

# Evaluation on Ecological Security and Optimization of Ecological System in Key District of Changzhutan Urban Agglomeration

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**Abstract:** Through expounding the ecological environment situation of key district of Changzhutan urban agglomeration, the two-oriented society ecological security evaluation of index system was established. Ecological Security was evaluation. The general structure and measures for improving the security of ecological system were built, thus promoting the construction of key district of Changzhutan urban agglomeration ecological security.

## Introduction

As new strategic starting point, the changzhutan urban agglomeration as the resource saving and environment friendly trial zone of comprehensive coordinated reform (hereinafter referred to as "two-oriented society"), it is concerned by domestic and abroad people. Since China's reform and opening to the outside world, with the rapid development of the urbanization process of the Changzhutan urban agglomeration, the overall ecology environment quality of the region has decreased significantly. In order to promote development of "two - oriented society" and ecological civilization construction, the core region should be optimized to promote the coordinated development of changzhutan urban agglomeration.

## The Situation of Ecological Environment in Changzhutan Urban Agglomeration

The specific scope of Changzhutan urban agglomeration core areas including Changsha, Zhuzhou and Xiangtan three urban areas, as well as 42 towns outside the city, 13 administrative village; including Changsha, Zhuzhou, Xiangtan three urban areas, and most, Wangcheng Changsha County all County, a small part of Liuyang, a small part of Ningxiang County, a small portion of Liling City, Zhuzhou County portion, partially Xiangtan County, a small portion of Xiangxiang County, the core area of 6362.66km<sup>2</sup>.

The area of Changzhutan has a typical southern terrain features between the basin and the hills wrong, urban and rural intertwined, the Xiangjiang River goes through, forming a good ecological background, coupled with plentiful water, ample sunshine, fertile land, the overall ecological environment good. The reason, one of the unique natural terrain formed a good ecological barrier, the higher the surrounding upland vegetation coverage basin topography, resources background is good; the second is the ecological function zone of Changsha, Zhuzhou and Xiangtan city, although three artificial ecosystem-based, but its interior is still scenic, city parks, urban green spaces and other features distinctive niche, forest Park and other mountain areas and water distribution more, become safeguard the ecological function of the key points, so the core area of the overall ecological environment is better. But with the accelerating process of urbanization, ecological environment pressure is also growing, and even the phenomenon of deterioration of the ecological

environment in the local area.

### Evaluation of Ecological Safety in Key District of Changzhutan Urban Agglomeration

After analyzing the known research results [1-3], basis of ecological security in urban agglomeration connotation, according to the pressure-stale-response model, from resources and environmental pressures, resource environment, human environment in response to three aspects to build a four-level Tan urban ecological safety Evaluation System (The index system is shown in Table 1). The establishment of a comprehensive evaluation model based on this, and as of Changsha, Zhuzhou and Xiangtan cities were analyzed and evaluated.

**The Data Source.** The Institute selected fundamental data mainly from Hunan Statistical Yearbook 2012 and Statistical Bulletin, 2012 China City Statistical Yearbook, 2012 in Changsha, Zhuzhou, Xiangtan City National Economic and Social Development Statistics Bulletin, Hunan Statistical Information Network and other statistical data and statistics, also made reference to relevant information and existing government websites related research.

**Construction evaluation matrix.** If the number of cities being evaluated is  $m$ , and the ecological security of each city in turn  $n$  evaluation indexes to reflect, so you can put the first  $i$  city is reflected in the indicators of  $j$  paragraph is represented by  $x_{ij}$ , then You can construct a raw data by the  $(x_{ij})_{m \times n}$  evaluation matrix composed.

