Study on the Consolidation Potential of Construction Land in Bagongshan District of Huainan City

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Abstract Based on grading of consolidation potential of rural construction land, coal mining subsidence areas, old towns and "villages within the city" in Bagongshan District, this article put forwards the following recommendations to fully tap the consolidation potential of construction land in Bagongshan District: strengthening the planning guidance; combining the construction land consolidation with beautiful countryside construction; focusing on the ecological civilization construction.

Key words Bagongshan District, Construction land, Consolidation potential

Since the new century, Bagongshan District has achieved leapfrog socio-economic development, and urban and rural areas have taken on a brand-new look. However, it is faced with the shortage of construction land quota and the pressure of increasing difficulty in construction land consolidation. Therefore, the in-depth study of land situation and the analysis of characteristics and consolidation potential of various types of construction land in Bagongshan District, is of important significance of reference to the sustainable land use in the resource-exhausted cities.

1 Natural and socio-economic conditions in Bagongshan District

1.1 Natural conditions Bagongshan District is under the administration of Huainan City, located in the west of Huainan City. It borders Xiejiaji District to the east, Fengtai County to the west, Shou County to the south, and faces Panji District across the water in the north. Huaihe River flows 11.4 km through the area. Geographic coordinates are 116°45′ - 116°52′ E, 32°36′ - 32°42′ N. The total area of the district is about 68 square kilometers, administering 1 forest farm, 2 towns, 3 streets, and 21 administrative villages.

1.2 Socio-economic conditions In 2011, the region's GDP reached 4.895 billion yuan, an increase of 12.2%; the fiscal revenue was 285 million yuan, an increase of 37%; the above-scale industrial added value was 3.15 billion yuan, an increase of 15.1%; the fixed assets investment was 2.258 billion yuan, an increase of 26.3%; total retail sales of social consumer goods reached 671 million yuan, an increase of 17.5%; per capita disposable income of urban residents was 18731 yuan, an increase of 16.6%; rural per capita net income was 8644 yuan, an increase of 17.1%. The socio-economic development in this district shows good momentum[1].

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2 The current situation and problems of land use in Bagongshan District

2.1 The current situation of land use

2.1.1 Land use structure. The region's total land area is 6714.55 hm^2. The area of agricultural land is 2826.53 hm^2, accounting for 42.63% of the total land area; the area of construction land is 3430.58 hm^2, accounting for 51.09% of the total land area; the area of other land types is 421.44 hm^2, accounting for 6.28% of the total land area; the land use rate is 87.51%.

2.1.2 Land use layout. Fig. 1 is the map of current land use in Bagongshan District. From Fig. 1, it can be found that the agricultural land is concentrated in Bagongshan District, but the layout of other types of land (such as rural construction land, old towns, industrial and mining land) is scattered. For example, the scattered distribution of Nantang Village, Zhugang Village and other natural villages forms "hollow villages"; the interspersed distribution of the old towns and rural settlements forms the "villages within the city"; the coal mining subsidence areas still show a growing trend.

2.2 The problems in land use

2.2.1 Great difficulty in the consolidation of rural settlements. The early rural construction land consolidation in Bagongshan District was mainly based on the abandoned homestead and the rural residential land with low cost of demolition, in accordance with the principles of easy first and difficult later. As the work of "linking the increase in land used for urban construction with the decrease in land used for rural construction" is carried out, the construction land easy to be consolidated and reclaimed has basically disappeared, and the whole district is faced with the problems of difficult demolition and high relocation cost.

2.2.2 Great difficulty in the consolidation of abandoned mining and industrial land. Bagongshan District is the key mining area in Huainan City, and with the building of a large number of modern high-yielding mines and the application of advanced coal mining technology, the subsidence region is increasingly expanding. As of

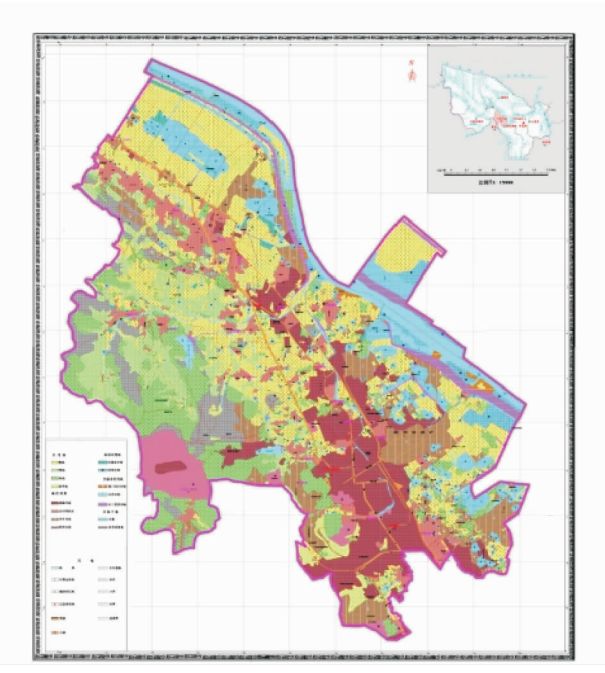

Fig. 1 Current land use map in Bagongshan District (2011)

the end of 2010, the area of coal mining subsidence regions in the whole district was about 826.7 hectares, causing damage to the farmland and houses.

