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Research on Industrial Land Utilization Efficiency in Jiangxi Province under the Background of Ecological Civilization

Hailing Jiang[1,2*]

[1]Small and Micro Enterprise Research Center, Nanchang Business College of Jiangxi Agricultural University, Nanchang 330044, China
[2]Institution of Ecological Civilization, Jiangxi University of Finance and Economics, Nanchang 330013, China
jhling2020@126.com
**Corresponding author*

Abstract: *With the rapid advancement of China's industrialization and urbanization, land shortage has become a bottleneck restricting the sustainable development of China's social economy. The excessive proportion of industrial land in urban construction land is showing a further intensified trend. This article builds an evaluation index system for industrial land utilization efficiency based on the Slacks-Based Measure (SBM) model. The utilization efficiency of industrial land in 11 prefecture-level cities in Jiangxi Province was studied, the problems of industrial land utilization efficiency in Jiangxi Province during the past 10 years were analyzed, and corresponding policy recommendations were put forward.*

Keywords: *Industrial Land Utilization Efficiency, Ecological Civilization Construction, Jiangxi Province*

1. Introduction

In recent years, the process of urbanization in China has accelerated, and resources have become an important factor that affects and restricts social and economic development. The report of the 19th National Congress of the Communist Party of China proposed to accelerate the reform of the ecological civilization system and build a beautiful China. We must adhere to the policy of giving priority to conservation, giving priority to protection, and giving priority to natural restoration, Form a spatial pattern, industrial structure, production method, and lifestyle that saves resources and protects the environment, and it is naturally tranquil, harmonious and beautiful. Since the reform and opening up, the rapid development of China's economy has promoted the development of all walks of life. As an important part of the national economy, China's industry has achieved rapid development. In 2013, China's industrial output value reached 2.107 billion yuan,It accounts for 37% of GDP. At the same time, the area of industrial land has also increased rapidly. In 2012, the area of urban industrial land in China was 8712 km2, an increase of 2943.5 km2from 2002, accounting for 19.04% of the total urban construction land area. The type with the highest proportion, due to historical reasons, For a long time, the supply of industrial land has been placed in the most important position. In addition, in order to attract investment, local governments often sell urban land at low prices. Due to the large number of industrial enterprises being introduced, urban industrial land takes up a large amount of urban land. Another factor that leads to the excessive dispersion of industrial land construction is the low land price. This will inevitably cause the output efficiency of industrial land to be too low. By analyzing the industrial land in European and American countries, we can find that their urban industrial land is generally controlled at 5%~10% of urban land. Obviously, China's current industrial land pattern is not conducive to the sustainable development of cities.

For a long period of time in the future, domestic urban construction will continue to develop at a relatively rapid rate. According to the analysis of the current situation, it is estimated that China's urbanization rate will reach 60% by 2020, and the land resources for urban construction in China will face greater pressure. This situation is difficult to change in the short term. The most important land type in construction land is industrial land.Whether industrial land can be used rationally will affect the development of the city. At present, the utilization efficiency of industrial land in China is generally

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low, and its floor area ratio is only 0.3~0.6, while the developed countries generally reach 1.0. Even if the industrialization level of Shanghai is in the leading position, the output intensity of its industrial land in 2009 is still much behind compared with the large cities in developed countries .In a word, improving the utilization efficiency of urban industrial land will promote the development of the city, solve the dilemma of "guaranteeing development and protecting resources", so as to realize the sustainable development of the city is of great significance.

