

Social Development Evaluation Index System Construct a Comprehensive Evaluation

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Abstract

Chairman Xi Jinping of the Nineteenth National Congress pointed out that the main contradiction in our country in the new era has become "the contradiction between the people's pursuit of a better life and unbalanced and insufficient development." A comprehensive, scientific and systematic evaluation of the development of our society is an urgent task. In this paper, a total of 31 social development related indicators in four categories are selected, including economic structure, quality of life, social security and cultural quality, and the factor scores are obtained after factor analysis of the secondary indicators of four categories. The comprehensive evaluation method was used to calculate the comprehensive score and ranking of social development for the four types of first-level indicators, and the social development situation and ranking results of various provinces and cities were analyzed, and suggestions were given from the aspects of economic structure, quality of life, social security, and cultural quality.

Keywords

Social Development Indicators; Factor Analysis; Comprehensive Evaluation.

1. Introduction

On December 8, 2019, a patient from Huanan Seafood Market was admitted to hospital for seven days of fever, cough and difficulty breathing, and an outbreak of a virus that could infect tens of thousands of people began. The virus, known as the "novel coronavirus" is transmitted through the respiratory tract and has a damaging effect on lung cells, causing dyspnea and hypoxemia. The incubation period of COVID-19 is 1-14 days, and the case fatality rate is high in the elderly population. As of January 19, 2022, more than 136000 cases have been confirmed in China, which is a black swan event with serious harm - China's large and medium-sized enterprises have been affected, the start of construction has been delayed, and funds have been funded. The chain is threatened; on the one hand, agricultural products are facing the threat of slow sales, on the other hand, prices in large and medium-sized cities are rising; ordinary people cannot buy basic protective materials, and manufacturers of fake and shoddy masks take the opportunity to make money in the country; some people have a weak awareness of disease prevention and control, patients conceal their diseases, and people obstruct the epidemic prevention work frequently; a series of phenomena such as the extreme shortage of medical supplies in hospitals in various provinces and cities have given a big test to various cities in China. In the face of the epidemic, the level of governance in various provinces and cities is far less glamorous than the usual economic data. Even if it is the second largest country in the world economically, despite the high cohesion of the Chinese nation in the face of disasters and the institutional advantage of concentrating its efforts on major events, China's provinces and cities are still insufficient in some aspects of social development, such as public governance, social security, and the cultural quality of residents. It is of great significance to create a social development evaluation index system that better represents social development and residents' lives to help the government and people face the crisis more rationally, have a higher level of urban governance, and make the social atmosphere more harmonious.

Social development is the ultimate goal of a country's economic construction, is the foundation and guarantee of people's living standards and quality, social development not only covers economic growth, but also includes politics, culture, education, social security, medical and health, environmental protection and other aspects. China has maintained an economic growth rate of 10% all year round, and even if the economic growth rate has slowed down in recent years, it is still more than 6%, but the society has not developed synchronously - the income gap between urban and rural residents has widened, environmental pollution has become more serious, the aging problem is severe, and the distribution of educational resources is uneven. The basis for solving the above problems is to weigh social development and find out the factors that restrict social development. China has established many social development evaluation systems to assess and guide economic and social construction. The setting of social development evaluation indicators should be comprehensive, wide coverage, strong representativeness, and to maintain the stability of the evaluation index system, this paper selects four types of social development evaluation indicators based on the principle of integrity, the principle of combining science and feasibility, the principle of comparability and the principle of orientation.

The main research content of this paper includes the introduction of the theoretical basis of factor analysis and analytic hierarchy method, the use of factor analysis and comprehensive evaluation methods to process the social development evaluation indicators of various provinces and cities, and the comprehensive ranking, and finally make conclusions and suggestions.

2. Literature Review

2.1. Foreign Social Development Indicator System

A typical Human Development Index (HDI) assessment and evaluation index system constructed by the United Nations is used to measure the degree of economic and social development of countries around the world, mainly including three basic indicators: life expectancy, adult literacy rate, and actual per capita GDP. The United Nations Development Programme calculates once a year and evaluates and ranks the level of economic and social development in the world. Compared with GDP per capita, the Human Development Index takes into account the achievements of social and cultural development, and the data are easy to obtain and calculate, which has become the main indicator for calculating the level of social development in various countries in the world.

