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Evaluation of intensive land use in development zone: a case of Nansha economic and technological development zone in Guangzhou city

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Abstract. The scarcity of land resources and human disorder expansion of land use constitutes the largest contradiction of social and economic development, while the intensive utilization of urban land optimal allocation become the core of the sustainable utilization of urban land. To explore city economic development zone land intensive utilization, the economic development zone of Nansha district since 2000 qualitative, quantitative evaluation of economical and intensive utilization of land through the analogy method, theoretical analysis, empirical validation method comparison research, combine with analytic hierarchy process (AHP) and principal component analysis (PCA) to Nansha economic development zone land intensive utilization is analyzed, the results of using GIS and SPSS visualization, to help the land management and urban and rural planning departments to choose the optimal land configuration scheme. Studies have shown that the Nansha economic development zone land intensive degree is 0.66, the land intensive utilization degree is higher; Policy and the economy are the main factors of regional economical and intensive utilization of land and larger regional land exploration potential.

Introduction

Land-use intensity theory originated from the concept of differential rent and land price by William petty ,and a group of western scholars represented by David Ricardo systematized the theory. Foreign scholars based on the city form, city planning and development, there is less research related to construction land saving and intensive, and tend to study on land use and land cover changes[1-3], such as the impact of industrial land and other land types on the city, impact on the city economy and the ecological impact[4], for example climate, vegetation, lakes[5-7], etc. The domestic researchers focus on the construction land of the city, the Development Zone, and the small part of cases study on the intensive utilization of rural land[8]. Pay attention to the economic attributes of the land, such as the intensity of land investment, the intensity of output, tax indicators, etc. Wu Kening[9] constructed index system from the degree of land use input, land use level, land use sustainability, land use economic efficiency.

For a long time, China's construction land has been extensive managed. On the land use scale, characterized by total out of control, expanded too quickly; on the land use structure, characterized by various types of land layout is unreasonable, low output. The relationship between coordinated development and protection has become an important way of sustainable land use, the urban land use should embody the unity of economic, social and ecological environment while pursuing

economic benefits. The economic development zone has the capacity for the sustainable development of regional economy. Evaluation of land use and conservation in the Development Zone regularly is not only the require of regional coordinated development and construction of harmonious society, but also provide scientific basis for study on the scientific, rational and sustainable utilization of urban and rural construction land in China, to ease the pressure of urban land use in the central city and realize the sustainable development of urban and rural areas.

Data sources and methods

In this paper, 2000, 2005 and 2015 Nansha Landsat TM remote sensing image (spatial resolution of 15m * 15m) are the data basic data source, and image quality is good because of map imaging time within the study area of cloud cover, Using ERDAS and ARCGIS 10.0 9.2 IMAGIN processing software such as space, with the second national land survey classification and coding to remote sensing interpretation of nansha district, mainly divided into the water, fish ponds, wetland, forest land, arable land and urban and rural industrial and mining land transportation and so on six major categories. In which water is mainly rivers and seas, transportation industrial and mining mainly is to use construction land, cultivated land farmland and irrigated land. And the class around the area is calculated according to the data, analysis and research. Nansha district land and resources bureau, planning bureau website provides nansha land data. Standardized processing to the data of land, facilitate computation intensive degree of the comprehensive score.

Multi-factor comprehensive evaluation, mainly is to determine the index weight, can fully consider the factor of human, expert knowledge of land evaluation factor weight. Analytic hierarchy process (AHP), the relevant element is decomposed into target, rules, plan and so on. On the basis of this structure judgment matrix, calculating a level and other related index weight normalized after processing.

(1)Construct the index system

According to the principles and requirements of construction, with reference to evaluate the principle of the method. The nansha economic and technological development zone land intensive utilization evaluation system is divided into land use status, land use efficiency and performance management in three target layer, and establish a sub goal layer and index layer two levels .

(2) To calculate and determine the ideal value and the present situation of evaluation index values. Through data integration to calculate the degree of intensive evaluation index values, the integrated use of the target, frame of reference, extract method and expert consulting method to obtain all indicators of the development zone land of ideal value.

(3) The weight ,To the method of analytical hierarchy process (AHP) is given priority to, combined with the expert scoring method, according to the important degree of each evaluation index and the evaluation index between the two is to construct judgment matrix, and calculated for each evaluation index weight, and consistency inspection, to determine evaluation index weights.