Jiangxi is a well-known old revolutionary base in China and an important ecological security barrier in southern China. It faces the dual pressure of economic development and environmental protection. At the beginning of 2016, when Xi Jinping visited Jiangxi, he emphasized that green ecology is Jiangxi's greatest wealth, greatest advantage, and largest brand. Take a path where economic development and the improvement of ecological civilization level complement each other and complement each other, and create a beautiful China "Jiangxi model". In August of the same year, in the Opinions on Establishing a Uniform and Standardized National Ecological Civilization Experimental Zone issued by the General Office of the Central Committee of the Communist Party of China and the General Office of the State Council, Jiangxi Province became one of the first batch of unified and standardized national ecological civilization experimental areas. During the National Day in 2017, the General Office of the Central Committee of the Communist Party of China and the General Office of the State Council issued the "National Ecological Civilization Pilot Zone (Jiangxi) Implementation Plan" (hereinafter referred to as the "Plan"), requiring Jiangxi Province to strive to build a beautiful China through reform, innovation and system exploration. Jiangxi model.

The green development of the industrial economy is the core of the construction of ecological civilization. As an old revolutionary area, Jiangxi Province firmly grasps this "bull nose". The goal of industrial economic growth is to maximize the output of various elements when the input is constant, or given Input is minimized when output is constant. Among them, land is one of the main input factors, As the most basic means of production in industrial production, land is the basis for the allocation of other production factors. The scale of industrial land firstly depends on the amount and scope of land resources available. Only on a certain scale of land can there be input of labor and capital, and the amount of input depends on the capacity of the scale of the land. Therefore, improving the efficiency of urban industrial land use is essential to effectively use the limited land in the city, solve the dilemma of "guaranteeing development and protecting resources", and to promote the innovation of ecological civilization system, actively explore effective models of ecological protection and industrial governance, and build on the innovative ecological civilization system.

Attempt to construct an evaluation index system for industrial land use efficiency in 11 prefecture-level cities in Jiangxi Province, The SBM model is used to analyze the difference of industrial land use efficiency in Jiangxi Province, reveal the trend changes of influencing factors on industrial land use efficiency and its influence mechanism, and propose targeted suggestions to improve industrial land use efficiency.

The academic research on the efficiency of industrial land began with Weber's "Industrial Location Theory" systematically expounding the issues of industrial location and enterprise location. Since then, classical location theory, neoclassical location theory and modern location theory have all expanded this theory. Fetter (1924) proposed the location theory of trade zone boundaries; Losch (1954) used the profit principle to explain location trends. Put forward the highest profit location theory; American scholar Israd (1956) integrated the thesis of predecessors, put forward a comprehensive analysis of the various cost factors of industrial location. The above studies are all based on microeconomics analysis methods. Modern industrial location theory mainly analyzes from a macroeconomic perspective, focusing on the growth rate of regional gross national product and national income. Research on the impact of differences in regional investment rate and inflation rate on industrial location.

On this basis, many scholars have found that the intensive use of industrial land is an important way to improve the level of industrial economic development. Guo et al.(2014) consider the two cases of undesired output by considering industrial waste water emissions, industrial so2 emissions, and industrial smoke and dust emissions, and when the undesired output is not considered, The inter-period data envelopment analysis method was used to measure the utilization efficiency of industrial land in 33 cities across the country from 2004 to 2011, and the Malmquist-Luenberger productivity index and Malmquist productivity index were used to analyze and compare the productivity changes and decomposition of urban industrial land. Huang(2015) analyzes the revitalization of stock industrial land in order to promote the efficiency of industrial land use. Xiao (2017) used the directional environmental distance function to measure the environmental technical efficiency of industrial land in the Beijing-Tianjin-Hebei region from 2004 to 2013, and used ArcGIS mapping software to analyze the

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Beijing-Tianjin-Hebei region in terms of time and space. The efficiency of industrial land use in 13 cities was analyzed. Zhu et al. (2018) analyzed the industrial land efficiency of 110 mining cities from 2000 to 2015 based on environmental constraints. Discuss its influencing factors and optimization path. DongY et al. (2020) studied the interaction between urban industrial land use efficiency, industrial transformation and carbon emissions. Using stochastic frontier analysis (SFA), index method (IM) and remote sensing inversion methods, the industrial land use efficiency, industrial transformation degree (ITD) and carbon emission intensity (CEI) of 108 cities in the Yangtze River Economic Belt (YREB) were calculated from 2005 to 2017.), and analyzed its temporal and spatial evolution characteristics. It is proposed that cities should take a new urbanization path that is resource-saving, cost-effective, and environment-friendly.

