

The Index System Calculation and Analysis of “Construction up to the Mountains” Pressure in Yunnan Province

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ABSTRACT: The demand of “Construction up to The Mountains” calculation and analysis is very important for the differential strategy. The concept of pressure was put forward in this paper, and the indicator system was built up. Furthermore, the pressure level of Yunnan province in 2020 was analyzed and estimated at the municipal level by the methods of Analytic Hierarchy Process, Delphi Method and The comprehensive fuzzy evaluation. The results show that the Yunnan “Construction up to The Mountains” pressure exist obvious unbalance on the space, this paper designed to narrow the unbalance of “Construction up to The Mountains” pressure by differentiated policy and ensure the policy implemented scientifically and reasonably.

KEYWORD: The cultivated land protection in basin areas; Construction up to the Mountains; Pressure index system; Calculation and analysis

1 INTRODUCTION

In order to protect basin quality cultivated land, ensure food security and maintaining the social stability of frontier rural, the party committee and government of Yunnan province proposed the major strategy of "Construction up to The Mountains" in 2011, its main function and the significance lies in: (1) protect basin quality cultivated land, ensure food security and effective supply of agricultural products; (2) through develop mountain towns to expand the development space of new urbanization and industrialization; (3) ensure the social stability of frontier rural. However "Construction up to The Mountains" is a system engineering whose difficulty coefficient and money loss is large, and it can't start to do everywhere, besides, it is a worth pondering question that whether promote "Construction up to The Mountains" in large area and a wide range will become another form unsustainable or not.

Constructing "hill town" can effectively relieve the contradiction between the rapid development of urban and the cultivated land protection, but the implementation of the policy must be scientific and reasonable, and reflect regional differences at the same time. In this paper, the indicator system of "Construction up to The Mountains" pressure be

established, moreover, we measured and analyzed the pressure of 16 states (cities) Yunnan province in 2020.

2 CONCEPT, CONNOTATION AND CALCULATION METHOD

2.1 *The concept of pressure*

This article first proposed the concept of "Construction up to The Mountains" pressure. The pressure reflects the regional macro demand of the mountain town, measuring from the area needs of natural, economic and social will play a guiding role in the strategy propulsion. The inspiration of concept mainly comes from land resources pressure. The land resources pressure had been researched a lot in land academia, but now the pressure on land resources has not been a clear understanding, often land resources pressure be equaled to population pressure, as a matter of fact, the population pressure mainly considered the food consumption of the population only [1-4], but ignored the land needs of the regional economic development and ecological protection. Therefore, the pressure should include the real output pressure, land output function pressure and land value output pressure actually

derived from the human needs in a certain region [5]. Due to targets of "Construction up to The Mountains" are protect cultivated land, promote the development of urbanization and industrialization and maintain the rural social stability. So, in this paper, "Construction up to The Mountains" pressure is defined as: the pressure is from the demand for constructing "hill town" cultivated land protection, urbanization and industrialization, maintenance of the rural social stable in a certain area, the pressure reflects the objective demand of mountain towns.

2.2 The connotation of pressure

The purpose of constructing "hill town" is to protect cultivated land. Protect arable land is protect food security in essence. In the process of researching spatial resources for constructing "hill town" in east plateau of Yunnan province, Jiaxue Wang revealed that: the total spatial resources for constructing "hill town" keep consistent with the development trend of urbanization [6], therefore, urbanization and industrialization pressure is also one of an important part of the constructing "hill town" pressure. Rural social stability is the aim of the constructing "hill town" strategy, the social contradiction triggered by land expropriation, diversion, and environmental pollution is due to cultivated land be occupied by construction. Town develop to mountain reduce the size of occupied cultivated land, lead to conflicts will also be reduced and rural social will be more stability by maintain farmers' interests.

2.3 The calculation method

2.3.1 The cultivated land protection pressure

Cultivated land protection pressure is derived from human demand on the grain output of arable land, so the farmland protection pressure depends on the grain production of the cultivated land, namely the pressure of grain production, and in theory, the size of the pressure of grain production and food demand is consistent [7-8]. The pressure of unit cultivated land grain production was calculated to the following formula:

$$Cp = (P \times AD) / C \quad (1)$$

To be specific, P indicated the total population; AD indicated per capita annual demand of grain (kg); C indicated the actual area sown to grain (ha).

The mainstream view of food security field in China is 400 kg per person/a [3][9-11], according to the related research, the actual situation through detailed field investigation in Yunnan learned and the demand for food under basic standard of the well-off society, this paper takes 400 kg per person/a as a reasonable standard.

2.3.2 Urbanization and industrialization pressure

Urbanization pressure comes from the demand for build-up land caused by the growth of urban population, so urbanization pressure can be represented as:

$$\begin{cases} Pc = c + dPc0 \\ Up = (Pc / P) \times 100\% \end{cases} \quad (2-1)$$

To be specific, Up indicated the future population urbanization pressure; Pc indicated the urban population in the last stage; $Pc0$ indicated the urban population in base period; P indicated the total population; c and d indicated the constant.