(4) intensive degree score calculation

The index data is standardized, with reference to make a comprehensive and intensive degree score calculation formula.

$$F_{ij} = \sum_{k=1}^{n} (S_{ijk} \times W_{ijk})$$

Among them: F_{ij} - i target j sub-targets land use intensive degree score;

S_{ijk} - i target j subgoals K index score achieved;

W_{ijk} - i target j subgoals relative weight value of j sub-targets K index;

n - index number.

Research results

Land cover change. Nansha district land non-agricultural phenomena between 2000 and 2015 is significant, in which the probability of cultivated land into urban construction land is the largest, proportion of 15 years of farmland fell by about 10%, at the same time the urban and rural construction land proportion rises year by year from 8.94% to 26.36%; The trend of wetland is reduced, only reduce nearly half 2000-2005 area, forest land and waters small amplitude decrease; Fish ponds in 15 years, the area has small rising trend year by year. As shown in the fig. 1.

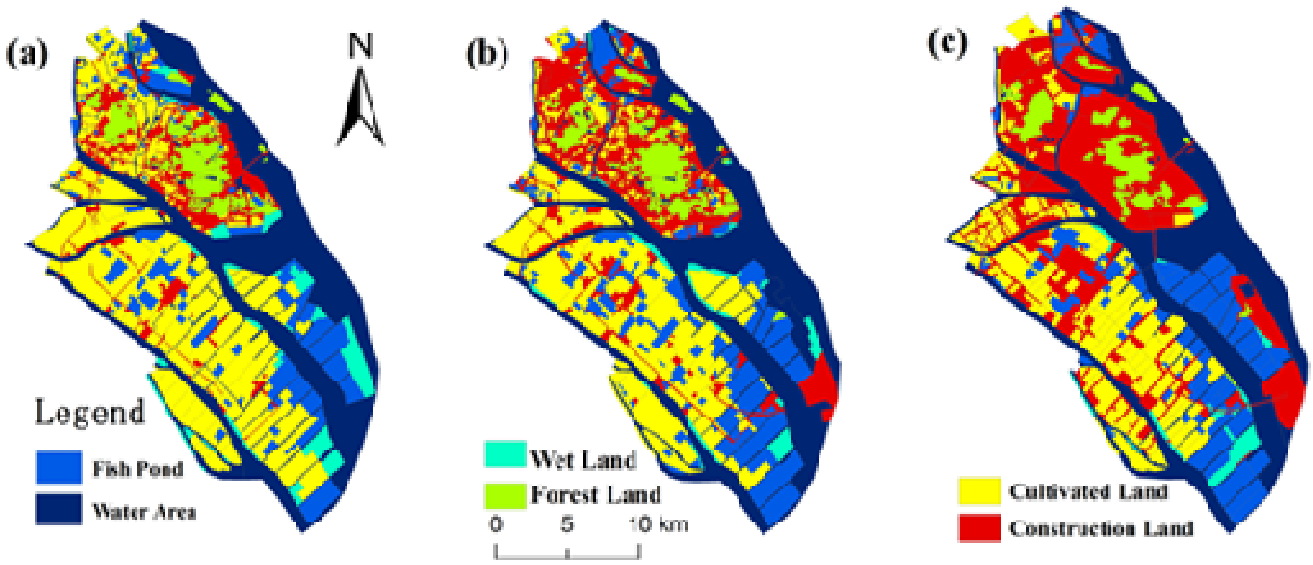

Fig. 1. 2000 ,2010, 2015 NanSha Land use map

Notes: (1) (a) represents 2000year; (2) (b) represents 2010year; (3) (c) represents 2015year.

Evaluation results. Through the analytic hierarchy process and expert scoring method to determine the index weight, combined with the following formula to calculate the nansha economic and technological development zone land intensive degree of the comprehensive score, results show that the nansha economic and technological development zone land intensive utilization degree must divided into 85.77. As shown in table1.

