Pisco Med Publishing

Ecological Protection Model Based on Saihanba Forest Farm

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Abstract: In order to protect the environment, restore nature and implement the sustainable development strategy, this paper establishes a comprehensive evaluation model according to the ecological protection model of Saihanba desert oasis, analyzes and evaluates the anti sandstorm in Beijing, China and the Asia Pacific region, and finally determines the city to establish the ecological protection zone.

Keywords: Saihan Dam; Ecological Protection; Analytic Hierarchy Process; Comparative Discrimination; Linear Regression; SPSS

Question background

In society, people have deeply felt the problems of resources and environmental problems, and the protection and development of forest resources has become the theme of global environmental issues.The construction of forestry ecological engineering is to improve and optimize the ecological environment, improve the quality of people's life, and achieve sustainable development.The changes of the ecological environment in Saihanba for more than half a century confirm the law of the relationship between man and nature: " Man is born because of nature, man and nature is a symbiotic relationship, and the harm to nature will eventually hurt human itself.Only by respecting the laws of nature can we effectively prevent detours in the development and utilization of nature.Therefore, the study of the ecological environment is of great significance.

Problem analysis

Understanding the construction evaluation index and evaluation model of Saihanba ecological environment is the key to solve the problem.

We select the Saihanba Ecological Environment Construction Evaluation Index System (ECCI): the primary index is the Ecological Environment Construction Index (ECI); the secondary index improves the original environmental conditions and gives the new environmental conditions; the tertiary index is vegetation coverage, annual evaporation, annual precipitation, carbon fixation value, species diversity, etc.

After the evaluation index is determined, it is more difficult to evaluate with the original index data.Because in the evaluation index system of ecological environment construction, each index unit has different influence on Saihanba ecological environment construction, which is not comparable.Therefore, the weight of each index and the score of ecological environment construction is conducive to the evaluation and calculation of ecological environment construction data.

Then, based on the score obtained, the ecological environmental impact before and after Saihanba recovery was obtained.

Model establishment, solution, and testing

1. Selection and establishment of evaluation indicators

The selection of ecological environment construction indicators and the establishment of the evaluation system are not only the embodiment of the connotation of the provincial ecological environment, but also the measure of the effectiveness of the ecological environment construction planning and construction of Saihanba. Based on the above principles, the main component analysis method was adopted to construct the evaluation index system of Saihanba ecological environment construction.Principal component analysis (Principal Component Analysis) is the idea of dimension reduction, multiple variables into a few comprehensive variables (i. e. principal component), each principal component is a linear combination of the original variables, the principal components are not related to each other, so these principal components can reflect the information of the starting variable, and the information does not overlap.

Table 1 Evaluation index system of Saihanba Ecological Environment Construction

Year	Vegetation coverage a	Annual evaporation b	Annual precipitation c	Carbon sequestration d	Species diversity e
1980s	64. 845	28. 4375	66. 96	17. 757	55. 8
2000s	65. 34	88. 725	70. 02	53. 136	83. 7
2019s	74. 25	93. 288	91. 08	98. 676	86. 25
Weight xi	0. 1969	0. 20269	0. 21966	0. 16322	0. 21734

2. Evaluation methodology

Analytic Hierarchy Process (AHP method), proposed by American operations strategist L. Saaty) in the 1970s, is a multi-criterion decision analysis method for dealing with a limited combination of qualitative and quantitative analysis.Its characteristic is that the first systematize the whole as the three levels of goal, criteria and scheme, and then the whole scheme uses matrix judgment evaluation, and finally the comprehensive evaluation.

3. Fundamental principles of the hierarchical analysis method

The basic idea of the hierarchical analysis method is to decompose complex problems into several levels and get the weights of various factors at the lowest level. Through the hierarchical analysis from low to high, the weight of each scheme to the total target is finally calculated. The scheme with the largest weight is the optimal scheme.The basic assumption of hierarchical analysis is that the hierarchy constitutes a progressive structure, but also from high to low or from low to high progressive.

4. Judgment matrix as well as the consistency test

4.1 The judgment matrix

A judgment matrix is a matrix composed of the arrangement of the relative importance elements of each two sub-targets as the weight reflecting the superiority of the i-th scheme to a lowest layer target, or the importance of the i-th target to a certain target in the upper layer.Judgment matrix is at the core of the hierarchical analysis method.Let, then judge that the element of the matrix has three properties.The judgment matrix satisfying the above three properties is the full consistency judgment matrix.The maximum eigenroot values of the order N and the other eigenvalues are zero.

4.2 Conformance inspection

Inspection is done by calculating the consistency index and the test coefficient.

coincidence indicator:

When the consistency is full transplant: value 1, the worse the full consistency of the matrix is.

It is generally believed that at that time, the consistency of the judgment matrix was acceptable.If the acceptance scope is absent, a new judgment is required.Generally, the consistency of the judgment will become worse as the dimension n of the judgment matrix increases, so, in the high-dimensional judgment matrix, the consistency requirement of the judgment matrix should be relaxed.At sufficient, the correction value is introduced, as the average consistency index, the value can be obtained by checking the table.And will measure the consistency of the judgment matrix index, to make it more reasonable.

