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Research on Saihan Dam Ecological Environment Evaluation Indexes Based on Quantitative Analysis

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Abstract: *The Saihan Dam Forest Farm is currently the largest artificial forest in the world. It has greatly improved the ecological environment of Saihan Dam and the surrounding areas, deeply implements the sustainable development strategy, and provides valuable experience for China's ecological and environmental governance, which is of great guiding significance. We establish an Eco-environmental Status Model from four indexes: ecological abundance, vegetation cover, water conservation and environmental quality. In order to ensure that there is no difference between various factors, we normalize the data and calculate the standard deviation of the data to analyze the weight processing, so as to reduce the result error, so as to obtain the environmental condition of Saihan dam more accurately. Then draw the relationship between each factor and the ecological environment evaluation index, so as to clearly evaluate the impact of Saihan dam restoration on each index.*

Keywords: *Ecological Protection, Normalization, Saihan Dam*

1. Introduction

In his report to the 19th National Congress, Xi Jinping pointed out that man and nature must coexist in harmony. It is necessary to establish and practice the concept that green water and green mountains are golden mountains and silver mountains, and adhere to the basic national policy of conserving resources and protecting the environment. Since 1962, after generations of unremitting struggle. Saihan Dam Forest Farm has now become an ecological green farm, which has greatly improved the ecological environment of Saihan Dam and surrounding areas, and promoted the development of a green economy and society. How to intuitively reflect the degree of improvement of the ecological environment and the impact on the surrounding environment after the restoration of Saihan Dam, and whether it needs to be widely promoted and improved, has become an issue that we need to consider. [1]

2. Analysis of Ecological Environment Evaluation Index

In order to explore the evaluation of the environmental impact of the Saihan Dam on the local ecology after the restoration, it is necessary to explore the changes in local ecological indicators over the years during the restoration of the Saihan Dam. According to China's "Technical Specifications for the Evaluation of Ecological and Environmental Conditions" Evaluation of ecological and environmental conditions using a comprehensive index (ecological and Environmental Conditions index, EI index), by judging the growth trend of EI to show whether afforestation has a catalytic effect on the environment of Saihan Dam. Taking into account the actual local situation, we have set up five sub-indexes: vegetation cover index, water content index, biological abundance index, and environmental quality index to evaluate the ecological and environmental conditions in the Saihan Dam area.

Before establishing the model, we want to briefly explain some of the concepts involved in this question:

Ecological abundance coefficient (x1): The biological abundance index is an index that evaluates the paucity of biological species and their survival status in the area [2]. According to the actual local situation, we select the forest cover area and the amount of water cultivated to determine, and use the principle of fuzzy mathematics to determine the weight of the two indicators affecting ecological abundance.

Vegetation coverage index (x2): The area of the five types of woodland, grassland, farmland, construction land and unused land in the evaluated area accounts for the proportion of the area of the evaluated area.

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Cultured water volume index (x3): the difference between precipitation, evapotranspiration, and surface run-off in the evaluated area accounts for the proportion of the total water resources in the evaluated area.

Environmental Quality Index (x4): a measure that characterizes the hazards of natural environmental pollution and the quality of the natural environment.

In order to obtain the above indices, weights are essential. The calculation formula for calculating the weights of each index is as follows:

$$\omega_i = \sigma_i / \sum_{i=1}^{n} \sigma_i$$

Normalize the data (a, b, c, d, and e), and then use the standard deviation method to obtain the corresponding weights of a, b, c, d, and e, and obtain the sub-indicators established in the model (x1, x2, x3, x4).

$$x_1 = TOC(a) * 0.58 + TOC(c) * 0.42 / TOC(a) + TOC(c)$$

$$x_4 = TOC(d) * 0.50 + TOC(c) * 0.50 / TOC(c) + TOC(d)$$

Use the standard deviation method to obtain the weight of each index. Then use the weights of x1, x2, x3, and x4 to obtain the ecological environment equilibrium index, and obtain the EI formula:

$$EI = 0.19 * x_1 + 0.30 * x_2 + 0.21 * x_3 + 0.30 * x_4$$

3. Model Solving

Calculate the ecological environment status index for each year, and use MATLAB to draw a diagram of the relationship between x1, x2, x3, x4 and EI.

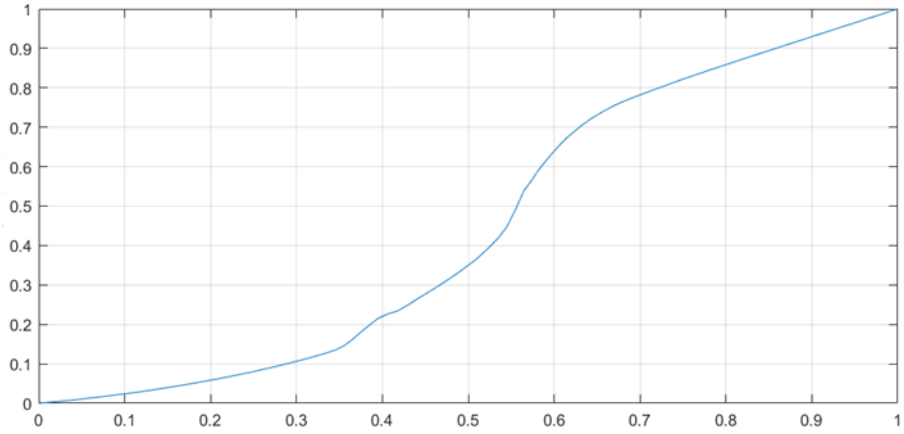

Figure 1: The relationship between x1 and EI.