2.2.3 Great difficulty in the consolidation of old towns and "villages within the city". The distribution of old towns and "villages within the city" in the whole district is scattered, the land use is chaotic, and the land utilization efficiency is low. However, due to the complexity of the sources of the miners and local residents, they are strongly attached to the land and have too high compensation expectation, increasing the difficulty of consolidation.

3 Grading of construction land consolidation potential in Bagongshan District

3.1 Grading methods and steps

3.1.1 Grading methods. On the basis of the land use database and remote sensing image data provided by the Bureau of Land Resources in Bagongshan District, we use planning simulation method, overall land use planning, urban-rural planning and the related survey results, to summarize the construction land to be consolidated, calculate the construction land consolidation scale, and calculate the new farmland coefficient and supplemental farmland area based on the project experience.

3.1.2 Grading steps. (i) We use Mapgis software to derive the second survey result map and planning map on Bagongshan District, and carry out statistical analysis of the patch area of the construction land region. (ii) By comparing the construction land area of current situation map and planning map, we determine the construction land consolidation scale, new farmland coefficient and supplemental farmland area. (iii) Using the Mapgis software statistical module, we calculate the area of construction land to be consolidated from the base year to the planned year. (iv) According to the consolidation area, we grade the consolidation potential.

3.2 Grading results

3.2.1 Rural construction land. According to the construction land consolidation area, the consolidation potential of rural construction land in the district is graded into four levels. The area of rural construction land to be consolidated in the whole district is 234.86 hm^2, the average new farmland coefficient is 62.34%, and the supplemental farmland area is 154.05 hm^2. Through the implementation of rural construction land consolidation, the area of rural construction land that can be saved is 182.64 hm^2 (Table 1).

Table 1 The consolidation potential of rural construction land in Bagongshan District

Village name	Scale of consolidation hm^2	New farmland coefficient %	Supplemented farmland area // hm^2	Potential level
Kongji Village	19.12	63	12.08	II
Tuxiang Village	12.25	67	8.24	III
Gongnong Village	29.36	82	24.22	I
Zhanglou Village	6.03	76	4.59	IV
Shantu Village	10.89	60	6.48	III
Nantang Village	4.00	44	1.75	IV
Linchang Village	5.21	37	1.92	IV
Bigang Village	30.95	81	24.96	I
Lizui Village	4.94	84	3.78	IV
Dingshan Village	21.86	74	16.25	I
Miaoshan Village	4.79	43	2.04	IV
Shanchong Village	11.04	64	7.09	III
Huaibin Village	0.19	37	0.07	IV
Yangjiadi Village	9.92	58	5.71	III
Qianhu Village	2.53	49	1.25	IV
Qianhuai Village	2.17	71	1.55	IV
Shenxiang Village	19.07	62	11.8	II
Caigang Village	5.76	69	3.95	IV
Xiaying Village	1.68	40	0.68	IV
Zhugang Village	15.23	75	11.43	II
Caiwa Village	17.87	24	4.21	IV

3.2 Coal mining subsidence areas According to the consolidation area of various evaluation units, the consolidation potential of coal mining subsidence areas in the whole district can be graded into four levels. The reclamation scale of coal mining subsidence areas in the whole district is 319.26 hm^2, the average new farmland coefficient is 78.41%, and the supplemental farmland area is 260.31 hm^2 (Table 2).

Table 2 The consolidation potential of coal mining subsidence areas in Bagongshan District

Village name	Scale of reclamation hm^2	New farmland coefficient %	Supplemented farmland area // hm^2	Potential level
Kongji Village	29.28	76	22.38	I
Tuxiang Village	11.44	91	10.42	II
Gongnong Village	58.82	93	54.63	I
Zhanglou Village	12.01	91	10.98	II
Shantu Village	6.56	87	5.71	III
Nantang Village	15.29	57	8.78	III
Linchang Village	14.32	60	8.63	III

To

(Table 2)

Village name	Scale of reclamation hm^2	New farmland coefficient %	Supplemented farmland area//hm^2	Potential level
Bigang Village	17.59	89	15.67	II
Lizui Village	17.33	88	15.22	II
Dingshan Village	16.40	60	9.86	III
Shanchong Village	18.74	77	14.52	II
Yangjiadi Village	15.22	86	13.13	II
Qianhu Village	8.14	42	3.38	IV
Shenxiang Village	20.13	91	18.37	II
Caigang Village	8.82	69	6.07	III
Zhugang Village	16.04	85	13.64	II
Caiwa Village	31.76	91	28.92	I

3.3 Old towns and "villages within the city" According to the construction land consolidation scale of old towns and "villages within the city", the consolidation potential of old towns and "villages within the city" in the whole district can be graded into four levels. The consolidation scale of old towns and "villages within the city" in the whole district is 397.92 hm^2, and by consolidation, 408.15 hm^2 of construction land can be saved (Table 4).

