

Research on Green Innovation Model of Industrial Cluster Development in Chemical Industry Parks

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The road of green and healthy development in modern cities is pursued through the research on the green innovation model in industrial cluster development of chemical industrial parks. Jiangxi Province is taken as an example to study the current status of chemical industrial parks in Jiangxi Province and the problems in the development of industrial cluster development and to put forward the green innovation development model for industrial cluster development. Based on the current status and problems of the development of industrial clusters in Jiangxi Province, this paper proposes an upgrading path for industrial clusters, promotes a new strategy for transformation and upgrading, innovates a new model for transformation and upgrading, creates a new engine for transformation and upgrading and releases new vigor for transformation and upgrading. Any innovation model for the industrial cluster development of industrial park needs to start from the actual situation in the region and the layout and spatial optimization of key areas of industrial clusters should be improved combined with the regional development characteristics. We should achieve the maximum utilization of the support from the local policies, finance, and industrial development to pursue all-round development.

1. Introduction

In the past two years, with the development of China's economy and society, the domestic economic volume has gradually increased. With the acceleration of the reform and opening up process, domestic economic reforms are constantly deepening and overall domestic economic development has entered a new normal, facing the current With regard to the economic development trend. The domestic economic growth rate has also begun to shift from high speed to medium and high speed and the development mode has also begun to shift from speed to quality and efficiency. For Jiangxi Province, industry is still the main driving force for economic development. However, along with the rapid economic development, Jiangxi Province also faces problems such as weak industrial development foundation, low level of research and development, low industrial level and economic development level significantly lagging behind neighboring provinces. As a result, the industrial and economic development of Jiangxi Province is faced with many problems and challenges, such as the insufficiency of the advantages and driving ability of leading enterprises, low level of industrial cluster intensification, the need to deepen the industrial chain extension, the need to strengthen scientific and technological innovation capabilities and the difficulty in the reform of institutional mechanisms.

2. Literature review

In recent years, the role of industrial parks in the promotion of regional economic development has become more apparent. However, the problem of unscientific enterprise layout, unreasonable industrial structure, and high transaction costs has become more and more obvious in the industrial parks, which has gradually emerged during many years of development. This has a direct impact on the long-term sustainable development of industrial parks. Therefore, reliance on leading industries, formation of industrial clusters, and implementation of industrial cluster development have become important options for upgrading the overall competitiveness of industrial parks, and it have also become effective models for accelerating regional economic development. In the study, Jin et al. pointed out that industrial agglomeration is an effective

mechanism for industrial parks to gain competitive advantage and the goal and direction of industrial park development (Jin et al., 2015). Han et al. pointed out that the development and construction of industrial parks should be guided by industrial clusters. According to the different characteristics and development needs of the five stages of industrial park industrial cluster development, the benign development of industrial clusters in the park is promoted with differentiated strategies (Han et al., 2014). Since entering the new century, China's economic and social development has faced many new situations, new trends, new issues, and new challenges. To understand new situations, grasp new trends, solve new problems, and respond to new challenges, development concepts must be further improved. In the analysis of Zhang, under such a background, the Fifth Plenary Session of the Eighteenth CPC Central Committee systematically put forward five development concepts of innovation, coordination, greenness, openness, and sharing. Promoting China's economic and social development in accordance with the five major development concepts is the general requirement, major trend and the only way for the current and future period. The report of the Nineteenth Party Congress held that development is the foundation and key to solving all problems in our country. Development must be a matter of scientific development. The five major development concepts must be unwaveringly implemented, and the development of the green industry system must be vigorously promoted to form a green development approach and lifestyle (Zhang, 2017). Long et al. pointed out that the new development concept emphasizes green development, which means respecting nature, conforming to nature, and protecting nature, changing the mode of industrial development at the expense of environmental pollution, waste of resources and ecological degradation, and accelerating industrial restructuring and optimization and upgrading to build a green industry system with high technological content, low resource consumption, and low environmental pollution (Long et al., 2014). General Secretary Xi Jinping stressed that green ecology is Jiangxi's largest asset, largest advantage, and largest brand, it must be protected well and we must do a good job in governing mountains and rivers, and develop a road of economic development and ecological civilization that complement each other and complement each other, and create a beautiful China "Jiangxi model". For the green development of Jiangxi Province, Wu et al. showed that in recent years, Jiangxi Province has turned ecological advantages into development advantages, and initially established a green industry system focusing on new-type industrialization, modern agriculture, and modern service industries. We will vigorously increase the degree of green economy and strive to build Jiangxi Province into an important green industry base in the country. However, in the process of the development of green industries in Jiangxi Province, the outstanding problem is to develop both production and ecology (Wu et al., 2015). Zhang pointed out that China's economic development has entered a new normal and has provided new opportunities and new requirements for the development of industrial clusters in industrial parks in Jiangxi Province. Under this circumstance, industrial cluster development in Jiangxi Province needs to achieve transformation and upgrading. The research shows that the development of industrial parks in Jiangxi Province shows a remarkable small and complete feature. There are a large number of industrial clusters but they are not large in scale, and there are fewer large companies that can play a leading role; Jiangxi's industrial economic development also showed significant regional differences, and it has formed the growth poles of the four regions of north central China, northeastern Jiangxi, western Jiangxi and central and southern regions, and it has become an important force for economic development in Jiangxi Province. The transformation of industrial clusters in Jiangxi Province to upgrade their industrial clusters requires that Jiangxi Province must concentrate on advantageous resources to cultivate advantageous industrial clusters, develop green industries, deepen the integration of the two industries, and speed up the institutional reform of the park (Zhang et al., 2017). Zhao et al. showed that the development of Jiangxi Province still has major problems. The industrial development foundation is weak, the level of research and development is low, the industrial level is low, and the level of economic development lags behind the surrounding provinces (Zhao et al., 2018). Therefore, in the research of Yang et al., an innovation system mechanism is proposed as a breakthrough, and an assessment system for the evaluation of green industry development in Jiangxi Province is established. Firstly, the Jiangxi provincial leading group for promoting the assessment of green industry development is established to be responsible for leading, organizing and coordinating the development of green industry in the province. Secondly, the annual assessment system for the development targets of Jiangxi's green industry is promoted and the annual assessment is strengthened. Thirdly, the strict reward and punishment system for the development of green industries in Jiangxi Province is established, and the results are used as an important reference for evaluating the performance of leading cadres, annual assessment, and selection and appointment (Yang et al., 2014).