The Social Progress Index (ASHA) is developed by the American Health Association to measure social welfare and quality of living. It consists mainly of six indicators: GDP per capita, employment rate, literacy rate, average life expectancy, birth rate, and infant mortality rate. It includes not only relevant indicators for economic development, but also the employment rate of whether a country's labor force is fully utilized, the literacy rate reflecting the cultural quality of the population, and the average life expectancy and infant mortality rate in terms of health and health. Concise and concise, it facilitates comparative studies between countries.

In 1996, the United Kingdom released the UK Indicators of Social Development, which is based on the concept of sustainable development, and selects 15 headline indicators for comprehensive evaluation, covering the three aspects of sustainable economic growth, promoting social progress and environmental protection. Its advantage is that it takes into account the efficiency of social development and pays attention to coordination and balance.

2.2. Domestic Social Development Indicator System

The national bureau of statistics research group has constructed a set of social development indicator systems covering multiple categories such as natural environment, population and

family, residents' income and consumption, and labor insurance. The development and reform departments are responsible for organizing and compiling the annual social development indicator plan, including the core areas of social development and the equalization of public services; the key indicators of social development are mainly population indicators, which are important indicators to measure the comprehensive strength of national economic and social development and the level of per capita development; followed by indicators in key areas of social development, mainly education, medical and health, culture and sports, social welfare and quality of life, mainly used to measure the state's ability and level of providing basic public services. The advantage of this indicator is that there is a consistent measurement system, which facilitates horizontal comparison between regions and longitudinal comparison within each region.

2.3. The System of Indicators for Social Development Proposed by Scholars

Zhang Xuewen and Ye Yuanxu(2002)proposed the regional sustainable development three-dimensional evaluation system "Factor Relationship - Functional State - Development Ability", and built a regional sustainable development evaluation index system on this basis [1];Li Chuying, Li Zhanjiang (2017) through dynamic clustering and factor analysis, the nine indicators with the lowest information overlap rate and the largest amount of information were selected as social development evaluation indicators from the two criteria layers of social equity and social interest protection [2]; Meng Bin, Kuang Haibo, Luo Jiaqi(2018) based on the Gini index and partial correlation analysis, the social development evaluation index system covering 98.7% of the original information was screened out from the four aspects of economic development, social and people's livelihood, scientific and technological progress, and resources and environment, and the rationality of constructing the above indicators was verified from the practical and theoretical levels [3].

3. The Construction and Measurement of the Social Development Indicator System

3.1. Selection of Indicators

Based on the existing high-frequency indicator system identified by international and domestic authoritative institutions, four types of first-level indicators are selected, namely: social structure, quality of life, social security, and cultural quality. Its breakdown metrics are shown in Table

social structure. Social structure refers to the sum of social relations, including family structure, social organization structure, urban and rural structure, employment or division of labor structure, urban and rural structure, regional structure, etc. Here, eight indicators are mainly selected: GDP per capita, total fixed investment, the proportion of tertiary industry output value to total output value, unemployment rate, the proportion of R&D expenditure of industrial enterprises above designated size to regional GDP, the number of invention patent applications, the number of utility model patent applications, and the number of design patent applications to express the social structure.

quality of life. The quality of life can express the material living standards and spiritual life of residents. This paper uses the total per capita deposit, per capita disposable income of urban residents, per capita net income of rural residents, consumption expenditure of urban residents, and consumption expenditure of rural residents to express the material living conditions of urban and rural residents; the urbanization rate shows the difference between urban and rural residents; the penetration rate of mobile phones, the number of broadband users per thousand people, and the number of public transportation vehicles per 10,000 people to reflect the consumption of public facilities in the whole province.