By the same token, the pressure of industrialization is derived from the demand for industrial land which is uses in industrial production, so industrial pressure can be expressed as:

$$\begin{cases} Ic = m + n Ic0 \\ Ip = (Ic / G) \times 100\% \end{cases} \quad (2-2)$$

To be specific, Ic indicated industrial production in the last stage; $Ic0$ indicated industrial production in base period; G indicated the gross domestic product in the last stage; m and n indicated the constant.

The weights were identified as $x1$ and $x2$. So the urbanization and industrialization pressure can be expressed as:

$$UIp = x1 Up + x2 Ip \quad (2-3)$$

2.3.3 The rural social stability pressure

In this paper, the survival conditions of farmers (Ji) was measured by the farmers' employment index, the rural production status (Ai) was measured by agricultural output index, the living conditions of rural (Ci) was measured by farmers' consumption level index. We used the Delphi method to determine the weights, and the rural social stability pressure (Sp) was expressed as:

$$SP = M1 Ji + M2 Ai + M3 Ci \quad (3)$$

Considering it is difficult to change and repeal the existing agricultural policy because of the existence of vested interests [12], namely the change of agricultural index can be almost invariable, and in this paper each index are take the average of pasted year.

2.3.4 The Integrated pressure assessment

The key of integrated pressure evaluation is to determine the weights of three target layer pressure and the assignment of graded index (Table 1). According to the need of study and practice the three weights are determined as $K1$, $K2$ and $K3$, Therefore, integrated pressure (ZP) can be represented as:

$$ZP = K1 Cp + K2 UIp + K3 SP \quad (4)$$

Accordingly, we can get the pressure value of "Construction up to The Mountains", determine the state (city) pressure condition, and then delimit pressure classification.

Table 1 Index system and weights

indicators	Weight	Assignment of graded index				
		1	0.75	0.5	0.25	0
Cp	0.470	≥4000	≥3500-4000	≥3000-3500	≥2500-3000	< 2500
Up	0.257	≥60	≥50-60	≥40-50	≥30-40	< 30
Ip	0.136	≥50	≥40-50	≥30-40	≥20-30	< 20
Ji	0.048	≥103	≥102-103	≥101-102	≥100-101	< 100
Ai	0.049	≥115	≥110-115	≥105-110	≥100-105	< 100
Ci	0.039	≥120	≥115-120	≥110-115	≥105-110	< 105

3 CALCULATION AND ANALYSIS

3.1 Analysis on the pressure of cultivated land protection

Due to the differences in regional size and population density, the grain production pressure differences between states (cities) are obvious (Figure 1), combined with regional cultivated land different quantity and quality, the difference cultivated land protection pressure is more highlighted. Kunming's cultivated protection pressure is 7463.33 kg/hm², and Pu'er is 2337.15 kg/hm², the former is 3 times more than the latter, the average cultivated land protection pressure in Yunnan is 3341.70 kg/hm². Actual Yunnan has ten states (cities) or 62.5% failed to reach the entire province average level, and has 12 states (cities) or 75.0% failed to meet the national average in 2012. Most of cultivated land resources in Yunnan province is scarcity, resulting in the high cultivated land pressure.

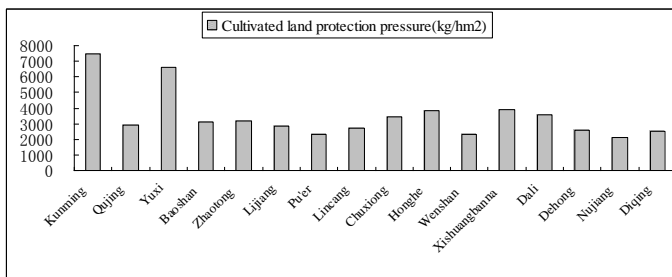


Fig1. The pressure of protect cultivated land

3.2 Analysis on the pressure of urbanization and industrialization

Due to the differences in population and economic development, the evaluation results urbanization pressure in Yunnan states (cities) is also obvious

(Figure 2). Kunming urbanization pressure forecast to 2020 is highest, and it's up to 76.88%. From the picture we can see in next few years Yunnan urbanization rate will up to a higher level, and can reaches the development level of urbanization.

Industrial economic development and emphasis different lead to different industrial land use structure demand, and the industrial pressure difference also obvious. The most highest industrialization pressure in 2020 is Yuxi city, it's up to 66.37%. The same way the average industrialization rate of Yunnan will reach 41.74% in 2020, complete the early stages of industrialization, and step to half of industrialization period.