Table 3 The consolidation potential of old towns and "villages within the city" in Bagongshan District

Village name	Scale of consolidation of old towns and "villages within the city"//hm^2	Potential level
Kongji Village	50.59	I
Tuxiang Village	29.03	III
Gongnong Village	61.71	I
Zhanglou Village	0.97	IV
Shantu Village	23.72	III
Nantang Village	0.80	IV
Linchang Village	15.88	IV
Bigang Village	20.09	III
Lizui Village	14.67	IV
Dingshan Village	59.30	I
Shanchong Village	13.71	IV
Huaibin Village	2.31	IV
Yangjiadi Village	7.05	IV
Qianhu Village	1.70	IV
Qianhuai Village	6.20	IV
Shenxiang Village	15.65	IV
Caigang Village	22.53	III
Xiaying Village	6.13	IV
Zhugang Village	14.20	IV
Caiwa Village	31.68	II
Xinzhuangzi Street	32.33	II
Bijiagang Street	34.25	II

4 Recommendations for fully tapping the consolidation potential of construction land

4.1 Strengthening the planning guidance

4.1.1 Drawing up the rural construction planning, integrating and regulating the rural construction land. It is necessary to rationally guide the relative concentration of rural settlements, and promote the moderate merging of natural villages, to ensure the construction land indispensable to agricultural production and farmers' living[2]. When the farmers build new houses, they should give priority to the use of idle land in the village, idle homestead and unused land. There is an urgent need to guide and regulate the reasonable circulation of rural idle homestead, to improve the utilization efficiency of rural homestead[3]; strengthen the transformation of "hollow villages", and promote the rural construction land consolidation, to build a beautiful countryside.

4.1.2 Drawing up the land consolidation plan, guiding the transformation of "hollow villages" and improving the reclamation level of coal mining subsidence areas. The land consolidation planning is drawn up in accordance with the overall land use planning. It is necessary to promote the transformation of old towns and "villages within the city" in Bagongshan District according to the plan, tap the potential of unused land, and raise the level of urban land use, to reduce land resource consumption and maximize efficiency of land use[4]; focus on promoting the land reclamation and ecological restoration projects in the coal mining subsidence areas according to the plan.

4.2 Combining the construction land consolidation with beautiful countryside construction In accordance with the requirements of "cultivating central villages, consolidating natural villages and improving characteristic villages", it is necessary to give full consideration to the rural natural resources, geographical features, economic base, folk culture and other factors, and combine construction land consolidation in Bagongshan District and beautiful countryside building. In the process of building a beautiful countryside, it is necessary to fully mobilize farmers' sense of participation, and attach importance to the seat of township government, small towns, characteristic industry villages, historical and cultural villages and large villages which can play a leading role to cultivate a number of central villages.

4.3 Focusing on the ecological civilization construction In the course of construction land consolidation, it is necessary to take actions that suit local circumstances, ensure the relative balance and virtuous cycle of land ecosystem, and improve the positive impact of land consolidation on ecological security[5]; strengthen the land reclamation in key mining areas to gradually restore the ecology of the mining areas; enhance village concentration, road and drainage improvement, and construction of shelterbelt to improve the level of ecological civilization while promoting the land use rate and land use intensity; focus on the rural residential land consolidation, effectively protect the ecology and environment in rural areas, exhibit the rural ecological characteristics, and promote the building of rural ecological economy, ecological settlement, ecological environment and ecological culture.

5 Conclusions

The inevitable ways to promote the simultaneous construction of

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parative evaluation of a number of villages in a given year within the specific areas, or longitudinal annual carrying capacity evaluation of single village.

Given the limited carrying capacity of a single village, this article focuses on the study of carrying capacity evaluation of several villages in a given year, and analyzes the development laws of regional rural carrying capacity, to identify the strengths and weaknesses of each village, and achieve sustainable development.

(i) Current carrying capacity analysis. Based on the information collected for each village, DEA model is used to analyze the current carrying capacity of each village after the completion of indicator standardization and weight calculation.

(ii) Ideal carrying capacity analysis. The capital of current environmental carrying capacity indicators is replaced by the target environmental carrying capacity indicators, to calculate the ideal carrying capacity.