Table 1. Social Development Indicator System

Level 1 indicators	Secondary indicators	English name
social structure	GDP per capita in RMB	gdp
	Total fixed investment (RMB100 million)	I
	The output value of the tertiary industry accounts for the proportion (%) of the total output value	teri_ratio
	Unemployment rate (%)	uem
	The proportion of R&D expenditure of industrial enterprises above designated size to the regional GDP (%)	R_D
	Number of invention patent applications (items)	invent
	Number of utility model patent applications (items)	Useful
	Number of design patent applications (items)	apper
quality of life	Consumption expenditure of urban residents (RMB)	urban_cons
	Consumption Expenditure of Rural Residents (RMB)	rural_cons
	Per capita disposable income of urban residents (yuan).	urban_inc
	Per capita net income of rural residents (RMB)	rural_inc
	Urbanization rate	ubaniz_ratio
	Mobile phone penetration rate (%)	mobile
	Broadband subscribers per 1,000 people (households)	bro_band
	There are public transport vehicles (standard stations) per 10,000 people	trans
	Total deposits per capita (10,000 RMB)	per_depo
social security	Pension insurance participation rate (%)	endo_insu
	Medicare coverage rate (%)	medi_insu
	Unemployment insurance coverage (%)	unem_insu
	Number of health technicians per 10,000 people (persons).	medi_person
	Number of beds per 10,000 people in medical institutions	bed
	Local financial medical and health expenditure (100 million yuan).	medi_expen
	Emergency case fatality rate (%) in health care facilities	er_dead
	The number of admissions (persons) per 100 emergency departments per health facility	in_hospi
Cultural qualities	Number of regular high schools (places)	college
	The proportion of education expenditure to fiscal expenditure	edu_ratio
	Per capita public library holdings (volumes/person).	perbook
	Number of performances by performing arts groups (10,000).	show
	Local financial expenditure on science and technology (100 million yuan).	tech_expen
	Natural population growth rate (‰).	popu_incre

social security. Social security reflects the government's obligation to provide facilities and take measures to protect the basic survival and development of vulnerable groups. It mainly includes basic insurance such as pension insurance participation rate, medical insurance participation rate, unemployment insurance coverage rate, etc.; it also includes medical

resource related indicators such as the number of health technicians per 10,000 people, the number of beds in medical institutions per 10,000 people in the city, medical and health expenditure, the emergency case fatality rate, and the number of hospital admissions per 100 emergency departments.

Cultural qualities. On the one hand, cultural quality reflects the soft power of a country, and on the other hand, it helps the people to be healthy and improve national cohesion. It mainly uses six indicators, including the number of ordinary colleges and universities, the proportion of education funds to financial expenditures, the per capita collection of public libraries, the number of performances by art performance groups, local financial expenditure on science and technology, and the natural growth rate of the population.

3.2. Data Collection

Urbanization rate = urban population (10,000 people)/ year-end permanent population (10,000 people);

Mobile phone penetration: Given the availability of data, 3G mobile phone subscribers (10,000 households) are adopted;

The proportion of R&D expenditure of industrial enterprises above designated size to regional GDP = R&D expenditure of industrial enterprises above designated size / regional GDP, data from the National Bureau of Statistics;

The participation rate of pension insurance = the number of urban workers participating in pension insurance (10,000 people) / the permanent population at the end of the year (10,000 people), calculated by the data of the National Bureau of Statistics;

The medical insurance participation rate = the number of urban workers participating in medical insurance (10,000 people) / the permanent population at the end of the year (10,000 people), calculated by the data of the National Bureau of Statistics;

Unemployment insurance participation rate = the number of urban workers participating in unemployment insurance (10,000 people) / the permanent population at the end of the year (10,000 people), calculated by the data of the National Bureau of Statistics;

Other indicators are available through the National Statistical Office and the Choice Database.

3.3. Data Processing

Since the units and dimensions of social development indicators are different, which may affect our screening of social development indicators, the data are standardized first.

(1) Standardized treatment of positive indicators. The larger the value of the positive indicator, the better the social development situation. Set P_{ij} the normalized value of the j th indicator for the i th IN_{ij} province; the j th for the i th province. The raw data of the indicator, n is 31 provinces; the standardized formula is as follows:

$$P_{ij} = \frac{IN_{ij} - \min_{1 \leq k \leq n} IN_{kj}}{\max_{1 \leq k \leq n} IN_{kj} - \min_{1 \leq k \leq n} IN_{kj}} \times 60 + 40 \tag{1}$$

(2) Normalization of negative indicators. The smaller the negative indicator value, the better the social development situation. Its symbol is the same as equation (1), the standardized formula is as follows:

$$P_{ij} = \frac{\max_{1 \leq k \leq n} IN_{kj} - IN_{ij}}{\max_{1 \leq k \leq n} IN_{kj} - \min_{1 \leq k \leq n} IN_{kj}} \times 60 + 40 \tag{2}$$