In summary, the related concepts of cluster development in China's industrial parks, the party's guiding policies, the development of industrial parks in Jiangxi Province, and some suggestions made by relevant scholars are mainly introduced. Taking Jiangxi Province as an example, the development status and existing problems of industrial parks in Jiangxi Province have been studied. The green innovation development model and the path of upgrading of industrial clusters has been proposed. It promotes a new transformation and

upgrading strategy and innovated a new model. It creates a new engine for the development, transformation and upgrading of the chemical industry cluster in Jiangxi Province and releases new vitality.

3. Analysis of current status of the development of industrial parks in Jiangxi Province

3.1 Development status

The contribution of industrial parks to economic growth in Jiangxi Province presents an increasing trend. According to the data from the Jiangxi Provincial Government Information Disclosure Network, in 2015, the added value of industries above designated size in the province was 726.89 billion Yuan, which was a year-on-year increase of 9.2% and accounted for 43.5% of the regional GDP; and industrial parks in Jiangxi Province achieved an annual industrial added value of 5454.0 Billion Yuan, which accounted for 75.0% of the province's total industrial output value above designated size and was year-on-year increase of 9.3%; in 2015, the main business income of industrial parks reached 2.56 trillion Yuan, which was a year-on-year increase of 4.6% and realized the total profits and taxes of 297.32 billion Yuan. This shows that the growth rate of industrial parks in Jiangxi Province is higher than that of the industrial average level in the province and has made important contributions to maintaining the medium and high speed growth of the large-scale industry in the province by 9.2%. The data also shows that from January to July 2016, the total economic volume of industrial parks in the province was further expanded, which realized an industrial added value of 31.865 billion yuan and was a year-on-year increase of 9.5%. By the end of July, the number of enterprises in the park reached 9957. On the whole, the total revenue from the main business of industrial parks Jiangxi Province has shown a rapid growth trend after 2009, which was close to 1 trillion Yuan in 2010. At the end of 2013, the number was close to 2 trillion Yuan, which has doubled in three years. In 2015, it exceeded 2.5 trillion Yuan. The index change in the main business income, total taxes and industrial growth value of Jiangxi Province from 2001 to 2015 is shown in Figures 1, 2, and 3:

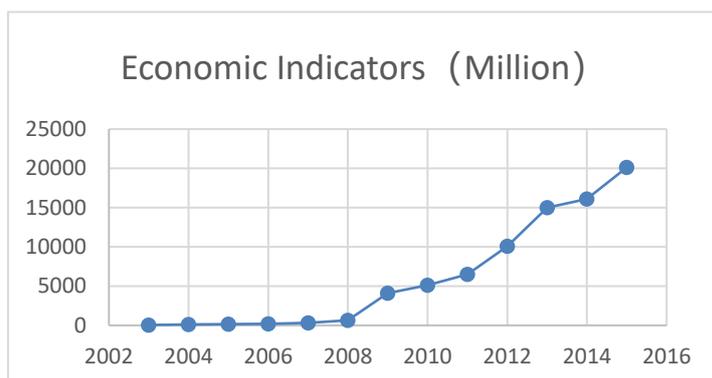


Figure 1: Jiangxi Province from 2003 to 2015 main business income economic indicators