(iii) Carrying potential analysis. By comparing the current environmental carrying capacity and ideal environmental carrying capacity, the environmental carrying potential of each village is evaluated.

Finally, according to DEA evaluation results, the difference in the public safety environmental carrying capacity between the villages is determined, and the overall rural public safety carrying capacity is improved through the rational layout and planning of rural natural environment and artificial environment.

5 Conclusions

The current rural public safety incidents are mostly due to the fact that pressure generated by human socio-economic activity exceeds the threshold of environmental carrying capacity, so the rural environmental carrying capacity is directly related to sustainable environmental, economic and social development in rural areas. Based on the current situation of rural public safety planning, this article establishes indicator evaluation system, nondimensionalizes the indicator and calculates its weight. DEA is used to establish evaluation model and get evaluation results (Fig. 2).

Based on the evaluation results, carrying out rational planning of rural natural and artificial environment can help improve the environmental carrying capacity of rural public safety, and provide scientific and quantified technical support to rural public safety planning.

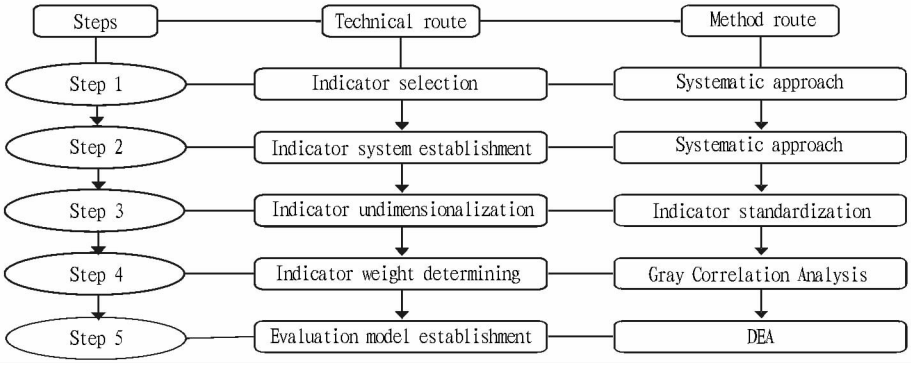

Fig. 2 Technical route for environmental carrying capacity indicator evaluation system

References

[1] LI YH. Common problems of township planning management and suggestions [J]. Modern Sciences, 2009(10): 93. (in Chinese).

[2] SUN M, YAN JX. Planning and management research of urban public safety [J]. Shanxi Architecture, 2013(27): 5 – 7. (in Chinese).

[3] WANG J, SUN TH, LI PJ, *et al*. Research progress on environmental carrying capacity[J]. Chinese Journal of Applied Ecology, 2005(4): 768 – 722. (in Chinese).

[4] WEN K, ZHU EJ, *et al*. Annual report on Beijing – Tianjin – Hebei metropolitan region development(2013)[M]. Beijing: Social Sciences Academic Press(China), 2013: 260 – 261. (in Chinese).

[5] SUN Y, LI XG, YAO XD. The research of Tianjin urban land comprehensive carrying capacity[J]. Urban Studies, 2012(9): 107 – 109. (in Chinese).

[6] SONG Y. Evaluation of air environment carrying capacity based on DEA in China[J]. Journal of Henan Agricultural University, 2011(5): 601. (in Chinese).

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"Four Modernizations" in China are as follows: vigorously enhancing the rural construction land consolidation and achieving the goal of decrease in the area of rural construction land and increase in the area of farmland; strengthening planning guidance and using land consolidation means to make old towns and "villages within the city" show a brand-new look; accelerating the reclamation of abandoned mining land and ecological restoration to increase the available land area. The current situation of construction land in Bagongshan District, Huainan City, Anhui Province, is of typicality and actuality, and this article proposes the ways and means to tap the potential, in order to provide a reference for efficiently using the available land.

References

[1] Bagongshan Statistical Bureau of Huainan. Main statistical data of December, 2012[EB/OL]. (in Chinese).

[2] LIU YL, QU FT, JIANG H. Evaluation of rural residential land reclamation potential in Jiangsu Province[J]. Journal of Nanjing Agricultural University (Social Science Edition), 2004, 4(4): 18 – 23. (in Chinese).

[3] LIN EP. Land reclamation should pay attention to internal tapping[J]. Guangdong Land Science, 2006, 5(5): 217 – 219. (in Chinese).

[4] YU ZX, TAN YX. Discussion on methods and approaches for economical and intensive utilization of land in Anhui Province[J]. Journal of Anhui Agricultural University(Philosophy & Social Sciences Edition), 2012, 21(3): 43 – 48. (in Chinese).

[5] YU ZX, JIA L, ZHANG YJ, *et al*. A research on ecological security in land arrangement[J]. Scientific and Technological Management of Land and Resources, 2008, 25(1): 42 – 45. (in Chinese).