3.4. Descriptive Statistics of Data

Table 2. Variable names and statistical descriptions

index	Sample size	minimum	median	mean	maximum	standard deviation
gdp	31	28497.00	49558.00	60856.00	128994.00	27573.46
I	31	1976.00	17537.00	20517.00	55203.00	14655.78
teri_ratio	31	0.42	0.49	0.50	0.81	0.08
uem	31	1.40	3.30	3.18	4.20	0.64
R_D	31	11.64	14.95	17.01	57.54	8.16
Invent	31	273.00	20500.00	39793.00	187005.00	48621.32
Useful	31	652.00	33073.00	53933.00	283564.00	66559.05
apper	31	172.00	7826.00	19605.00	161631.00	35385.97
urban_cons	31	19552.00	25593.00	29453.00	57507.00	9790.69
rural_cons	31	6676.00	11848.00	13710.00	26755.00	5762.57
urban_inc	31	27446.00	30996.00	34976.00	62596.00	9023.48
rural_inc	31	8076.00	12758.00	14000.00	27825.00	4807.47
ubaniz_ratio	31	0.31	0.57	0.59	0.88	0.12
mobile	31	67.20	356.30	434.30	1366.80	299.93
bro_band	31	61.20	872.90	1124.30	3246.80	865.97
trans	31	9.74	13.94	14.10	26.55	3.29
per_depo	31	5.71	8.77	12.85	63.54	12.08
endo_insu	31	0.12	0.26	0.29	0.74	0.14
medi_insu	31	0.21	0.92	0.78	1.09	0.26
unem_insu	31	0.05	0.10	0.14	0.54	0.11
medi_person	31	49.00	63.00	65.87	113.00	11.72
bed	31	43.94	57.24	57.08	68.54	7.51
medi_expen	31	93.80	420.40	462.70	1307.60	265.33
er_dead	31	0.00	0.10	0.09	0.40	0.08
in_hospi	31	2.00	5.00	4.94	9.00	1.77
college	31	7.00	81.00	84.87	167.00	41.55
edu_ratio	31	0.11	0.20	0.20	0.25	0.03
perbook	31	0.30	0.57	0.75	3.21	0.53
show	31	0.39	5.60	9.46	64.68	15.52
tech_expen	31	8.49	79.34	143.23	823.89	171.48
popu_incre	31	-0.44	6.19	5.98	11.40	3.14

From Table 2, we can see, per capita GDP and fixed asset investment changes in a large range, indicating that there is a large gap in the economic level between provinces; Proportion of R&D expenditure unusually significant, the minimum value is 11.64%, the maximum value is 57.54%. In some provinces, the intensity of research and development is too small, which may affect sustained economic growth. The number of patent applications for the three types also varies greatly between provinces, and the standard deviation is: 48621.32, 66559.05, 35385.97. Whether it is the per capita income of urban and rural areas or the standard difference between urban and rural consumption, it is very large, and there is an outlier value, and the consumption and disposable income of urban residents have a large outlier value, and the details can be found in the chart of Appendix 1. The urbanization rate varies greatly, and the minimum value is 0.31, the maximum value is 0.88. This shows that some provinces have achieved

modernization and some provinces are lagging behind. Per capita deposits vary greatly between provinces, with a minimum value 5.71, the maximum value is 63.54, the standard deviation is 12.08. The medical insurance coverage rate and the unemployment insurance coverage rate are quite different, and the ratio of the maximum to minimum values of the two indicators is large 6.17 and 10.8. This shows that the public services provided by the governments of some provinces are far from enough, and it is difficult to ensure the basic livelihood of residents. The greatest difference in local financial health expenditure is achievable 14-fold. The cultural quality of each province varies significantly, with the minimum and maximum values of the number of ordinary institutions of higher learning being respective 7,167. This shows that the serious imbalance in the distribution of educational resources will widen the gap between the rich and the poor between regions, and the talent structure will be unreasonable, which will also affect the satisfaction of residents with society. Additional descriptive statistics can be found in Appendix 1.

