Analysis and Evaluation of High Quality Development Status of Beijing Transportation

Wang Ying

1Beijing Jiaotong University, Beijing, Beijing, 10089, China
1057032153@qq.com

Abstract. China is realizing the leap of a big transportation country to a powerful transportation country, and promoting high-quality development is a fundamental requirement for transportation work in the future. This paper elaborates on the high-quality connotation of transportation, and measures the high-quality development index of transportation in Beijing from 2014 to 2018 by constructing a high-quality development evaluation index system. The results show that the high-quality development level of Beijing's transportation has been increasing year by year, but the overall condition is not so good. At the same time of focusing on quantity, it has begun to work towards quality. In the future, Beijing's transportation development should continue to be tilted towards high efficiency and green.

1. Introduction

The 2018 National Transportation Work Conference proposed that transportation has shifted from a high-speed growth phase to a high-quality development phase [1]. From the perspective of development, after years of efforts, China's transportation development has made great achievements, and many indicators have been at the forefront of the world. The scale of infrastructure is world-leading. The total mileage of the comprehensive transportation network has exceeded 5 million kilometres, and the world's first high-speed railway and highway mileage, port 10,000-ton berths [2]. The transportation service capacity has been greatly improved. The railway freight volume and passenger turnover, road passenger and cargo transportation volume and turnover, port cargo throughput and container throughput, and express delivery volume rank first in the world. Civil aviation passengers and cargo and mail turnover rank second [3]. It has the material basis for the accumulation of quantity and quality.

At present, most of the research on the high-quality development of transportation is theoretical. There are relatively few studies based on the theory of high-quality development of transportation and quantitative indicators. For example, Zhou Wei profoundly explored new contradictions and new problems in the field of transportation, and then proposed the high-quality development goals of China's transportation industry [4]. He Jianzhong puts forward the theory of rejuvenation transportation development [5]. Based on theories and methods of sustainable development evaluation, Wang Jianwei etc. established low-carbon transportation development evaluation indicators [6], Wang Wei etc. established an index system that comprehensively evaluates the development level of urban ecological transportation, which based on the theory of urban complex ecosystem [7].

2. Interpretation of the concept of high-quality development of transportation

This paper starts from the theory of three-dimensional (FSO)[8] comprehensive transportation theory and explains the concept of high-quality development of transportation.
2.1. Functional dimension
Functional dimension includes the transportation between urbans, urban and rural, and countries. There are many problems and shortcomings in the development of China's transportation. First, the structural contradictions of transportation infrastructure are still prominent, and the development of inter-regional and urban-rural is not coordinated. Second, in terms of urban transportation, the speed of infrastructure construction cannot keep up with the rapidly growing of traffic demand, conventional public transportation has shrunk, and taxis and private cars have increased rapidly. Third, in terms of inter-city transportation, the construction of the metropolitan area has shown a relatively rapid development trend, but the level of inter-city transportation integration is not high. To improve the quality of transportation development, it is necessary to strengthen the design of the comprehensive transportation system, starting from the four aspects of urban transportation, and systematically plan the coordinated development of inter-regional and urban-rural transportation.

2.2. Structural dimension
The structural dimension emphasizes the combination of five basic modes of transportation: railway, highway, water transport, aviation, and pipeline. At present, the structural contradictions of China's transportation services mainly have the following problems: First, the road bears too much cargo freight of medium and long distance. The railway's large-capacity and low-emission technical advantages have not been fully utilized. Second, China's comprehensive transportation efficiency is not high, and the connection is not perfect. To improve the quality of transportation, it is necessary to consider the coordinated development of transportation modes. There is a close symbiotic relationship between them, which together form the network form of transportation.

2.3. Operating dimension
The operational dimension emphasizes the high efficiency, low cost and seamless connection of various transportation modes and various transportation subsystems in cooperation. At present, there are the following problems in the operating dimension of integrated transportation development: First, the transportation industry has shortcomings in terms of cost, service and environment, and the reform of transportation supply side needs to be accelerated. Second, transportation is in the“Internet +” process, there are still many problems such as difficulty in sharing information resources and insufficient development and utilization. Third, the main contradictions in China's society have changed in the new era. People pay more attention to feelings, happiness and security. The user experience needs to be optimized. To improve the quality of transportation, it is necessary to carry out scientific planning and operation from the operational dimension, transform the transportation development model to improve the quality of transportation services.

3. Index evaluation system for high-quality development of Beijing transportation
In this paper, the comprehensive evaluation method of composite indicators is used to construct the high-quality development evaluation index, which is suitable for Beijing transportation. Based on the selected indicators, the entropy method is used to determine the weight, and finally the high-quality development index of transportation in Beijing is calculated. The research data comes from the Beijing Municipal Traffic Development Annual Report and the Beijing Statistical Yearbook.