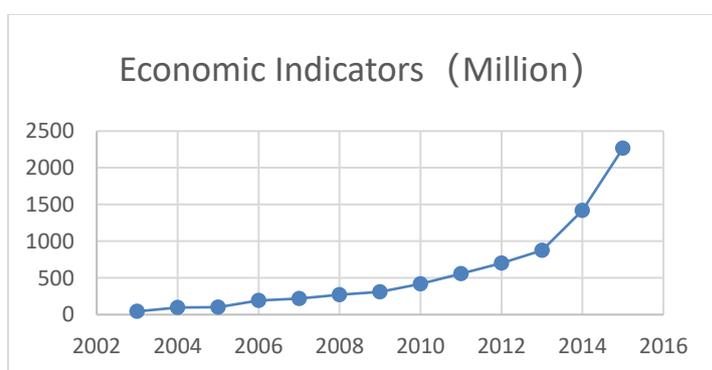


Figure 2: Jiangxi Province 2003-2015 tax amount of economic indicators

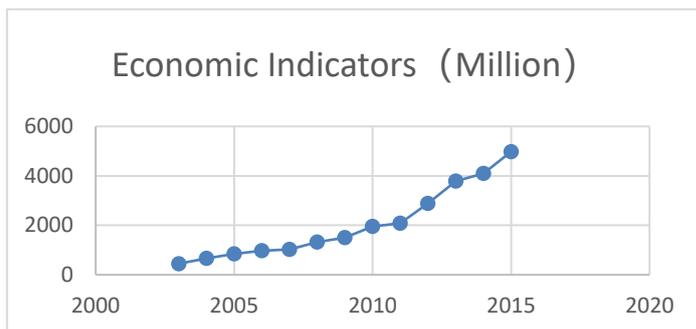


Figure 3: Jiangxi Province 2003-2015 Industrial growth economic indicators

In recent years, the park-district economy in Jiangxi Province has developed rapidly and the pace of development and upgrading has been accelerating. The pattern of the industrial park covering the 11 prefecture-level cities has basically formed in the whole province, which is led by 100 billion of industrial parks and the national level development zone, dominated by over 10 billion industrial parks and supplemented by the construction of industrial parks and other parks. In 2015, there were 4 parks in Jiangxi Province with main business revenues over 100 billion Yuan, 16 parks with main business revenues over 50 billion Yuan, 30 parks with main business revenues over 30 billion Yuan, 47 parks with main business revenues over 20 billion Yuan and 75 parks with main business revenues over 10 billion Yuan. The specific situation is shown in Table 1:

Table 1: Development of Jiangxi Industrial Park in 2015

Index (Billion)	Quantity	Proportion
≥1000	4	4.26%
500-1000	12	12.77%
300-500	14	14.89%
200-300	17	18.09%
100-200	28	29.79%

Table 2: Distribution of Jiangxi Industrial Parks in 2015

Area	The number of parks		National Park		Provincial key park	
	Quantity	Proportion%	Quantity	Proportion%	Quantity	Proportion%
Nanchang	9	9.57	3	20	2	10
Jingdezhen	3	3.19	1	6.67	1	5
Pingxiang	3	3.19	1	6.67	1	5
Jiujiang	14	14.89	1	6.67	2	10
Xinyu	2	2.13	1	6.67	1	5
Yingtian	3	3.19	1	6.67	2	10
Ganzhou	16	17.02	3	30	1	5
Ji'an	13	13.83	1	6.67	2	10
Yichun	10	10.64	1	6.67	3	15
Fuzhou	10	10.64	1	6.67	2	10
Shangrao	11	11.7	1	6.67	3	15
The province	94	100	15	100	20	100

The regional development of industrial parks in Jiangxi Province differs significantly. At the end of 2015, Jiangxi Province has established a total of 94 industrial parks approved by the National Development and Reform Commission and other relevant departments, basically reaching an industrial park in each county, among which there are 15 national-level industrial parks and 20 provincial-level key industrial parks, accounting for 16% and 21% of the total number of industrial parks respectively. The number of industrial parks is the largest in Ganzhou, which is 16 and accounts for 17.02% of the total number of industrial parks in the province; followed by Jiujiang and Ji'an, with 14 and 13 industrial parks respectively. The proportion is 14.89% and 13.83% respectively. The number of industrial parks in Shangrao, Yichun, Fuzhou, and Nanchang

is relatively even, with about 10 industrial parks in each city. However, Xinyu, Yingtan, Jingdezhen and Pingxiang have the fewest industrial parks among 11 prefecture-level cities. The specific situation is shown in Table 2.