3.5. Factor Analysis

(1) The purpose of factor analysis. The factor analysis of the four types of indicators is carried out separately, and the indicators with the largest load are selected as the representative indicators of specific classes.

(2) The basic model of factor analysis. let $X = (X_1, X_2, \dots, X_p)^T$ is an observable random vector, and

$$E(X) = \mu = (\mu_1, \mu_2, \dots, \mu_p)^T, \quad Var(X) = \Sigma = (\sigma_{ij})_{p \times p}$$

The model for factor analysis is

$$\begin{cases} X_1 - \mu = a_{11}f_1 + a_{12}f_2 + \dots + a_{1m}f_m + \varepsilon_1 \\ X_2 - \mu = a_{21}f_1 + a_{22}f_2 + \dots + a_{2m}f_m + \varepsilon_2 \\ \dots \\ X_p - \mu = a_{p1}f_1 + a_{p2}f_2 + \dots + a_{pm}f_m + \varepsilon_p \end{cases} \quad (3)$$

where $f_1, f_2, \dots, f_m (m < p)$ common factors, special $\varepsilon_1, \varepsilon_2, \dots, \varepsilon_p$ factors, they are non-observable random variables, common factors appear in the expression of f_1, f_2, \dots, f_m each original variable, $X_i (i = 1, 2, \dots, p)$ can be understood as the original variables have a common factor, special factors represent the $\varepsilon_1, \varepsilon_2, \dots, \varepsilon_p$ original variable i in addition to the X_i common factors of the special factors, special factors have an effect only on that original variable. Write the (5.2.1) equation as a matrix

$$X = \mu + AF + \varepsilon \quad (4)$$

Among them $F = (f_1, f_2, \dots, f_m)^T$ are the common factor vectors, $\varepsilon = (\varepsilon_1, \varepsilon_2, \dots, \varepsilon_p)^T$ the special factor vectors, and the factor load $A = (a_{ij})_{p \times m}$ matrix. It is usually assumed

$$E(F) = 0, \quad Var(F) = I_m \quad (5)$$

$$E(\varepsilon) = 0, \quad Var(\varepsilon) = D = diag(\sigma_1^2, \sigma_2^2, \dots, \sigma_p^2) \quad (6)$$

$$Cov(F, \varepsilon) = 0 \quad (7)$$

From the above assumptions, it can be seen that common factors are not related to each other and have a square matrix of units, and special factors are not related to each other and are not related to common factors.

Table 3. Factor scores for various indicators

province	Social Structure Score	Quality of life score	Social Security scores	Cultural quality score
Beijing	1.4890	1.6481	1.8372	0.1786
Tianjin Municipality	0.1233	0.8175	-0.3959	-0.5767
Hebei Province	-0.3442	-0.1868	-0.2033	0.0892
Shanxi Province	-0.4243	-0.3905	-0.2873	-0.1555
Inner Mongolia Autonomous Region	-0.3883	-0.1185	0.0761	-0.6595
Liaoning Province	-0.3702	0.0668	0.3638	-0.5755
Jilin Province	-0.4417	-0.5001	-0.3309	-0.8513
Heilongjiang Province	-0.4762	-0.3457	0.3825	-0.9239
Shanghai	0.3358	1.6973	0.8366	0.1871
Jiangsu Province	1.4262	1.2304	0.3426	0.7490
Zhejiang Province	0.9922	1.2183	0.5518	0.9862
Anhui Province	0.0696	-0.2867	-0.9523	0.8777
Fujian Province	-0.0864	0.3101	-0.4783	0.2879
Jiangxi Province	-0.3193	-0.3079	-0.5302	0.1348
Shandong Province	0.3218	0.5311	0.4099	0.8290
Henan Province	0.0247	-0.1530	0.1119	0.7610
Hubei Province	0.0982	-0.0950	0.3384	0.2231
Hunan Province	-0.2676	-0.1764	0.1631	0.0270
Guangdong Province	1.7219	0.8061	0.2862	1.7086
Guangxi Zhuang Autonomous Region	-0.1051	-0.4784	-0.4779	0.0712
Hainan	-0.1240	-0.3476	-0.8325	-0.2867
Chongqing Municipality	-0.2135	-0.1603	0.4596	-0.3019
Sichuan Province	-0.0503	-0.1030	0.4857	-0.1194
Guizhou Province	-0.4140	-0.6411	-0.3193	-0.0498
Yunnan Province	-0.3900	-0.5618	-0.4232	-0.1326
Tibet Autonomous Region	-0.3529	-0.9222	-1.4516	-0.6610
Shaanxi Province	-0.1711	-0.3769	0.0746	-0.1700
Gansu Province	-0.2785	-0.7630	-0.4082	-0.3730
Qinghai Province	-0.4790	-0.5847	0.1914	-0.6637
Ningxia Hui Autonomous Region	-0.5954	-0.4375	0.0631	-0.4795
Xinjiang Uygur Autonomous Region	-0.3106	-0.3885	0.1166	-0.1305