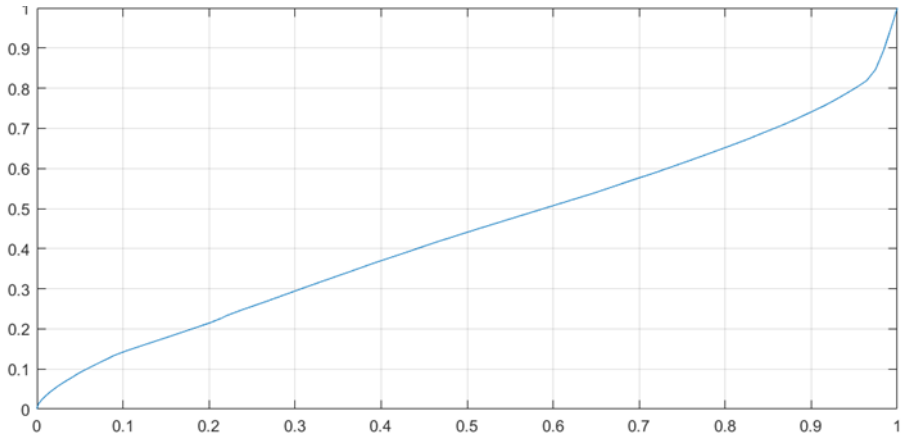

Figure 2: The relationship between x2 and EI.

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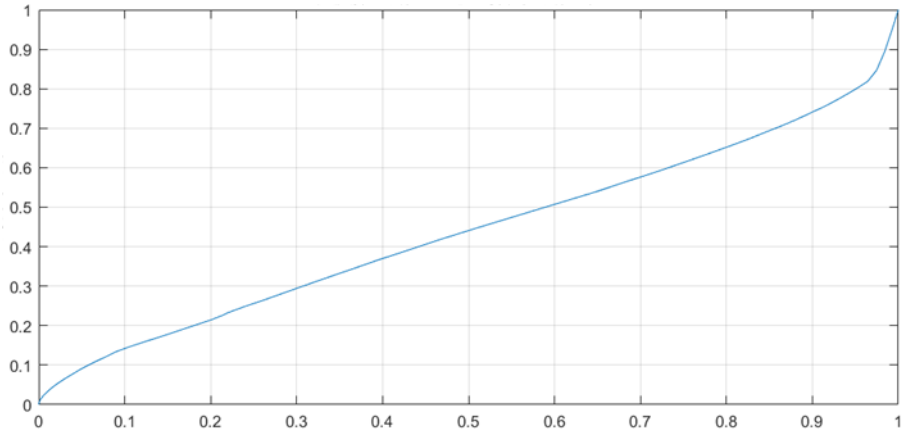

Figure 3: The relationship between x3 and EI.

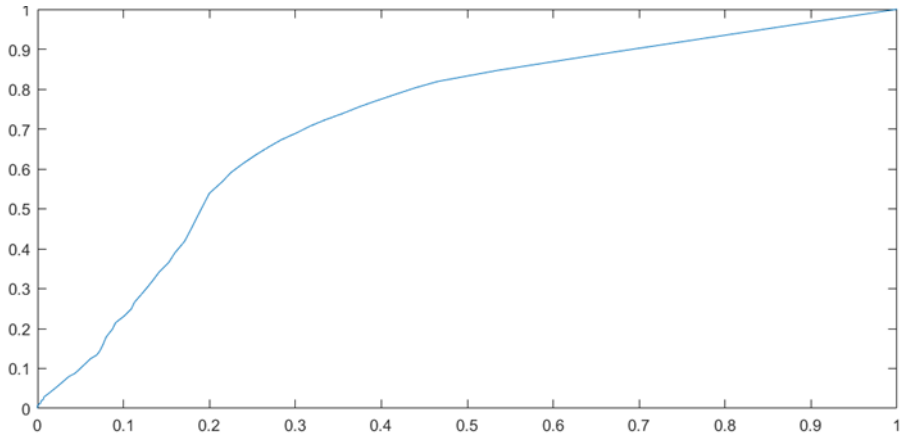

Figure 4: The relationship between x4 and EI.

From the figure, it can be seen that x1~x4 are positively correlated with EI. From the literature [3], it can be seen that the ecological environment status index (EI) is an important indicator for evaluating the ecological environment status of an area. From 1962 to 2021, various indicators have increased year by year, and the ecological evaluation index has gradually increased. As of 2021, the forest coverage rate has reached 82.21%, and the amount of water cultivated has reached 0.473 billion cubic meters, which is a significant increase compared to 1962. According to the attached data, we can see that the number of tourists and tourism revenue in the Saihamba area will generally increase from 2008 to 2021. It can be seen from this that the establishment of Saihamba Forest Farm not only improved the local ecological environment, but also promoted the local economic development, which is in line with the sustainable development strategy.

4. Conclusion

We have established an ecological environment evaluation model of Saihan Dam based on fuzzy comprehensive evaluation, mainly to compare the changes in the ecological status index of Saihan Dam over the years. Through consulting the literature, we learned about the various factors affecting the ecological environment index, and combined with the actual situation of Saihan Dam, we determined four sub-indicators such as the ecological abundance coefficient to evaluate the ecological status of Saihan Dam. In addition, we also drew a map of the ecological environment status index of the four sub-indicators in the Saihan Dam area from 1962 to 2021, which more intuitively shows the restoration effect of the forest field on the ecological environment of Saihan Dam.

References

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