Research on the Influencing Factors of China's Resources and Environment to Urbanization Based on Computer

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Abstract. Based on the computer regression analysis method, this article first analyses the urbanization system, resource system, and environmental system on the premise of carefully analysing the connotation characteristics of new-type urbanization, resource and environmental carrying capacity, and response relationships. Mechanism of action. Furthermore, an index system for the response relationship of urbanization resources and environmental carrying capacity was constructed, and the urbanization level and resource and environmental carrying status of 10 provinces and cities in China were evaluated from 2000 to 2015. The characteristics of the change in the response relationship of each province and city are divided into three types: "positive response type", "positive-negative response type" and "alternative response type". Finally, through multiple regression analysis, explore the factors that affect the response relationship to show different evolutionary trends.

1. Introduction
Since the 21st century, with the rapid development of economic globalization, urbanization has gradually become the focus of attention of countries around the world. The report of the 19th CPC National Congress pointed out that China's economy has shifted from a high-speed growth stage to a high-quality development stage [1]. Promoting a new urbanization strategy centered on human urbanization and improving quality is a key measure for building a modern country in the new era. With the rapid development of urbanization, problems such as imbalances in urban spatial planning, low industrial structure, inefficient use of resources, and deterioration of the ecological environment have gradually become prominent. With the continuous improvement of the level of urbanization, the degree of influence of urbanization on the resources and environment is gradually increasing. Therefore, the interaction between urbanization and the carrying capacity of resources and the environment and its evolutionary trend are explored. Coordination and sustainable development are particularly important. Based on this, this paper uses the responsiveness model to study the resource-environment carrying capacity response relationship of urbanization in 31 provinces and cities in China from 2000 to 2015, classifies features according to their dynamic evolution trends, and further uses panel data models to explore the different types of urbanization in response The resource and environment carrying capacity responds to the influencing factors of the relationship, and accordingly proposes differentiated policy recommendations.
2. Responsive relationship between urbanization and resource and environmental carrying capacity

2.1. Implications of urbanization
As China enters the transition period, the development of urbanization has been given new connotations and requirements. The 18th National Congress of the Communist Party of China proposed that "it is necessary to adhere to the road of socialism with Chinese characteristics, promote the simultaneous development of the four industrializations, urbanization, informatization, and agricultural modernization, improve the sound development mechanism of urbanization, and promote urbanization with people at the core [2]. "The so-called new urbanization is relative to the traditional urbanization in the past. China's traditional urbanization is following a rough development path. It is a civil and one-sided pursuit of urban size expansion and space expansion. Over-emphasis on industrial urbanization has caused serious waste of resources and environmental pollution. Therefore, it promotes the traditional rapid urbanization trend. The transformation of quality-efficient urbanization is increasingly urgent. The so-called new type of urbanization changes the "new" mode of economic growth from extension to connotation, regional development relations from uncoordinated to urban-rural coordinated development, and resource utilization from extensive to intensive. The new type of urbanization is an urbanization development model that is people-oriented, synchronized with the four modernizations, intensive development, environmentally friendly, and socially harmonious. Its connotative characteristics include four aspects: population urbanization, social urbanization, economic urbanization, and spatial urbanization. The core of urbanization is to realize the orderly civilization of rural migrants, the optimized layout of regional economy and industrial structure, the coordinated development of public services, and the spatial coordination of population, resources and the environment.

2.2. Implications of carrying capacity of resources and environment
The carrying capacity of resources and the environment is a complex concept that includes resources, environmental factors, and other aspects. It is in a specific period and region that the regional resource structure continues to develop and the environmental function maintains steady state effects. Under the conditions, the resource and environment system can bear human's various economic and social activities; its main body is the resource and environment system, and its object is human economic and social activities. The carrying capacity of resources and the environment has two meanings: first, the capacity of the environment and the ability to supply resources for a specific region; and second, the pressure exerted by human economic and social activities on the resources and environment in the region. In fact, the resource and environmental carrying capacity can be said to be a multi-dimensional space vector supported by multiple variables. It mainly has the following functions: (1) service functions. The resource and environmental carrying capacity provide a full range of social and economic activities in the entire region. Diversified services provide a source of power for the sustainable development of the region; (2) Restriction functions, the strength or size of the resource and environmental carrying capacity changes according to specific regional conditions, and the resource and environmental carrying capacity requires the region to continuously improve its resources Utilize efficiency, continuously carry out technological innovation, and develop in an orderly and circular manner, which restricts the process of regional economic development; (3) the adjustment function, the regional resource and environmental carrying capacity is limited, and once it exceeds its threshold, the natural environment system will It will give timely and effective feedback to the humanities system, and human beings will make reasonable control and adjustment through their own subjective initiative; (4) Maintenance function, the regional resource and environmental carrying capacity can maintain the ecological balance and prevent various injuries to a certain extent Capacity to ensure the healthy development of the region [3].
2.3. Inherent mechanism of response relationship between urbanization and resource and environmental carrying capacity