**Dimensionless Method on Evaluate Index.** Differences exist dimensionless index taking into account the data collected, it can not directly use the raw data to conduct empirical measure, the need for data normalization. Generally speaking, three types of indicators: The first indicator is neutral, it is best when the value of the index is close to a moderate value; the second is a forward-type index, value index of greater relevance when the larger contribution; third category is the reverse type index, the more hours the greater the degree of contribution of the associated value indicators. In index layer, such as residential investment to GDP ratio with respect to the ability to invest in terms of a neutral index, population density, the natural population growth rate relative to population pressure is positive in terms of type indicators, and flood control standards with respect to natural disasters pressure Speech is the reverse type indicators. The index factor layer corresponds to item level for both positive indicators; pressure on resources and the environment with respect to the project level comprehensive index of ecological security is the reverse type indicators, resources and the environment and the human environment status indicators are positive response type indicators. Standardization of these three types of indicators can respectively be achieved by the following method.

When the index value is close to a median:

$$r_{ij} = 1 - \frac{|x_{ij} - u_0|}{\max_j |x_{ij} - u_0|}$$

When the index is positive:

$$r_{ij} = \frac{x_{ij} - \min_j x_{ij}}{\max_j x_{ij} - \min_j x_{ij}}$$

When the index value of reverse:

$$r_{ij} = \frac{\max_j x_{ij} - x_{ij}}{\max_j x_{ij} - \min_j x_{ij}}$$

**Affirmation of the Index Weight.** Weights mainly reflect the importance of each evaluation index. Right ecological security evaluation index weight determination is crucial, only when the

index weight distribution is reasonable to ecological security level assessment correctly. Firstly, the raw index data matrix  $(r_{ij})_{m \times n}$  by the same quantization. Let the  $i$  city indicators specific gravity is  $p_{ij}$ , then  $p_{ij} = r_{ij} / \sum_{i=1}^m r_{ij}$ , Entropy  $j$  indicators of the first cities to  $i$ :

$$w_{ij} = \frac{1-h_{ij}}{\sum_{j=1}^n (1-h_{ij})}$$

In the above equation,  $h_{ij} = -\frac{1}{\ln m} \sum_{k=1}^m p_{ij} \ln p_{ij}$ .

Secondly, rights can be added according to the principle of entropy can be calculated separately each index weight, paper uses entropy method determined index weighting value as shown in Table 1.

Table 1 Evaluation index system table of ecological security

Destination layer	The level of project	The level of element	The level of index
ecological security integrated index	Resource and environment pressure A1 (0.3401)	natural disaster pressure B11 (0.1246)	flood control standard C1 (0.5000) soil loss area C2 (0.5000)
		population pressure B13 (0.2413)	population density C3 (0.5271) natural population growth rate C4 (0.4729)
		Land pressure B13 (0.3711)	living space per person C5 (0.2135) road area per person C6(0.3582) farmland areas per person C7 (0.4283)
		water resources pressure B14 (0.2630)	life-water quantity C8 (0.5362) water repeatedly in industry C9 (0.4638)
	State resources and environment A2 (0.4362)	resource quality B21 (0.2303)	green cover percentage C10 (0.2177) water quality regular rate C11 (0.3572) Public green land per capita C12 (0.4251)
		environment quality B22 (0.4174)	selections about municipal solid waste C13 (0.1371) (100%) industrial wastewater treatment rate C14 (0.1637) industrial waste gas treatment rate C15 (0.1243) (100%) industrial waste residue treatment rate C16 (0.1277) air pollution index C17 (0.2153) environmental noise C18 (0.2319)
		economic development quality B23 (0.3523)	GDP per capita C19 (0.4072) rate of urbanization C20(0.2854) proportion of third industry at GDP C21 (0.3074)
	Humanities environmental response A3 (0.2237)	Intellectual input B31 (0.4573)	Number of Schools C22 (0.5000) collection amounts C23 (0.5000)
		Capability input B32 (0.5427)	housing investment C24 (0.4283) environmental protection investments (0.3527) science and technology input C26 (0.2190)

**Establish evaluation function.** Fuzzy comprehensive evaluation method to calculate, evaluate possible item index value  $j$ :

$$u_{ij} = w_{ij} \times p_{ij}$$

Ecological Security Assessment n cities is  $U_i = \sum_{j=1}^n u_{ij}$ .