The factor analysis of four types of indicators is carried out separately, each type of index takes the first three factors, and the variance contribution rate of each factor is weighted, and the comprehensive factor score is obtained by the linear combination of each factor:

$$F = \frac{\lambda_1 F_1 + \lambda_2 F_2 + \lambda_3 F_3}{\lambda_1 + \lambda_2 + \lambda_3} \quad (8)$$

Here, λ_i contribute to the variance of the factor before or after rotation. The calculation results are shown in Table 3.

From the above results we know that in class one, that is, in social structure, factor 1 has a large load on total fixed investment, invention patents, utility models and appearance designs, that is: 0.8256, 0.9085, 0.9609, 0.9146; Factor 2 has a large load on per capita GDP and the proportion of tertiary industry, respectively: 0.8451, 0.9234. Factor 3 has a larger load on unemployment rate and the proportion of R_D expenditure, which are: 0.9725, 0.7825. On the whole, Guangdong Province ranked first, followed by Beijing, Jiangsu Province, Zhejiang Province and Shanghai Municipality, indicating that Guangdong Province is relatively strong in economic structure, regional structure and R&D innovation. Shanxi Province, Jilin Province, Heilongjiang Province, Qinghai Province and Ningxia ranked last 5 name.

In class two, that is, in terms of quality of life, factor 1 is relatively large in terms of urban and rural residents' consumption and disposable income, as well as the urbanization rate, which are: 0.9297, 0.931, 0.9121, 0.9437. Factor 2 is large in the number of 3G mobile phone households and the number of broadband users per 10,000 people, which is: 0.9011, 0.9163. Factor 3 has the highest load of 0.7063 per 10,000 people with public transport vehicles. On the whole, Shanghai and Beijing ranked in the top two, followed by Jiangsu Province, Zhejiang Province and Tianjin Municipality, indicating that the quality of life of residents in these five provinces is higher; Yunnan Province, Qinghai Province, Guizhou Province, Gansu Province, and Tibet Autonomous Region ranked in the last 5 places, and the quality of life of their residents needs to be improved.

In class three, that is, in terms of social security, factor 1 has a large load on the pension insurance participation rate, unemployment insurance participation rate and the number of health technicians per 10,000 people, which are: 0.9538, 0.9472, 0.893; The load of factor 2 on the number of beds per 10,000 people in medical institutions was 0.9082, and factor 3 is larger in the medical insurance participation rate and local financial health expenditure, which is 0.8172 and 0.815. On the whole, Beijing, Shanghai, Jiangsu, Sichuan and Chongqing ranked in the top 5, indicating that the social security work in these 5 provinces was doing better; Fujian Province, Jiangxi Province, Hainan Province, Anhui Province, and Tibet Autonomous Region had the worst social security.

In class four, that is, in terms of cultural quality, factor 1 has a large load on the number of ordinary colleges and universities and the proportion of education funds in financial expenditure, which is 0.8789 and 0.8569; factor 2 has a public library collection per capita and the local financial science and technology expenditure load is larger, those are 0.8361 and 0.825; factor 3 in the natural population growth rate load of 0.9896. On the whole, Guangdong Province, Zhejiang Province, Anhui Province, Shandong Province and Henan Province scored higher in terms of cultural quality, ranking in the top 5, and inner Mongolia Autonomous Region, Tibet Autonomous Region, Qinghai Province, Jilin Province and Heilongjiang Province had the lowest cultural quality scores.