According to the theory of urban complex ecosystem, urbanization and resource environment are a complex and huge self-organizing system composed of urbanization system, resource system and environmental system (Figure 1). The response relationship between urbanization resources and environmental carrying capacity mainly means that for a specific region, if the development of urbanization is within the range that the resources and environment of the region can carry, there will be a coordination between urbanization and the carrying capacity of resources and environment. Orderly optimize the development relationship; if the development of urbanization exceeds the scope of the region's resources and environment, the relationship between urbanization and the carrying capacity of resources and environment will be a conflicting and disorderly development relationship. The response relationship between urbanization and resources and environment is evolved from the long-term interaction between human activities and the ecological environment. It has certain characteristics of dynamics, complexity, and spatial differentiation.

![Figure 1. Response mechanism of resource-environment carrying capacity in urbanization.](image)

3. Provincial Urbanization and Resource and Environmental Carrying Capacity Assessment

3.1. Index selection and model construction

3.1.1. Construction of evaluation index system. The new type of urbanization is a comprehensive process of coordinated, interactive, and synchronized development of the "four modernizations." With the rapid advancement of urbanization, the carrying capacity of resources and the environment will present a dynamic evolution. The evaluation system of the response relationship between urbanization and the carrying capacity of resources and environment has not yet formed a unified standard. Therefore, after reading a large amount of literature and works, this article combines the connotation of the new chapter with new chapters on urbanization and carrying capacity of resources and environment on the basis of a full understanding of the characteristics, according to the principles of systematic, targeted, dynamic, operability, and the development requirements of a "resource-saving and environment-friendly" society based on the design of the index system, refer to the research results of relevant scholars, and constructed an evaluation index system for the response relationship of urbanized resource and environmental carrying capacity consisting of two primary indicators, six secondary indicators, and 28 specific indicators (see Table 1).
Table 1. Evaluation index system for the response relationship of resource carrying capacity of urbanization.

| Secondary indicators       | Tertiary indicators                                                                 | Index properties |
|----------------------------|-------------------------------------------------------------------------------------|------------------|
| Population urbanization    | Urban population (10,000 people)                                                    | +                |
|                            | Proportion of urban population in total population (%)                              | +                |
|                            | Urban population growth rate (%)                                                     | +                |
|                            | Proportion of urban employed population in total employed population (%)             | +                |
|                            | GDP per capita (yuan / person)                                                      | +                |
|                            | GDP growth per capita (%)                                                           | +                |
| Economic urbanization      | Proportion of secondary industry to GDP (%)                                         | +                |
|                            | Proportion of tertiary industry to GDP (%)                                          | +                |
|                            | Per capita disposable income of urban residents (yuan / person)                     | +                |
| Social urbanization        | Urban employee endowment insurance coverage rate (%)                                | +                |
|                            | Average wage of employed workers in urban units (yuan / person)                     | +                |
|                            | Urban employee medical insurance coverage rate (%)                                  | +                |
| Spatial urbanization       | Number of cities                                                                    | +                |
|                            | Urban road area per capita (m² / person)                                            | +                |
|                            | Per capita built-up area (km² / 10,000 people)                                      | +                |
|                            | Urban population density (person / km²)                                             | -                |
|                            | Per capita arable land area (mu / person)                                           | +                |
|                            | Water resources per capita (m³ / person)                                             | +                |
| Resource carrying capacity | Basic coal reserves per capita (tons / person)                                       | +                |
|                            | Forest cover rate (%)                                                               | +                |
|                            | Proportion of wetland area in area under jurisdiction (%)                          | +                |
|                            | Green coverage of built-up area (%)                                                 | +                |
|                            | Industrial wastewater discharge compliance rate (%)                                 | +                |
| Environmental support      | Industrial waste gas (SO₂) removal rate (%)                                        | +                |
|                            | Comprehensive treatment rate of industrial solid waste (%)                          | +                |
|                            | Harmless treatment rate of domestic garbage (%)                                     | +                |
|                            | Environmental pollution treatment investment as a percentage of GDP (%)             | +                |