**Determination of evaluation level.** Scientific and rational way to determine the level of urban agglomeration ecological security, the key is reasonably require several thresholds Based on the foregoing analysis, we identified five levels of thresholds in Table 2 below.

Table 2 Classification standard ecological security in Changzhutan urban agglomeration

Evaluation value	[0-0.3]	(0.3-0.4]	(0.4-0.5]	(0.5-0.7]	(0.7-1]
Remark	Strongly unsafe	Unsafe	Critical safe	Safe	Ideal safe

**Evaluation Results and Analysis.** According to the previous analysis, the use of Matlab software to calculate, respectively, related indicators Changsha, Xiangtan and Zhuzhou calculated, the calculated results are shown below in Table 3.

Table 3 Evaluation results table of ecological security

Project	Changsha	Zhuzhou	Xiangtan
Resource and environment pressure	0.7319	0.5072	0.6124
State resources and environment	0.6742	0.3126	0.4571
Humanities environmental response	0.4831	0.3785	0.3610
ecological security integrated index	0.6511	0.3935	0.4884

According to the ecological security grading standards given in Table 2, we can see that the ecological security level of Changsha, Zhuzhou, Xiangtan and the three cities. From the target layer, the three cities, Changsha ecological security index highest 0.6511, in a relatively safe state; followed Xiangtan, to 0.4884, in a critical state security; Zhuzhou is 0.3935, belongs to the state of insecurity. Overall, the Urban Agglomeration of the ecological environment in a critical state security, building security ecosystem system without delay.

### Optimization measures of ecological system in Changzhutan Urban Agglomeration

**Adjust the "Green Heart" layout, protect the ecological plaque, strengthen ecological corridor construction, optimization of regional ecosystems Security System.** In order to maintain and further improve the overall quality of the ecological environment, Urban Agglomeration of the core area should be adjusted to the "green heart" layout, and coordinate contradiction "green heart" within ecological protection and urban construction, thereby making the "green heart" truly become three City's "green lung." At the same time it should be strictly protected core area of water conservation areas, nature reserves, scenic spots, forest parks, wetlands, slope greater than 25 ° of the mountain hills and other important ecological plaques. Through closed forest, forest, Tuitianhuanhu, ecological migration, compensation policies and other measures to further improve the ecological security and ecological service function of ecological plaques. Strengthen the construction of Xiangjiang (including Xiangjiang tributary) and ribbon green ecological corridors, protected coastal hills, farmland, floodplain wetlands, according to the principle of building community tree, shrub and grass along the riverside greenbelt binding. Strengthen ecological corridors and ecological plaque communication link together to form a network of eco-floor, two-oriented society construction Xiangtan Urban Agglomeration build

regional ecosystem security system.

**Improve the structure of the forest species.** Forest coverage in Urban Agglomeration core area, although located in the country, but the forest structure is not reasonable, especially capable of generating economic benefits of timber, fruit trees, high proportion of seedlings, and the low proportion of species have ecological benefits. In many places, understory vegetation coverage rate is too low, resulting in some parts of the forest coverage rate is high, but the soil erosion is still a serious situation. Press the forest ecosystem succession law, the implementation of tree, shrub and grass combination appropriate to increase the proportion of broad-leaved forest, build a relatively complete plant communities, enhance biodiversity within the forest area, increasing the stability of forest ecosystems, improve Tree structure of the forest.

## **Conclusion**

Ecological Urban Agglomeration of the core zone of security related to the overall layout of the city, the industrial structure, comprehensive disaster prevention and other aspects, only from the ecological point of view this article explores the optimization of the core area of ecological security evaluation system and ecosystems, hoping to to their own innovative practices to promote the core area of "society" and ecological civilization to contribute.

## **References**

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