

Research and development suggestions on the coordinated development of green cities based on spss data processing basis

Chaoqi Lv^{1,*}

¹School of Art, Chongqing University, Chongqing 400044, China

Abstract. Based on extensive reading of domestic and international research on green city development, this paper uses a combination of qualitative and quantitative methods to conduct an in-depth study of the interactive and coordinated development of a city PRED and its model from the perspective of systemic analysis based on grey correlation theory, and then evaluate the green city development of a city. Based on PRED system theory, we analyze the deep meaning of green city and clarify the interaction between them and the guiding significance of PRED system theory for green city development. Design a city green city evaluation index system, use gray correlation analysis method, and build a gray correlation evaluation model of green city coordination ability of a city based on PRED system analysis. This paper has researched and thought about the coordinated development of green cities based on the basic data processing. The optimization and re-planning study was carried out on the development strategy of the previous period. The future urban development of Wei has laid some research theoretical foundation.

1 Introduction

The share of the world's urban population increased from 13% in 1900 to 29% in 1950 and to 50% in 2006. According to UN projections, by 2030, 60% of the world's population will live in cities. However, the high level of urban development has brought an unpredictable crisis to mankind. In 2007, the outbreak of cyanobacteria in Taihu Lake made the tap water in Wuxi city suddenly deteriorate, and the pungent and smelly water disturbed the normal life of the public, who frantically bought pure water, thus triggering a drinking water crisis. China's capital city, Beijing, is "haunted" by smoke and haze, with air quality suffering from heavy pollution [1]. It is clearly that the development of cities will determine the sustainability of the entire planet [2].

2 Green city evaluation index system and evaluation method of a city based on PRED system

2.1 Principles of Indicator Design

The design of a city's green city evaluation index system based on PRED system should reflect the level of a city's

green city development through statistical indicators, and the setting of statistical indicators must be subordinated to the special law of the movement level of coordinated development of economic development with population, resources, environment [3]. This paper argues that the study of the green city evaluation index system, like other index systems, needs to follow the following principles:

- (1). Comprehensive principle;
- (2). The principle of combining descriptive and evaluative;
- (3). Comparability principle;
- (4). Principle of data accessibility.

2.2 Construction of the indicator system

2.2.1. The process of constructing the indicator system

The picture below shows: The process of constructing an indicator system is a dialectical and logical thinking process from individual to whole, from concrete to abstract to concrete, and is a process of gradually deepening, improving and systematizing people's understanding of the overall quantitative characteristics of phenomena [4].

*Corresponding author E-mail: L1277344132@163.com

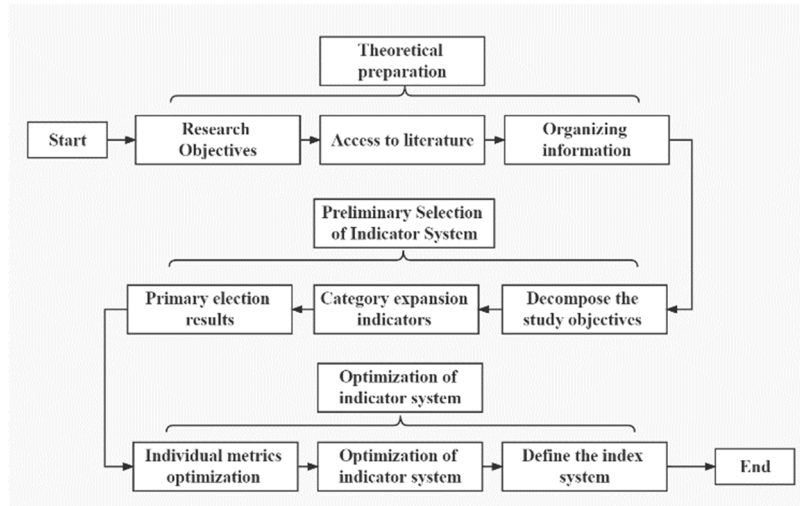


Fig. 1. Schematic diagram of the construction of the indicator system

2.2.2. Preliminary Selection of Indicator System

The primary selection methods of the indicator system mainly include analytical method, frequency statistics method, synthesis method, crossover method, and indicator attribute grouping method. In this paper, we mainly use the analytical method and frequency statistics [5].

(1). Analysis method.

The analysis method to the evaluation index system from multiple perspectives and levels to reflect the number of specific evaluation object size and quantity level. It is a "concrete an abstract a concrete" of the dialectical logic thinking process [6].

(2). Frequency statistics method

This paper will first use frequency statistics mainly to conduct frequency statistics on current reports, literature on PRED coordination studies and select those indicators that are used more frequently; Secondly, to analyze, compare and synthesize the connotation, main characteristics, basic elements and main issues of sustainable urban PRED development, and select highly targeted indicators; Using these two methods, we can finally obtain a green city evaluation index system for a city [7].

2.3 Evaluation model construction and methodology

The basic idea of gray correlation analysis is to determine whether the sequences are closely related based on the similarity of their curve geometries. The closer the curves are, the greater the correlation between the corresponding sequences, and vice versa, the smaller the correlation.

The green city PRED system of a city to be analyzed in this paper can be studied by the method of gray correlation analysis [8].

According to the definition of correlation degree, the calculation steps of correlation degree can be obtained as follows:

(1). Determine the evaluation index system and collect evaluation data according to the evaluation purpose, Let mdata sequences form the following matrix:

$$(X_0, X_1, \dots, X_m) = \begin{pmatrix} x_0(1), x_1(1), \dots, x_m(1) \\ x_0(2), x_1(2), \dots, x_m(2) \\ \dots, \dots, \dots, \dots \\ x_0(n), x_1(n), \dots, x_m(n) \end{pmatrix} \quad (1)$$

where n is the number of indicators:

$$X_i = (x_i(1), x_i(2), \dots, x_i(n))^T, i = 1, 2, \dots, \quad (2)$$

(2). Determine the reference data column X_0 .