2. Overview and Research Methods of the Study Area

2.1. Overview of the Study Area

Jiangxi Province is located between 24°29′14″to 30°04′41″north latitude and 113°34′36″to 118°28′58″east longitude. It is adjacent to Zhejiang Province in the east, Fujian Province, Connected to Guangdong Province in the south and connected to the west Hunan Province, Hokurei Hubei Province and Anhui Province Yangtze, Belongs to the East China region. Jiangxi Province covers an area of 166,900 square kilometers, and governs 11 prefecture-level cities and 100 counties (cities, districts). The provincial capital is Nanchang.

In addition to the relatively flat northern part of the province, the east and west are surrounded by mountains on three sides, and the central hills are undulating, forming a whole direction. Poyang Lake A huge basin sloping and opening to the north. There are more than 2,400 large and small rivers in the whole area. Ganjiang, Fuhe, Xinjiang, Xiuhe and Raohe are the five major rivers in Jiangxi. Poyang Lake It is the largest freshwater lake in China. Near the Tropic of Cancer in Jiangxi, the province has a warm climate with abundant rainfall, with an average annual rainfall of 1341 mm to 1940 mm. The frost-free period is long and the climate is subtropical humid.

2.2. Data Sources

The data in this article come from the 2003-2012 China Statistical Yearbook, China Urban Statistical Yearbook and China Urban Construction Statistical Yearbook.

2.3. Research Methods

Tone determined the non-radial and non-angle SBM model for the calculation of slack variables in 2001. It includes the basis of different decision-making units and puts the slack variables into the objective function. The following are the details of the constructed model.

Suppose that there are n DMUs(Decision making unit), and each DMU(Decision making unit) has M inputs (x) to produce J outputs (y), they can be followed by the vectors $\mathrm{x} \in R^M, \mathrm{y} \in R^J$, and then, we can define the matrices X and Y as

$$X = [x_{11}, \ldots, x_{Mn}] \in R^{M \times n}, Y = \left[y_{11}, \ldots, y_{J_n} \right] \in R^{J \times n}, \text{ where } X > 0, Y > 0.$$

The production technology can be defined as:

$$X = [x_{11}, \ldots, x_{Mn}] \in R^{M \times n}, Y = \left[y_{11}, \ldots, y_{J_n} \right] \in R^{J \times n} \quad (1)$$

Where T(x) is always assumed to satisfy the production theory. Considering that the scale return invariant model satisfies all production technology assumptions, the model of the scale return invariant model can be expressed as:

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$$\rho_0^* = \min \frac{1-\frac{1}{M}\sum_{m=1}^{M}\left(\frac{S_{m0}^x}{x_{m0}}\right)}{1+\frac{1}{J+K}\left(\sum_{j=1}^{J}\frac{s_{j0}^y}{y_{j0}}+\sum_{k=1}^{K}\frac{s_{k0}^b}{b_{k0}}\right)}$$

$$S.T\begin{cases}\sum_{t=1}^{T}\sum_{n=1}^{N} x_{mn}^t \lambda^t{}_n - s_{m0}^x = x_{m0} \\ \sum_{t=1}^{T}\sum_{n=1}^{N} y^t{}_{jn}\lambda_n{}^t + s_{j0}^y = y_{j0} \\ \sum_{t=1}^{T}\sum_{n=1}^{N} b_{kn}^t \lambda_n{}^t - s_{k0}^b = b_{k0} \\ \sum_{n=1}^{N}\lambda_n = 1, s_{m0}^x \geq 0, s_{j0}^y \geq 0, s_{k0}^b \geq 0\end{cases} \quad (2)$$

Where m and j represent the indexes of inputs and outputs, respectively. s_{m0}^x, s_{j0}^y represent the slack variables of inputs and outputs, respectively. ρ represents the efficiency value of DMU_0, When $\rho = 1$, s_{m0}^x, s_{j0}^y =0, the DMU_0 is strongly efficient; and the DMU is weakly efficient when s_{m0}^x, s_{j0}^y ≠0. When $\rho < 1$, the DMU (Decision making unit)is inefficient, and it is necessary to adjust the input-output structure. λ represents the non-negative multiple vector.