5. Model solution

As described above, build the judgment matrix:

Judgment matrix

Mean	Items	Vegetation coverage	Annual evaporation	Annual precipitation	Carbon sequestration	Species diversity	Comprehensive rating
68.145	Vegetation coverage	1	0.971	0.896	1.206	0.906	1.067
70.150	Annual evaporation	1.029	1	0.923	1.241	0.932	1.098
76.020	Annual precipitation	1.116	1.084	1	1.345	1.010	1.190
56.523	Carbon sequestration	0.829	0.806	0.744	1	0.751	0.885
75.250	Species diversity	1.104	1.073	0.990	1.331	1	1.178
63.864	Comprehensive rating	0.937	0.910	0.840	1.130	0.849	1

Table2: judgment matrix

When calculating weights by AHP hierarchical analysis, you first needs to build a judgment matrix (SPSSAU automatic build), as shown in the above table;

First: the judgment matrix is constructed as follows: calculate the average value of each analysis item, and then divide the size of the average value to obtain the judgment matrix;

Second: The larger the mean means the higher the importance (make sure such data), the higher the weight;

Third: the AHP hierarchical analysis method is usually applicable to experts to score the importance of indicators.

RI Table

Order	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RI	0.52	0.89	1.12	1.26	1.36	1.41	1.46	1.49	1.52	1.54	1.56	1.58	1.59	1.5943
Order	17	18	19	20	21	22	23	24	25	26	27	28	29	30
RI	1.6064	1.6133	1.6207	1.6292	1.6358	1.6403	1.6462	1.6497	1.6556	1.6587	1.6631	1.6670	1.6693	1.6724

Table 3:RI

consistency test analysis is required for weight calculation using AHP hierarchical analysis;

First: the consistency test needs to use the two index values: CI and RI;

Second: CI value has been calculated, RI value can be query corresponding to the above table

Intelligent Analysis In this study, we built a 6-order judgment matrix. Therefore, we got the random consistency RI value of 1.260, and the RI value was used for the following consistency test calculation.

First: first describe the CI value calculated above [CI= (maximum feature root-n) / (n-1)];

Second: combine to judge the matrix order to obtain the RI value;

Third: calculate the CR value, and make the consistency judgment.

Generally, the smaller the CR value is, the better the consistency of the judgment matrix. Generally, if the CR value is less than 0.1, the judgment matrix meets the consistency test. If the CR value is greater than 0.1, it indicates no consistency, and the judgment matrix should be adjusted and analyzed again.The CI value of 0.000 and the RI value of 1.120, so the CR value is 0.000 <0.1, which means that the research judgment matrix meets the consistency test and the calculated weight is consistent.

Then substitute in the formula:

Comprehensiven score=(a*ai+b*bi+c*ci+d*di+e*ei)/x

(The a,b,c,d and e are the variables in Table 1 and ai, bi, ci, di and ei are the weight values)

Year	Vegetation coverage a	Annual evaporation b	Annual precipitation c	Carbon sequestration d	Species diversity e	Comprehensiven score=(a*ai+b*bi+c*ci+d*di+e*ei)/x
1980s	64.845	28.4375	66.96	17.757	55.8	48.27545285
2000s	65.34	88.725	70.02	53.136	83.7	54.91300084
2019s	74.25	93.288	91.08	98.676	86.25	88.40327086
Weight xi	0.1969	0.20269	0.21966	0.16322	0.21734	0.99981

Table 4:Weight

The results get the line chart below, which intuitively shows that the score calculated from 1980 to 2019 is getting higher and higher, and the environment is gradually getting better

6. Interpretation of result

Model index analysis results:

From the results of model 1, the line chart below, we can intuitively see that the score calculated from 1980 to 2019 became higher and higher. Therefore, in the years, the environment of Saihanba became better and better, creating the human miracle of wasteland into forest.

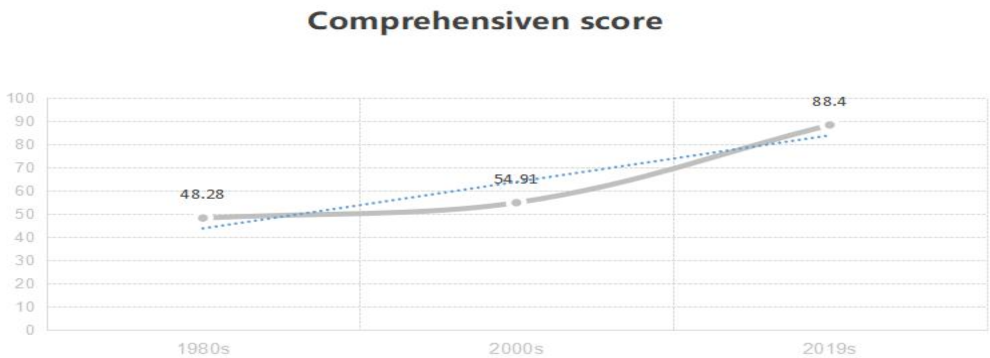

Table 5: Comprehensiven score

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