal cases filed by public security organs per 10,000 people	Annual Reports of Provincial Procuratorates	-
13		infrastructure	Urban road area per capita	BNS	+
14			Number of public buses per 10,000 people	BNS	+
15	Urban and Rural Coordination	Urban-rural differences	Disparity in per capita disposable income between urban and rural areas	BNS、Wind Database	-
16			Difference in per capita consumption expenditure between urban and rural areas	BNS	-
17			The difference in electricity consumption per capita between urban and rural areas	BNS	-
18	Intensive and efficient	economic development	The proportion of non-agricultural industries in GDP	MCA	+
19			Proportion of non-agricultural industry employees	BNS	+
20		Economic efficiency	Unit labor GDP	BNS	+
21			Energy consumption per 10,000 Yuan GDP	BNS	-
22			Profit provided by funds of industrial enterprises above designated size	BNS	+
23	Ecological Civilization	Pollution control	Comprehensive utilization rate of industrial solid waste	MEE	+
24			Harmless treatment rate of domestic garbage	MEE	+
25			Centralized treatment rate of sewage treatment plant	MEE	+
26		city environment	Urban construction land per capita	BNS	+

Number	First level	Second Level	Third Level	Sources	Attributes
27			Green coverage rate in built-up area	BNS	+
28			The amount of domestic garbage collected and transported per capita in cities and towns	BNS	+
29	Space layout	Space layout	Population density in urban area	BNS	+
30			City scale layout	BNS	+
31	Cultural Technology	Public education	The number of ordinary high schools per 10,000 people	China City Statistical Yearbook, Local Statistical Yearbook	+
32			Number of college students per 10,000 people	BNS	+
33		Technological development	R&D expenditure as a percentage of GDP	BNS	+
34			Number of patent applications granted per 10,000 people	BNS	+
35		Culture and entertainment	Number of public libraries per 100,000	BNS	+
36			Number of theaters per 100,000 theaters	BNS	+

Notes: 1. BNS, MHURD, MCA, and MEE are the National Bureau of Statistics, the Ministry of Housing and Urban-rural Development, the Ministry of Civil Affairs, and the Ministry of Ecology and Environment. 2. The "attribute" in the table refers to whether the new urbanization evaluation index is positive or negative.

From the comparison of the horizontal rankings among the provinces in a single year and the ranking changes in different years: (1) The vast majority of the top ten are eastern provinces, and the overall level of new urbanization development in eastern provinces is relatively high; (2) the three northeastern provinces as a whole continue to decline , Jilin Province ranks relatively stable; (3) Most of the bottom ten are remote provinces in the northwest and southwest; (4) Shaanxi and Inner Mongolia in the northwest region have relatively stable performance, while Sichuan, Chongqing, and Ningxia rank continuously rising, while Xinjiang and Qinghai continue to decline; (5) In the middle are other central provinces, whose ranking fluctuates in different years; (6) The color map of China shows that the color of the comprehensive level of new urbanization changes from east to west from dark to light; (7) with Over time, the overall difference in the comprehensive level of new urbanization among China's provinces has decreased, and the coefficient of variation has dropped from 0.30 in 2007 to 0.25 in 2018. The changes in the new urbanization index are shown in Figure 1 above

Second, Calculation based on principal component method

The principal component analysis method also starts from the objective characteristics of the indicator data itself, combines many indicators into the principal component indicators, combines the standardization of the indicators and the characteristic roots to calculate the indicator weight, and then comprehensively calculates the new urbanization level of each province. Due to space limitations, and principal component analysis is mainly to verify the entropy method, the detailed calculation process is omitted here.

According to the ranking from high to low, the evaluation results of the principal component analysis method are basically the same as those of the entropy weight method. The top ten provinces are basically the same. Only Shaanxi, Ningxia, Jiangxi, Xinjiang, Tibet and other provinces have significant differences. In general, the new urbanization evaluation results measured by the entropy weight method are more reasonable.

4 FUTURE OUTLOOK

According to the evaluation index, the national comprehensive index of new urbanization has increased by an average of 0.012 units per year in the past ten years. It is expected that new urbanization will develop faster in the future, and the social, ecological, urban and rural, and technological aspects other than economic growth will be improved rapidly. Therefore, the comprehensive index of new urbanization in various provinces will increase at an average annual rate of 0.015 units. It is estimated that the eastern provinces will take 24 years on average, that is, the new urbanization will be basically completed in 2039; the central provinces will take 29 years on average, that is, they will realize the New-type urbanization in 2044; the western provinces need an average of 31 years, that is, to basically complete the new-type urbanization in 2046; the three northeastern provinces need an average of 29 years, that is, to basically complete the new-type urbanization in 2044. The national average needs 28 years, that is, the new urbanization will be basically completed around 2043.

5 THE CONCLUSION

This paper establishes a "six-in-one" comprehensive evaluation index system for new urbanization, which comprehensively covers the core content of new urbanization. The results show that the quality of new-type urbanization in eastern provinces is relatively high, and 7 provinces have entered the stage of medium-high quality development. The overall ranking of the three northeast provinces fell, with the lower ranking mostly being the remote provinces in Northwest and Southwest. The development quality gap between the central and western provinces has widened. It is estimated that the eastern, central, western and northeastern regions will basically complete the new-type urbanization by 2039, 2044, 2046 and 2044 respectively. The index established in this paper can track and observe the development of new-type urbanization in different regions and provide effective tools for policy-making.

REFERENCES

[1] Biliang Hu. "On the 'Six in One' New Urbanization Path", Guangming Daily, 2013 June 28.

[2] Fang Chuanglin, Wang Deli. The comprehensive measurement and improvement path of urbanization development quality in China. Geographical Research, 2011, 30 (11), pp1931-1946.

[3] Houkai Wei. Comprehensive Evaluation Report of China's Urbanization Quality. Beijing: Institute of Urban Development and Environment, Chinese Academy of Social Sciences. 2013

[4] Wei Li, Sri Mulyani Indrawati, Shijin Liu, et al. "China: Promoting an efficient, inclusive and sustainable new urbanization", China Economic Report, 2014 (4), pp19-22.

[5] Zhenyan Han, Jue Wang. Construction of a new urbanization index system under the new normal: Taking Nanjing City, Jiangsu Province as an example. Business Economics Research, 2016 (8), pp146-148.