2.4. Selection of Investment Indicators

This article uses industrial land area, industrial assets, and the number of industrial employees as input changes, and industrial GDP and environmental pollution emissions as its output variables.

3. Analysis of the Utilization Efficiency of Industrial Land in Jiangxi Province

As shown in Figure 1, the comprehensive technical efficiency of industrial land in Jiangxi Province from 2003 to 2012 has increased year by year, especially the pure technical efficiency and scale efficiency have increased rapidly, with ranges of 136% and 77% respectively, and the development of comprehensive technical efficiency has been relatively slow. An increase of 23%. There is a certain gap between the three efficiencies and the optimal level, of which the pure technical efficiency gap is the most obvious. However, the three types of efficiencies have also seen significant growth in the past 10 years, indicating that the transfer of industrial land in Jiangxi Province has become more reasonable and Jiangxi is taking a green development path.

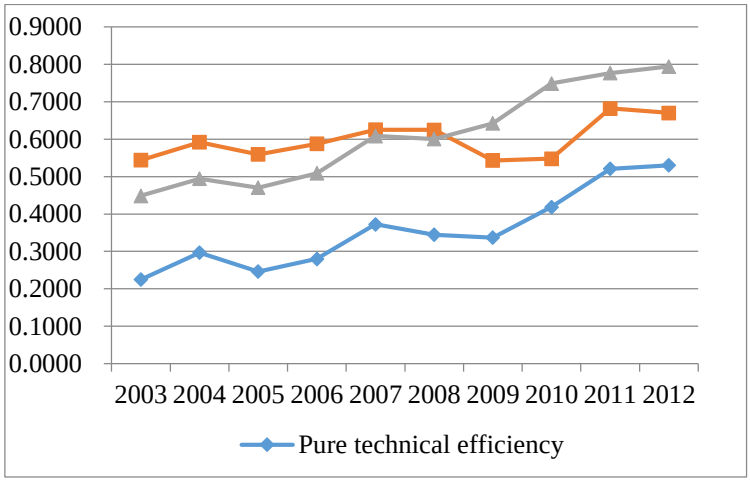

Figure 1: The development trend of the industrial land-use efficiency average value of Jiangxi province

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From Figure 1, it can be found that the utilization efficiency of industrial land in Jiangxi Province has several common characteristics. First of all, the three types of efficiencies in Jiangxi Province have basically shown an upward trend in the past 10 years, indicating that the industrial land use in Jiangxi Province has generally developed in the direction of intensification and rationalization in the past decade, and the pure technical efficiency and scale efficiency have increased rapidly. Secondly, Among the three efficiencies, the scale efficiency value is the highest, and both have seen significant and stable growth, indicating that the scale of industrial development in Jiangxi Province has expanded rapidly in the past 10 years, and the advantage of scale effect has continued to increase. By 2012, the scale efficiency value of each province was generally above 0.8. Finally, among the three efficiencies, pure technical efficiency is the most eye-catching. Among them, the pure technical efficiency of Jiangxi Province has increased by more than 100%, indicating that the industrial development of these provinces pays more attention to technological input. As a slightly underdeveloped province, Jiangxi Province has a large proportion of industrial land and low utilization efficiency. In order to achieve the goal of the rise of Central China, Jiangxi Province has always adhered to the green and ecological development strategy, and continued to promote the development of agricultural modernization. Strengthen the construction of a new industrial-led pattern and upgrade the industrial structure.