3.1.2. Analysis steps of entropy method. This article chooses the simple and objective entropy method to evaluate and analyse panel data. The specific analysis steps are as follows:

The first step: Because the nature of each indicator is positive or negative, in order to facilitate comparison, the original data is first normalized. Suppose there are r years in the sample set, m evaluation objects and n indicators, so $x_{ij\theta}$ represents the value of the jth index of province i in year $\theta$ [4].

Positive indicators:

$$x'_{ij\theta} = \frac{x_{ij\theta} - \min(X_j)}{\max(X_j) - \min(X_j)}$$ (1)

Negative indicators:
$$x_{ij}' = \frac{\max (X_j) - x_{ij}}{\max (X_j) - \min (X_j)}$$ (2)

Among them, $\max (X_j)$ and $\min (X_j)$ are the maximum and minimum values of the raw data of the j-th index, and $x_{ij}'$ is the standard value of the original index.

Step 2: Determine the weight of each indicator. Proportion of sample i under index j:

$$y_{ij} = \frac{X_{ij}'}{\sum_i \sum_j X_{ij}'}$$ (3)

Entropy of the jth index:

$$e_j = -k \sum_i \sum_j y_{ij} \ln (y_{ij}) \quad k > 0, k = \ln (rm)$$ (4)

When $y_{ij} = 0$ or $y_{ij} = 1$, $y_{ij} \ln (y_{ij}) = 0$. Weight of each indicator:

$$w_j = \frac{1 - e_j}{\sum_{j=1}^{n} (1 - e_j)} \quad (j = 1, 2, ..., n)$$ (5)

Urbanization Composite Index:

$$UB = \sum_{j=1}^{17} X_{ij}' \ast w_j$$ (6)

Comprehensive index of carrying capacity of resources and environment:

$$RE = \sum_{j=1}^{11} x_{ij}' \ast \omega_j$$ (7)

Among them, $X_{ij}'$, $w_j$ and $x_{ij}'$, $\omega_j$ represent the standard values and index weights of the raw data of the indicators of urbanization and resource and environmental carrying capacity, respectively.

3.2. Data source and processing

This article selects 10 provinces and cities in China as the research object, and analyses the development level of China’s provincial urbanization, the resource and environmental carrying status, and the evolution trend of the resource and environmental carrying capacity of urbanization. The data mainly come from the National Bureau of Statistics, China Economic Network, China Statistical Information Network, and China Statistical Yearbook, China City Statistical Yearbook, China Energy Statistical Yearbook, and China Environmental Yearbook, 2000-2016. Due to the large missing data of Tibet statistics, it is not listed as a research object for the time being. For the missing of other individual data, moving average method, interpolation method and other methods are used for processing. As shown in table 2. (Given the limited layout, only part of the data is intercepted.)
Table 2. Results of the evaluation of the response relationship between the resource and environmental carrying capacity of China's provincial urbanization from 2000 to 2015.

| Area   | 2000   | 2001   | 2002   | 2003   | 2004   | 2005   | 2006   | 2007   | 2008   | 2009   |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Jilin  | 0.329  | 0.310  | 0.296  | 0.271  | 0.277  | 0.294  | 0.312  | 0.399  | 0.495  | 0.521  |
| Shanghai | 0.522  | 0.736  | 0.921  | 1.354  | 2.096  | 1.385  | 1.836  | 1.725  | 1.670  | 1.552  |
| Jiangsu | 0.810  | 0.756  | 0.713  | 0.593  | 0.522  | 0.537  | 0.521  | 0.453  | 0.412  | 0.400  |
| Zhejiang | 1.408  | 1.179  | 1.165  | 0.804  | 0.618  | 0.679  | 0.961  | 0.745  | 0.581  | 0.519  |
| Anhui  | -0.030 | 0.601  | 0.308  | 0.472  | 0.797  | 0.718  | 0.794  | 0.976  | 0.980  | 0.984  |
| Fujian | 1.185  | 1.067  | 1.063  | 1.014  | 0.909  | 0.869  | 0.925  | 0.794  | 0.736  | 0.658  |
| Ningxia| 0.253  | 0.609  | 0.341  | 0.730  | 0.883  | 1.256  | 0.593  | 1.180  | 1.073  | 1.082  |

