

Quantitative Analysis of Land Allocation and Utilization in Ji'nan

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Abstract—Land development and utilization are directly related to regional economic development. Taking Ji'nan as an example, some representative reference factors are selected in this paper through clustering analysis, time series regression analysis and coordination degree model, so as to find out the existing problems, current situation, reasons and corresponding solutions of the current land use distribution in Ji'nan.

Index Terms—land use; time series regression analysis; coordination degree model; matlab

I. INTRODUCTION

At present, with the rapid development of the country's economy, the process of urbanization is getting faster and faster. However, in the process of economic development,

there have always been land occupation, illegal land occupation and unutilized land and other undesirable phenomena, making the efficiency of land use inefficient.

II. ANALYSIS OF INTENSIVE USE OF LAND BASED ON COORDINATION DEGREE MODEL

The coordination degree model is used to analyze the current status of intensive land use in Ji'nan from the aspects of land utilization and land input and output levels. The indicators for evaluating the intensive land use standards and their weights[1] are determined as shown in Table I.

TABLE I.
DESCRIPTIONS AND WEIGHTS OF LAND USE AND INTENSIVE USE INDICATORS

Target layer A	Target layer B	Evaluation indicator layer C	Indicator description	Weight
Land conservation and intensive use	Degree of land use	Per capita construction land	Construction land area / total population	0.12
		Urban per capita housing area	Urban construction land area / total urban population	0.12
		Rural per capita housing area	Rural residential area / total population of rural settlements	0.10
		Unit GDP transportation land	Total area of land used for transportation / Gross Domestic Product	0.10
		Unit GDP land for water conservancy facilities	Land area for water conservancy facilities / GDP	0.08
		Idle rate of construction land	Idle land area / total area of construction land	0.08
	Input-output level	Per-acre fixed asset investment	Total social investment in fixed assets / Land area	0.12
		Per-acre GDP	GDP / total land area	0.12
		Per-acre industrial output	Industrial output / total land area	0.08
		Forest cover rate	Forest covered area/ total land area	0.08

After determining the intensive land use evaluation standard in Ji'nan, according to the statistical yearbook of Ji'nan City in 2016, the corresponding data are calculated and introduced into the form, as shown in table II.

TABLE II.
INDICATORS OF LAND USE AND INTENSIVE USE IN JI'NAN CITY

Target layer B	Evaluation indicator layer C	Current situation C	Standard values
Degree of land use	Per capita construction land	356.4	<362
	Urban per capita housing area	44.9	<59.3
	Residential area per capita in rural residential areas	52.6	<79.2
	Unit GDP transportation land	4.7	<15.52
	Unit GDP land for water conservancy facilities	8.35	<49.4
	Idle rate of construction land	22.5	<30
Input-output level	Per-acre fixed asset investment	4.4	>2.5
	Per-acre GDP	7.6	>3.83
	Per-acre industrial output	6.7	>1.26
	Forest cover rate	35.2	>21.6

The level of land use and input-output are respectively used as two elements in the evaluation system of intensive land use in Ji'nan, and the comprehensive coordination level of land use and input-output is calculated, and the adjustment coefficient is 2. From the analysis, we can see that land use and input output level are equally important

for intensive land use evaluation in Ji'nan, and the result is 0.61.

According to the coordinated development and the characteristics of land intensive use, the corresponding relationship between coordinated development degree and coordination level and intensive use level can be established, such as table III.

TABLE III.
THE CORRESPONDING RELATIONSHIP BETWEEN COORDINATED DEVELOPMENT DEGREE, COORDINATION LEVEL AND INTENSIVE UTILIZATION LEVEL

Coordinated development degree	0 ~ 0.39	0.4 ~ 0.59	0.6 ~ 0.79	0.8 ~ 1.0
Coordination level	Incoordinate	Preliminarily coordinated	Basically coordinated	Highly coordinated
Intensive utilization level	Extensive utilization	Starting of intensive use	Primary intensive use	Intensive use

According to the results of the model, the level of intensive land use in Ji'nan City is in a phase of basic coordination and primary intensive utilization. According to relevant data, there are problems such as the continuous reduction of cultivated land area, the growing contradiction between people and land, and the serious destruction of the ecological environment.