The reference data column should be an ideal standard for comparison, and the best value (or the worst value) of each indicator can constitute the reference data column, or other reference values can be selected according to the evaluation purpose. written as:

$$X_0 = (x_0(1), x_0(2), \dots, x_0(m)) \quad (3)$$

(3). The indicator data series are dimensionless with the correlation operator (or not), and the dimensionless data series form the following matrix:

$$(X'_0, X'_1, \dots, X'_m) = \begin{pmatrix} x'_0(1), x'_1(1), \dots, x'_m(1) \\ x'_0(2), x'_1(2), \dots, x'_m(2) \\ \dots, \dots, \dots, \dots \\ x'_0(n), x'_1(n), \dots, x'_m(n) \end{pmatrix} \quad (4)$$

(4). Calculate the absolute difference between the index series of each evaluated object and the corresponding element of the reference series one by one, i.e $\Delta_i(k) = |x'_0(k) - x'_i(k); k = 1, \dots, n; i = 1, \dots, m$.

(5). Determination $M = \min_{i=1} \min_{k=1} m |x'_0(k) - x'_i(k)|$ with $m = \max_{i=1} \max_{k=1} m |x'_0(k) - x'_i(k)|$.

(6). Calculation of correlation coefficient

The correlation coefficients of each comparison sequence and the corresponding elements of the reference sequence are calculated separately.

$$r(x'_0(k), x'_i(k)) = \frac{m + \xi \cdot M}{\Delta_i(k) + \xi \cdot M} \quad (5)$$

$$k = 1, \dots, n \quad (6)$$

where ξ is the discrimination coefficient and takes values within (0, 1). The smaller ξ is, the greater the difference

between the correlation coefficients and the greater the discrimination ability. Usually ξ is taken as 0.5.

(7). Calculate the correlation degree:

$$r(X_0, X_i) = \frac{1}{n} \sum_{k=1}^n r_{0i}(k) \quad (7)$$

(8). Based on the correlation order of each observation, the comprehensive evaluation results were derived.

3 Evaluation of a city's coordinated green city development

3.1 Data Acquisition

According to the green city index system of a city designed in the previous paper, 32 variables were selected for the study [9]. The sample interval was set at 2004-2008, taking in account the availability, feasibility, and validity

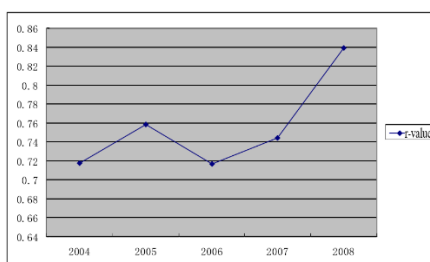


Fig. 2. r-value trend from 2004-2008.

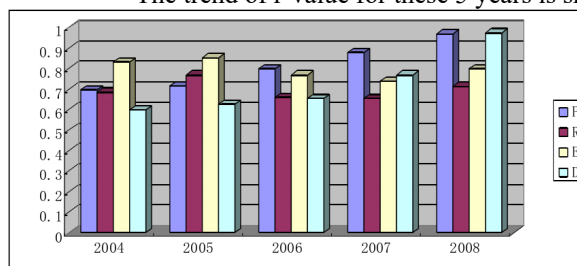


Fig. 3. Schematic diagram of r values for each year from 2004 to 2008

3.2.2 A specific study on strategic measures for green city construction

Conserving resources and advocating green consumption In terms of conserving resources, the Xiamen Taiwanese Investment Zone can be considered a great example. In order to protect the environment and save land use, we have seized the opportunity to make bold innovations, set up a new concept of "green management" in accordance with the requirements of an environmentally friendly high-tech industrial zone, make every effort to build a "green industrial zone", and gradually realize the environmental management mode of the industrial zone in development in line with international standards. In terms of consumption, buy less disposable products, such as disposable plastic bags, plastic cups and plates, and hotels try not to provide disposable toiletries.

4. Conclusion

This paper uses spss data analysis basis, then based on urban PRED theory, green city theory and gray correlation analysis method to make an analysis and evaluation of the development of a city green city, its evaluation conclusions are as follows: A feasible path choice for a city's green city development is derived, namely, the need to take the path of sustainable development of resources and environment, change the mode of economic growth, and develop a circular economy and low-carbon economy. Resource-saving society refers to the adoption of comprehensive legal, economic and administrative measures in the fields of production, distribution and consumption to improve the efficiency of resource

of the sample. The statistics are from the official "Yearbook of a Special Economic Zone of a City".

3.2 Evaluation results and analysis

3.2.1. Evaluation results.

From the results of the above model, the mean values of the correlation coefficients (correlations) for each indicator can be obtained from 2004 to 2008:

$$\begin{aligned} r_{2004} &= 0.7175, & r_{2005} &= 0.7583, & r_{2006} &= 0.7170, & r_{2007} &= 0.7439, & r_{2008} &= 0.8394 \end{aligned}$$

$$r_{2008} > r_{2005} > r_{2007} > r_{2004} > r_{2006}$$

The trend of r-value for these 5 years is shown below:

utilization, obtain the maximum economic and social benefits with the least consumption of resources, and guarantee sustainable economic and social development [10]. The following approaches can be used as the basis and guiding theoretical foundation for development Transforming economic growth, developing a circular economy, transforming economic growth, developing a low-carbon economy, conserving and using resources, advocating green consumption, promoting the 4R principle, developing a circular economy, increasing environmental protection publicity, and launching a green city creativity competition.

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