3.2 Problems in the development of industrial clusters

In 2015, there is no single industrial cluster among the 60 key industrial clusters in the province with over 100 billion Yuan of main business income. There are few industrial clusters with strong influence and driving force among the 60 key industrial clusters. Most industrial clusters lack the support of leading enterprises with strong strength, advanced technology and leading role. The development of industrial agglomeration in Jiangxi Province shows obvious low levels and the advantages of clusters are not prominent. The development level is low and the cluster advantage is not prominent in the development of industrial clusters in Jiangxi Province. The industrial parks have shown the characteristics of blindly attracting investment. As a result, many industrial parks are “small and complete” integrated industrial parks and lack their own characteristics.

Among the 94 industrial parks in Jiangxi Province, the leading industry is not prominent and the industrial division is not clear. The majority of industrial parks in Jiangxi Province has more than three leading industries in 2014 with the largest number of six leading industries, of which there are 73 industrial parks, with more than 3 leading industries, accounting for 77.7%. These parks have the problems of unreasonable industrial structure, uncoordinated industrial layout, scattered industrial park layout and arbitrary selection of industrial development and project and it is difficult to form industrial clusters with large volume, strong driving force and strong competition.

The industrial parks Jiangxi Province rely excessively on factor-driven inputs and the long-standing problems of structural contradictions and extensive growth methods have not yet been fundamentally changed, which has led to increasing resource and environmental constraints. The land use index of industrial parks in various regions of Jiangxi Province is generally tense and the idle and inefficient land use is common. Large area of land has been approved but not utilized and the intensity of land use is low. The comprehensive plot ratio of industrial parks in the province is only about half that of coastal developed provinces.

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4. The path of green innovation and upgrading of industrial clusters in chemical industrial parks

4.1 Promoting the cultivation and expansion of industrial clusters and boosting the new strategy for transformation and upgrading

Industrial clusters are an important pillar for the development of industrial parks and industrial parks are the main carriers for the cultivation of industrial clusters. The core of the development and upgrading of industrial parks is industrial upgrading and the key to industrial upgrading is industrial upgrading. The core driving force of industrial upgrading is to accelerate the development of industrial clusters. For this reason, industrial parks in Jiangxi Province need to strengthen the cultivation and introduction of leading enterprises, enhance the driving ability of industrial clusters and focus on the development of a number of large enterprises with strong core competitiveness. A group of growth-type enterprises with growth prospects, space for explosion, growth momentum, breakthrough potential and management advantages are selected to give major support.

4.2 Promoting the green development of the industry and innovate the new mode of transformation and upgrading

On the one hand, the green transformation and upgrading of traditional industrial clusters should be accelerated and the green development is promoted. Jiangxi Province needs to promote the green transformation of traditional manufacturing industries such as iron and steel, non-ferrous metals, chemicals, building materials, light industry, printing and dyeing, adopt green technology and equipment, strengthen the research and application of green products and build green industrial chains and supply chains. On the other hand, the green industrial system should be actively built and the demonstration park construction should be implemented. The green industrial system should be constructed and the green industry development plans and the energy conservation and environmental protection industry action plans should be formulated.

4.3 Strengthening the innovation-driven and “Integration of Two Industries” and build a new engine for transformation and upgrading

The integration of industrialization and informationization should be taken as the main line and the innovation-driven; the intelligent manufacturing and “Internet+” application should be taken as drivers; and the green development should be taken as the characteristics, which can open up new space for the upgrading of industrial parks and industrial clusters in Jiangxi Province and guide the transformation and upgrading of industrial clusters towards intelligence, innovation and greenization.

4.4 Accelerating the reform of institutional mechanisms and releasing the new vitality of transformation and upgrading

First, we need to rationalize the management system, optimize the management model and improve management performance. Based on the concept of “small government, big society, small organization, large service”, the management model of “large-sector system reform, flat management and enterprise service” should be actively explored and the standardization, service enterprization and de-administration of the management of industrial parks should be promoted. Secondly, the mechanism for attracting investment should be improved; diversified investment attracting mode should be explored; and the scientific layout of the project should be strengthened.

5. Conclusion

The transformation and upgrading of industrial clusters in industrial parks in Jiangxi Province require the consolidation of advantageous resources to cultivate advantageous industrial clusters, develop green industries, deepen the integration of the two industries and accelerate the institutional reform of industrial parks. The industrial economic development in Jiangxi Province lack the leader in industrial clusters and the industrial development is still relatively extensive. Under this circumstance, it is necessary to further promote the concentration of resources to large-scale enterprises and incorporate the green development concept into the process of industrial economic development. Under this circumstance, it is necessary to promote the deep integration of industrialization and informatization and form the development situation of the mutual promotion between informationization and industrialization.

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