III. ANALYSIS OF THE CAUSES OF LAND USE AND DISTRIBUTION IN JI'NAN CITY

Reasons for the continuous decrease of arable land: On the one hand, because the development of urban and rural

economy has a certain demand for arable land, it will reduce the area of arable land. On the other hand, the laws and regulations on the land are not perfect, and there are too many violations of land occupation, because a large amount of cultivated land is illegally occupied.

Reasons for low land-use efficiency: Insufficient intensification of cultivated land; inadequate use of forest land, declining land quality; and overused farmland without proper attention to the maintenance of its fertility result in a decline in land productivity. Due to the low cost of acquisition and input and output per unit area, industrial projects have relatively low utilization efficiency.

TABLE IV
POPULATION OF JI'NAN CITY IN THE LAST 5 YEARS

Year	2013	2014	2015	2016	2017
Population (Ten thousand people)	613.25	621.61	625.73	706.69	To be counted

Reasons for the outstanding contradiction between man and land: As shown in Table IV, Ji'nan City's population has continued to increase in recent years, and the total land area in Ji'nan has not changed. As a result, the per capita land area in Ji'nan has decreased year by year, and the tension between man and land has become increasingly tense.

soil erosion is more serious and the level of sustainable utilization of the land is very low because of the unreasonable exploitation of land in the Southern mountainous areas in recent years. [2]

IV. COMBINING TIME SERIES AND REGRESSION ANALYSIS AND MAKING RELEVANT RECOMMENDATIONS

Use excel to combine time series with regression analysis to predict the future land use in Ji'nan:

The causes of ecological environment destruction: in the southern mountain area of Ji'nan, the ecological environment of the southern mountain area has been destroyed, the area of the cultivated land is damaged, the

TABLE V
FORECAST TABLE OF LAND USE IN JI'NAN CITY

Year	Cultivated land	Forest	Town villages and industrial and mining land	Transportation land	Water area and land for water conservancy facilities	Other land
2011	361251	86070	137306	28459	51324	50395
2012	360279	85682	139087	28742	51246	50127
2013	361012	85100	140218	28740	51155	49863
2014	360241	84963	140772	29068	51039	50150
2015	358568	84676	142969	29135	50962	50227
2016	358511.8	84141.87	144298.1	29377.33	50942.4	49936.6
2017	357912.6	83746.5	145491	29530.09	50823.8	49945.93
2018	357313.4	83351.12	146784.9	29690.68	50745.45	49980.84
2019	356714.2	82955.75	148254.3	29895.05	50673.32	49985.89
2020	356115	82560.38	149766.8	30044.86	50604.66	49882.74

2021	355515.8	82165.01	150975.8	30238.48	50524.71	49839.31
2022	354916.6	81769.64	152363.7	30401.52	50437.26	49861.45
2023	354317.4	81374.27	153784.2	30581.82	50368.51	49821.01
2024	353718.2	80978.9	155175	30758.94	50291.7	49773.62
2025	353119	80583.52	156524.3	30929.45	50212.96	49738.23
2030	350123	78606.67	163401.3	31808.01	49826.22	49596.22

Using Excel to predict the future development trend of different types of land, and then combine the policies and targets set by the government authorities, and then get the specific measures to solve the problems existing in the current land use in Ji’nan.

Suggestions on strengthening land management: source management and control; strengthening land management proposals; excavating the potential of land.

Suggestions to guide the rational use of land in enterprises: to improve the access threshold, strengthen post management, tighten examination and check, increase incentive measures, free choice and formulate differentiated land supply policies.

Suggestions on guiding community construction and mass consciousness: enhance awareness of publicity, design high-quality community and introduce social supervision mechanism.

V. CONCLUSIONS

Land resources, as important natural resources, are undergoing profound changes[3]. As one of the important research directions, land use change is of great significance for realizing the coordinated and sustainable development of human society [4].

Social factors such as economic development, population increase and government policy have influence on different land types of Ji’nan in varying degrees, and affect the speed of the change of land area in Ji’nan. Therefore, only by taking into consideration all the development of these three aspects and the protection of the environment and resources can we further improve the land problem in Ji’nan City [5].

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