3.1. Indicator selection
This paper constructs the indicator system from five aspects: high efficiency, economy, safety, convenience and green. These five levels were originally proposed by General Secretary Xi Jinping in 2014, which also pointed out the basic value pursuit of modern integrated transportation system [9].Since the reform and opening up, China's transportation has been in a state of shortage for a long time, and it has become the norm in the fast-moving, and naturally formed a system oriented by scale. This set of indicator system has played an important role in building a major transportation country. However, it is not suitable for building a high-quality transportation country [10].
In terms of economy, it tends to reflect the overall economic efficiency of the transportation industry. Therefore, this paper selects the ratio of investment in transportation infrastructure and the contribution rate of transportation industry to GDP. Next, the two indicators of operation and maintenance cost and household transportation as a proportion of consumption expenditure are selected, which reflect the economic efficiency of the transportation industry from the perspective of industry and micro-family. In terms of efficiency, four indicators of comprehensive travel time index, road congestion index, continuous congestion time and road freight volume ratio are selected. Considering the particularity of selected cities, this paper focuses on reflecting the status of urban traffic in the selection of indicators. Safety measured by the proportion of loss of traffic property to consumption expenditure. Convenience is used to reflect the convenience of residents' travel. The convenience of urban residents' travel is measured by the bus reliability index and the subway comfort index. The convenience of suburban residents' travel is measured by the length of the suburban county road. Environmental benefits are the result of the impact of the transportation industry on the ecological environment. The high-quality development of transportation requires the use of low-energy vehicles as much as possible, so that negative effects such as air pollution and noise pollution are minimized.

3.2. An Empirical Analysis of the High Quality Development of Beijing Transportation

3.2.1. Determination of weight
The entropy method is used to obtain the information entropy of each index. The larger the utility value of the information, the larger the weight of the index. The specific model is as follows :(1) Variable setting. There are n years of data, m indicators.(2)The normalized model of the forward index is: \[ X_{ij} = \frac{(A_{ij} - A_{i, \text{min}})}{(A_{i, \text{max}} - A_{i, \text{min}})} \]. The normalized model of the negative index is: \[ X_{ij} = \frac{(A_{i, \text{max}} - A_{ij})}{(A_{i, \text{max}} - A_{i, \text{min}})} \].(3) Find the contribution of the i-th year under the j-th indicator \( P_{ij} \). \[ P_{ij} = X_{ij} / \sum X_{ij} \].(4) Find the entropy value \( E_j \) of the jth indicator. \[ E_j = -K \sum P_{ij} \ln(P_{ij}) \].(5) Find the degree of consistency of the contribution of each year under the jth indicator \( d_j \). \[ D_j = 1 - E_j \].(6) Weighting \( w_j \). \[ W_j = d_j / \sum d_j \].(7) Calculate the high-quality development index of transportation \( H_i \). \[ H_i = \sum w_j X_{ij} \].
3.2.2. Analysis of Transportation Quality Index

Table 1. Index System and Weight of High Quality Transportation Development

| Primary indicator | Weights | Secondary indicators                        | Indicator attribute | Weights |
|-------------------|---------|--------------------------------------------|---------------------|---------|
| Efficient         | 1/5     | Road congestion index                      | -                   | 0.2241  |
|                   |         | Continuous congestion time                | -                   | 0.5689  |
|                   |         | Road freight volume                        | -                   | 0.2070  |
| Economic          | 1/5     | Contribution rate of transportation industry to GDP | +                   | 0.3766  |
|                   |         | Transportation infrastructure investment ratio | +                   | 0.4135  |
|                   |         | The proportion of household transportation expenditure in consumption expenditure | -                   | 0.2099  |
| Safety            | 1/5     | 10,000-car mortality rate                  | -                   | 0.6720  |
|                   |         | Traffic property loss as a proportion of GDP | -                   | 0.3280  |
| Convenience       | 1/5     | Urban Public Travel Walking Distance        | -                   | 0.3682  |
|                   |         | Length of Suburban Highway                 | +                   | 0.6318  |
| Green             | 1/5     | Equivalent Sound Level of Urban Road Traffic Noise | -                   | 0.1605  |
|                   |         | Green travel ratio                         | +                   | 0.1682  |
|                   |         | PM2.5                                      | -                   | 0.1283  |
|                   |         | Nitrogen dioxide                           | -                   | 0.2064  |
|                   |         | Inhalable particulate matter               | -                   | 0.0880  |
|                   |         | Urban Greening Coverage Rate               | +                   | 0.0701  |
|                   |         | Per capita urban road area                 | +                   | 0.1785  |

Figure 1. Beijing’s transportation quality index for the past five years

It can be seen from Figure 1 that in 2014-2018, the evaluation results of Beijing's transportation high-quality development index were 0.24, 0.23, 0.37, 0.59, and 0.83, showing an upward trend. However, the average value is 0.45, the overall level of the evaluation results is not high, and there is still a big gap from the excellent level. Among them, the growth of economic, convenience and safety indicators is very obvious, indicating that the economic efficiency of the transportation industry has been greatly improved, the construction of transportation facilities has been improved to a certain extent, but the improvement of high efficiency and green is not significant. The reason is that in recent years, the phenomenon of separation of employment and residence in Beijing has existed greatly, commuting has become longer, private cars have increased, urban traffic is congested, and traffic pollution is serious.
4. Conclusion
This paper expounds the high quality of transportation from the three dimensions of FSO theory. To improves the quality of transportation, it needs to start from the four aspects of urban transportation, intercity transportation, urban and rural transportation and international transportation. It needs to be coordinated from the development of transportation modes.

Beijing as a model city, it is especially important to study the high-quality development of transportation. This paper builds an indicator system from five levels: high efficiency, economy, green, security and convenience, and evaluates the high quality of transportation development in Beijing during the past five years. The quality of transportation development in Beijing has shown an upward trend, indicating that Beijing's transportation construction has made great achievements, and various infrastructures have become more perfect. While focusing on quantity, it has begun to move toward quality. However, the problems of urban traffic congestion and environmental protection are still serious. In the future, the high quality development of Beijing's transportation should continue to be tilted towards high efficiency and green.

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