3.6. Comprehensive Analysis

In order to conduct an overall evaluation of each province and city, the multi-index comprehensive evaluation method is used to synthesize four types of first-level indicators into one indicator. The synthesis method adopts the weighted arithmetic averaging method, and the weights of each indicator are obtained through the analytic hierarchy method.

(1) First, the four types of first-level indicators are scored, and the scoring matrix constructed is as follows;

Table 4. Social Development Indicators Judgment Matrix

	social structure	quality of life	social security	Cultural qualities
social structure	1	1/5	1/7	1/3
quality of life	5	1	1/3	3
social security	7	3	1	5
Cultural qualities	3	1/3	1/5	1

(2) Calculate the weights according to the weight matrix. Using the sorting principle, the geometric average of each row is obtained, and then the weight of importance of each evaluation index is calculated, and the calculation formula is

$$\bar{a}_i = \sqrt[4]{a_{i1}a_{i2}a_{i3}a_{i4}}$$

$$\omega_i = \frac{\bar{a}_i}{\sum_{i=1}^4 \bar{a}_i}, i = 1,2,3,4$$

The weight vector obtained from the above formula is $\omega = (0.055,0.2634,0.5638,0.1178)$.

Perform a consistency check on the judgment matrix. The judgment matrix A:CI=0.039, CR=0.0433, passed $\lambda_{max} = 4.117$ the consistency test. The weights and consistency metrics of each metric are, in order:

Table 5. Weights and consistency test results of each indicator

social structure	quality of life	social security	Cultural qualities	THERE	CR	L
0.055	0.2634	0.5638	0.1178	0.039	0.0433	4.117

(3) Calculate the overall score. The above weights are substituted into the four types of first-level indicator scores to the comprehensive score, and the calculation formula is

$$S_i = \sum_{j=1}^4 \omega_j Z_{ij}$$

ω_j Represents the weight of the class j Z_{ij} indicator, representing the class j score of the ith province. Substitute the above formula into the raw data to obtain a comprehensive score table, as shown in Table 6.

From Table 6 it can be seen that Beijing ranks first, indicating that Beijing has the highest degree of social development, and from the classification score, we also know that Beijing ranks in the top two in each type of indicator. It is followed by Shanghai Municipality, which ranks second, Zhejiang and Jiangsu are third and fourth, and Guangdong ranks fifth, because Guangdong Ranks Lower in the quality of life and social security categories, and these two types of indicators have the largest weight, resulting in Guangdong Province ranking fifth overall. Jilin Province, Gansu Province, Anhui Province, Hainan Province, and Tibet Autonomous Region ranked fifth from the bottom, and Anhui Province ranked first in the fields of social structure, social security, and cultural quality, there are 8th,17th,and 3rd,and because the quality of life ranked too low, it ranked 30th, resulting in the third to last overall ranking Hainan Province

ranks around 20th in various indicators, and because some provinces score higher on the two types of indicators with higher weights, quality of life and social security, and higher than the score of Hainan Province after weighting, Hainan Province ranks second from the bottom; the Tibet Autonomous Region has the lowest score in quality of life and social security, ranking last, so it ranks last place in the comprehensive ranking.

Table 6. Comprehensive scores and rankings of provinces and municipalities

province	Overall score	ranking
Beijing	1.5728	1
Tianjin Municipality	-0.0690	15
Hebei Province	-0.1723	21
Shanxi Province	-0.3065	22
Inner Mongolia Autonomous Region	-0.0874	17
Liaoning Province	0.1345	10
Jilin Province	-0.4429	27
Heilongjiang Province	-0.0104	13
Shanghai	0.9593	2
Jiangsu Province	0.6839	4
Zhejiang Province	0.8027	3
Anhui Province	-0.5052	29
Fujian Province	-0.1589	19
Jiangxi Province	-0.3817	24
Shandong Province	0.4864	6
Henan Province	0.1138	11
Hubei Province	0.1974	8
Hunan Province	0.0339	12
Guangdong Province	0.6697	5
Guangxi Zhuang Autonomous Region	-0.3929	25
Hainan	-0.6015	30
Chongqing Municipality	0.1696	9
Sichuan Province	0.2299	7
Guizhou Province	-0.3775	23
Yunnan Province	-0.4237	26
Tibet Autonomous Region	-1.1586	31
Shaanxi Province	-0.0866	16
Gansu Province	-0.4903	28
Qinghai Province	-0.1506	18
Ningxia Hui Autonomous Region	-0.1689	20
Xinjiang Uygur Autonomous Region	-0.0690	14