The evaluation results of the comprehensive index of urbanization development in China's provinces and cities from 2000 to 2015 are shown in Table 2 above. For the development process of urbanization, it is divided internationally into three stages: Urbanization levels below 30% are in urbanization In the early stage of the process, the "starting stage", the urbanization level between 30% and 70% is in the intermediate stage, that is, the "rapid advancement stage", and the urbanization level between 70% and 90% is in the later stage. That is, "steady development stage". According to this division criterion, it can be seen from Table 2 that since 2000, except for Shanghai, Guangdong, Beijing, Tianjin, Zhejiang, Shandong and other 11 provinces and cities, which have initially entered the intermediate stage, the urbanization process of the remaining provinces and cities in China is still in its infancy. stage. With the continuous advancement of urbanization, as of the end of 2015, the development levels of urbanization in 30 provinces and cities across the country were significantly different. From the perspective of the three regions of east, west, and west, the urbanization level of most eastern provinces represented by Beijing, Shanghai, Jiangsu, Zhejiang, and Guangdong has grown rapidly, and urbanization has entered the late stage of rapid advancement; In the western region, the urbanization process of the three provinces and cities of Yunnan, Gansu, and Guizhou has been relatively slow, and has entered a rapid advancement stage around 2014. In general, although China's regional urbanization development is uneven and presents a certain step difference, the average level of urbanization is relatively high, and all provinces and cities in the country are in the middle stage of urbanization development.

3.3. Analysis of Urbanization Change Trend

As can be seen from Figure 2 below, from 2000 to 2015, the overall level of urbanization development in the three major regions of China showed

The trend of steady growth in fluctuations, the urbanization level of the three major regions of East, West, and West is quite different. Specifically, the eastern region has the highest level of urbanization and is much higher than the central and western regions, with obvious advantages. The evolution of the comprehensive index of urbanization in the central and western regions is very similar. Except for the decline in urbanization levels in individual years, the remaining years have maintained a steady upward trend. Although the development level of urbanization in the western region has been lagging, its catch-up momentum is obvious. The comprehensive index of urbanization has increased from 0.236 in 2000 to 0.382 in 2015. The gap with the central region has been narrowed year by year. As of 2015, urbanization in the western region the level is basically the same as in the central region [5].
Figure 2. Trends in the Urbanization Comprehensive Index of the Three Major Regions from 2000 to 2015.

3.4. Changes in resource carrying capacity
As can be seen from Figure 3 below, from 2000 to 2015, the overall carrying capacity of resources and environment in the three major regions of China showed a rapid upward trend. There is a certain difference in the resource and environmental carrying conditions of the three regions of east, middle, and west. The level of resource and environmental carrying capacity is highest in the eastern region, followed by the central region, and relatively backward in the western region. Specifically, the evolution of the comprehensive index of the carrying capacity of resources and environment in the three major regions is very similar. The growth momentum of carrying capacity of resources and environment was obvious from 2000 to 2010, and it declined sharply from 2010 to 2011. It started to pick up after 2011 and showed steady development thereafter.

Figure 3. Trends in the comprehensive index of resource and environmental carrying capacity in the three major regions from 2000 to 2015.

4. Conclusion
This article proposes differentiated policy recommendations to promote urbanization and the orderly development of resources and environment from the national level and the three major response types: at the national level, efforts should be made to optimize the shape and spatial layout of urban agglomerations, improve air pollution prevention policies, and establish green GDP assessment Mechanism; "Positive response" should promote smart city informatization construction, rational and
intensive use of land resources, and establish environmental protection regulations and incentive policies; "Positive-negative response" should accelerate the civilization of agricultural transfer population, and vigorously develop energy-saving and water-saving cities Actively cultivate characteristic small towns; "alternative response" should strengthen the construction of transportation infrastructure, promote comprehensive rural environmental governance, improve the ecological environment compensation mechanism, and realize regional circular production.

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