Table 1: Urban industrial land efficiency of Jiangxi province during 2003-2012

province	Mean efficiency	Average efficiency of each city
Jiangxi Province	0.3697	Nanchang City (0.3745), Shangrao City (0.3527), Jiujiang City (0.2978), Jingdezhen City (0.2466), Pingxiang City (0.3217), Xinyu City (0.4781), Yingtan City (0.4571), Ganzhou City (0.2916), Yichun City (0.3527), Ji'an City (0.4870), Fuzhou City (0.2641)

It can be seen from Table 1 that the utilization efficiency of industrial land in most cities in Jiangxi is not high, and the average efficiency of most cities is less than 0.5. It can be seen that the utilization efficiency of urban industrial land is generally low, and there is much room for improvement. There are significant internal differences between Jiangxi's districts and cities. Although Jiangxi's industrial land utilization efficiency has increased, in terms of its internal development,Not all are in the rising stage, and the industrial land use efficiency value fluctuates frequently in most regions. Overall, the development of industrial land utilization efficiency in Jiangxi Province is still relatively low, and it is not conspicuous in the central region.

4. Problems in the Utilization Efficiency of Industrial Land in Jiangxi Province

Action lags behind idea. Jiangxi's industrial land utilization efficiency development action cannot keep up with the pace of the ecological civilization development concept, and the policy implementation effect is poor. Moreover, local cities have not issued better policies for the development of ecological civilization, and the actual work has not yet been implemented.

Environmental capacity pressure continues to increase. The actual pollution emissions of the industrial industries in Jiangxi Province are still at a relatively high level and are on the rise. At present, Jiangxi Province has certain green environmental advantages, and it is necessary to continue to introduce effective ecological protection policies, and to strengthen the prevention and control of polluting enterprises and other sources of pollution at this stage.

The industrial organization is unreasonable, and the proportion of green industry is not high. At this stage, the release of green industries in Jiangxi Province is excessively dispersed. Among them, the "three products and one standard", that is, pollution-free agricultural products, green food, organic agricultural products, and geographical indications of agricultural products are not widely used.

5. Policies and Recommendations

Ecological civilization is the connotation of Jiangxi's economic development, and green ecology is the greatest wealth and advantage of Jiangxi Province. Adhering to green development is the greatest development advantage of Jiangxi Province. We must adhere to the development concept of "green water and green mountains are golden mountains and silver mountains" unshakable, further promote the construction of Jiangxi ecological civilization, and strengthen the demonstration role of the national ecological civilization experimental zone.Actively explore new models of green development and

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create a "Jiangxi model" for a beautiful China.

a) Reasonably control the scale of land use. According to the research results of this article, Jiangxi Province's industrial economic growth mainly depends on the expansion of scale, and the phenomenon of extensive land use and land waste still exists. Therefore, the goal of ensuring the sustainable use of land resources should be ensured, and land use should be planned scientifically and rationally.

b) Strengthen the transformation and upgrading of green industries, and accelerate the cultivation of new driving forces for green development. To further promote the deepening of green development, it is necessary to solve the problem that Jiangxi's green production capacity does not match the actual level of green development. Focus on cultivating new drivers of development, fully implement the digital economy strategy, and promote the integration of the Internet, the Internet of Things, and big data with the real economy. Actively cultivate emerging environmental protection industries.

c) Build a demonstration zone for green development in the Yangtze River Economic Belt. Support the creation of a regional shipping center in Jiujiang, and promote the construction of a "100-mile scenic belt, a trillion industrial belt". Establish a provincial environmental protection industry group to use the demonstration effect of state-owned capital to drive the development of the province's energy conservation and environmental protection industry. The Provincial Environmental Protection Department undertakes the environmental benefit assessment of the government's major ecological protection and environmental pollution prevention and control projects. Implement the optimization and upgrading project of traditional industries, actively develop ecological enrichment industries, and create a green development demonstration zone in the Yangtze River Economic Belt.

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