4. Conclusions and Recommendations

Through factor analysis and comprehensive evaluation methods, this paper obtained the ranking of 31 provinces and cities in 2017, Beijing, Shanghai, Zhejiang, Jiangsu and Guangdong ranked in the top five, while Jilin Province, Gansu Province, Anhui Province, Hainan Province, and Tibet Autonomous Region ranked last in the fifth place, and there was a certain gap

between provinces and cities in terms of economic structure, quality of life, social security and cultural quality, and the level of social development was quite different.

Through factor analysis and comprehensive evaluation methods, the following suggestions are made for each province and city:

1. For provinces with low scores in social structure, the government should mainly focus on economic construction, increase investment, improve the investment environment, and promote economic growth; second, it should encourage enterprises to carry out research and development innovation, appropriately provide tax reductions and exemptions, investment subsidies and other measures, and stimulate the enthusiasm of enterprises in research and development.
2. For provinces with low quality of life scores, we should focus on improving social public governance, guiding governments or organizations to pay attention to successful practical innovation, paying attention to major livelihood problems, and taking this as the guide to reform Entering the level of government public management services, improving the quality of public management services, and thus playing an important role in improving the path of economic and social development and improving and improving public management policies.
3. For provinces with low social security scores, the government should work the education, medical care, and pension systems to solve the problem of insufficient supply of public facilities and services, accelerate the solution of the problem of quality and quantity of basic public services in rural areas, and pay close attention to the basic demands of the people. Establish an emergency management system for major events, carry out production and life in an orderly manner after the emergence of black swan events, ensure the normal operation of functions such as water and electricity, gasoline, and communication networks, smooth the procurement chain of basic materials for the masses, and crack down on acts that endanger social public safety and disrupt social public order, so as to maintain the operation of a good society.
4. For provinces with low cultural quality scores, the government should ensure that educational resources tend to rural areas, ensure that rural prosthetic children have access to relatively fair educational resources, regularly carry out cultural activities, encourage residents and the masses to read more books, read good books, and hold reading exchange activities, share reading experience, and subtly improve the cultural quality of residents.

References

- [1] ZHANG Xuewen, YE Yuanxu A Preliminary Study on the Theory of Three-dimensional Systematic Evaluation of Regional Sustainable Development[J]. Journal of Quantitative and Technical Economics, 2002(07):57-60.
- [2] MENG Bin, KUANG Haibo, LUO Jiaqi Screening model and application of economic and social development evaluation index based on significant differences[J]. Journal of Scientific Research Management, 2018, 39(11):17-26.
- [3] Chi Guotai, Cao Tingting, Zhang Kun. Based on correlation-Construct a system of evaluation indicators for the comprehensive development of human beings in principal component analysis [J]. Systems Engineering Theory and Practice, 2012, 32(01):111-119.
- [4] FAN Xuan-li, BAI Yan-juan, HE Zhong-wei, LIU Fang Research on the Construction of Regional Economic and Social Development Evaluation Index System[J]. Science and Technology and Industry, 2016, 16(06):33-36 .
- [5] Mao Lin. Measurement method and evidence of social development level process[J]. Journal of Chongqing Technology and Business University (Natural Science Edition), 2011, 28(06): 590-593.
- [6] HU Jian, ZHANG Weiqun, XING Fang, GENG Hongqiang Research on the Measurement and Evaluation of the Economic and Social Development Level of the "Belt and Road" Countries: An

Analysis Based on the Indicator Data of 64 Countries Along the Silk Road[J]. Statistics and Information Forum, 2018, 33(06): 43-53.

- [7] Dai Jinhui, Ma Shucai, Liu Hongyan Construction and evaluation of statistical index system for social development level [J]. Statistics and Decision, 2018, 34(01): 30-33.
- [8] Li Chuying, Li Zhanjiang Construction model of social development evaluation index based on dynamic clustering-factor analysis [J]. Mathematics in Practice and Cognition, 2017, 47(16): 47-60.