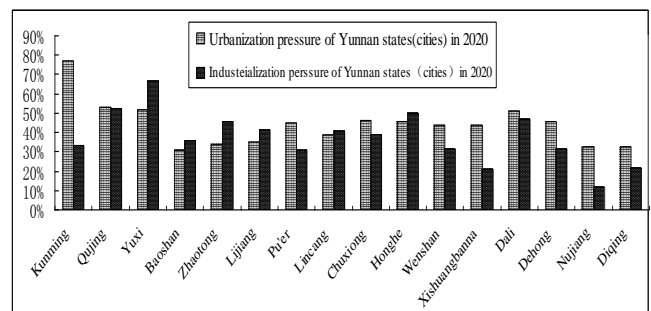


Fig2. Urbanization and industrialization pressure

According to the contrast situation of urbanization and industrialization rate, in most of states (cities) in Yunnan province the urbanization rate is generally higher than the industrialization rate, so when promote the constructing "hill town" strategy, the share of industrial land should have a appropriate improve.

3.3 Analysis on the pressure of rural social stability

The pressure of rural social stability reflected in three aspects: farmers' employment index, the agricultural output and farmers' consumption index. The rural social stability pressure is presence comparatively large difference (Figure 3). Overall, rural employment < agricultural output index < farmers' consumption level index, the reason is that the employment is the basis of the production, and the production is the basis of the consumption. Due to the characteristics of Yunnan Plateau Mountain, cultivated land resource is very limited, with the development of urbanization and the expansion of construction land, rural social contradictions may be further intensified. To alleviate the contradiction, "Construction up to The Mountains" must Comply with the principle of account for less arable land and create more jobs for farmers.

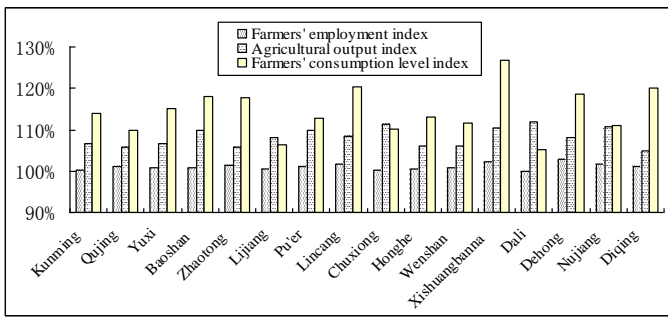


Fig3. The rural social stability indicators

3.4 Comprehensive results analysis

Based on the analysis of the pressure index, we used comprehensive fuzzy evaluation model and then got their pressure value according to the weights of various pressure, finally divided the pressure into four classes (Table 2) according to the hierarchy method.

Table 2 The rank method

Rating	Pressure situation	Threshold
I	Ultra-high pressure	≥ 0.70
II	High pressure	$\geq 0.50 \sim 0.70$
III	Medium pressure	$\geq 0.30 \sim 0.50$
IV	Low pressure	< 0.30

"Construction up to The Mountains" pressure in Yunnan pressure is divided into four levels (Figure 4), and appear zonal distribution: the UHP zone is mainly located in middle of Yunnan; the high pressure zone is composed of the east of central region of Yunnan, west of northeast Yunnan and north of southwest Yunnan which appear like a line; except Nujiang, Diqing and Dali, most of the western states (cities) of Yunnan province appear a medium pressure. So the key areas of "Construction up to The Mountains" should be the eastern of Yunnan, the west of southeastern Yunnan and the south of southwestern Yunnan.

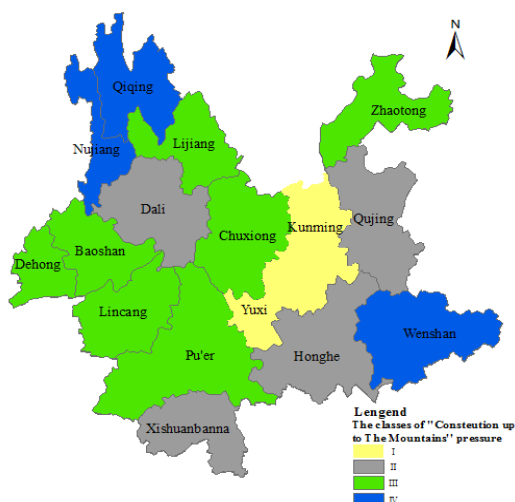


Fig4. "Construction up to the mountains" pressure

4 CONCLUSION

By creating "Construction up to The Mountains" pressure index system, we contrast and comprehensive analyze the pressure 16 states' of Yunnan, and then measure the "Construction up to The Mountains" pressure rating.

The "Construction up to The Mountains" pressure of Yunnan exist space non-equilibrium. But regions can narrow this gap by implementing differentiated "up to hilly" policies. In addition, in order to promote social stability the mountain town must adhere to that farmers working in cities. Last but not least constructing "hill town" policy should promoted according to microscopic suitability evaluation.

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