Table1 Comprehensive score table of land use intensity

Target layer	Sub target layer	Index layer	Present value	Ideal value	Status score	Single index weight	Single index score
The land use status	Land development degree	Land development rate	56.89%	75%	75.85%	0.04	3.03%
		Land supply rate	91.18%	100%	91.18%	0.042	3.83%
		Land completion rate	60.12%	80%	75.15%	0.049	3.68%
	Land use structure	Rate of industrial land	48.78%	55%	88.69%	0.113	10.02%
		Integrated volume rate	0.57	0.8	71.25%	0.051	3.63%
	Land use intensity	Building density	19.94%	30%	66.47%	0.049	3.26%
		Comprehensive volume rate of industrial land	0.63	0.7	90.00%	0.054	4.86%
		Industrial land density	30.65%	35%	87.57%	0.04	3.50%
Land use efficien	Input and output efficiency of industrial land	Investment intensity of fixed assets of industrial land	27.26	35.00	77.89%	0.157	12.23%
		Industrial land output intensity	61.06	65.00	93.94%	0.191	17.94%
Management performance	Land regulation performance	Rate of disposal of project land	100%	100%	100.00 %	0.054	5.4%
		Idle land disposal rate	93.12%	100%	93.12%	0.07	6.52%
	Degree of marketization of land supply	The land use fee rate	75.58%	80%	94.48%	0.04	3.78%
		Land auction rate	16.36%	20%	81.80%	0.05	4.09%
Composite score						85.77%	

Conclusion and discussion

Development of economical and intensive land use degree from two aspects of natural factors and social factors, but the overall social and economic impact is far greater than the influence of natural environment. Due to the nansha water intensive natural aspect, wetland landscape is rich, development zone site selection of fragmented for seven of the layout, huangge town, nansha economic and technological development zone, lingshan town southeast corner, horizontal drain town, pearl river management area, sand, white town, panyu district reclamation companies such as regional distribution to finesse waters landscape, scenic spots and to reduce the interference of regional internal.

Social and economic factors that mainly focuses on policy factors, economic factors and demographic factors, etc. With policy factors and among them the most intense, nansha district government defined in 2016 to allow these areas covers an area of 19903 hectares, conditional looks remarkably covers an area of 3927 hectares, limit these areas covers an area of 44911 hectares, forbid these areas covers an area of 1022 hectares, According to the regional land resources and social and economic development conditions and level of differentiation characteristics, could be divided into eight regional land use functional areas: 15259 hectares of basic farmland protection areas; General area of 13623 hectares; Town village construction area 17837 hectares; Independent industrial and mining area 2066 hectares; Scenery tourist area 194 hectares; Ecological environment security control area 9 hectares; 1013 hectares of natural and cultural heritage site; Forestry area 1294 hectares. Planning policies for the development of economical and intensive use of land have higher control effect.

"A year of a small change, three years in a medium, five years in a big change" is the guangzhou city for the future development of speed, according to development planning in guangzhou, nansha district belongs to the south area, in keep up with the guangzhou nansha development speed, seize the development opportunity at the same time, also should pay attention to the protection of the ecological environment. The government in planning, investment promotion and capital introduction, revitalize and land intensive utilization of land supervision and reward mechanism plays a big role. In addition to road traffic for regional economic development has important guiding role, the graph is guangzhou nansha district land use present situation and the superposition of road traffic line graph, as the deputy center city of guangzhou nansha district in recent years, the amphibious transportation network development, improving road tongda degrees also for the region, especially promote the economic development of economic and technological development zone.

Demographic factors: Population is an extremely important component of urban space structure, also is the important factors influencing the function of cultivated land use change, the change of population will have a significant impact to urban land function, urban population distribution and change of regional economic development and people living standard improving impact (29-30)[10].

From the point of general land intensive utilization degree, nansha economic and technological development zone belongs to the average level, the more intensive land use, but there are a lot of room for improvement. From the intensity of land use ways, nansha economic and technological development zone land use intensity of 78.64%, have some room to improve. And land development degree is also have plenty of room to improve, the land development rate of only 56.89% of the nansha area, relative to other state-level development zone, the nansha land potential is enormous. And, in the land and market-based degree of land supply regulation performance evaluation results, the nansha economic and technological development zone multi-factor comprehensive evaluation results were 96.11% and 87.62% respectively, illustrates the nansha

development zone land use management level and the degree of mercerization has the high level, as long as you continue to play their own advantages, it must be good to promote the area of land resources optimal allocation, improve the efficiency of land use and benefit.

Further accelerate the speed of urban expansion, the driving force behind this change is mainly in economy, urbanization, population and policy these four aspects. In the long run, should implement sustainable land use policy, put equal emphasis on the development and protection of the land and resources, realize the sustainable utilization of land and resources and regional sustainable development; To strictly control population growth, to balance; Strengthen the education resources, environment, make people set up the suffering consciousness of the contradiction between human and land. Remote sensing technology can be used to quickly and accurately obtain the dynamic change of land use and cover, the land resource scientifically and rationally for the development, utilization and management to provide decision-making basis.

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