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**RESEARCH ON THE LAYOUT AND DEVELOPMENT OF
CHEMICAL INDUSTRY IN CHINESE CITIES**

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ABSTRACT

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<p>The practice of developed countries has proven that the development of heavy industry is an insurmountable stage in a country's industrialization process, and heavy industry will be the main driving force for China's future economic growth. The theme and purpose of this article is to study the layout and development of China's urban chemical industry, as well as its impact on urbanization and economic growth. The rapid development of heavy industry is not only an important feature of China's industrialization process, but also an important driving force for promoting industrialization and urbanization. This article adopts a combination of theoretical analysis and empirical research to analyze the future trends of China's chemical industry layout and draw conclusions. Industrialization drives the non-agriculturalization of rural population and the transfer of population capital to cities, promoting the vigorous development of urban economy. The acceleration of urbanization and the demand for large-scale urban construction are also of great significance for promoting the sustainable development of heavy industry.</p>		
Key words Chemical industry, layout, urbanization		

CONCEPT DEFINITIONS

Industrial clusters

Refers to competitive enterprises in a certain industry and the cooperative enterprises, specialized suppliers, service providers, related industry manufacturers and related institutions that interact with these enterprises.

CNPC

China National Petroleum Corporation

Sinopec

China Petrochemical Corporation

CNOOC

China National Offshore Oil Corporation

ABSTRACT
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1 INTRODUCTION

The practice of economically developed countries has proved that the development of heavy chemical industry is an insurmountable stage in the process of industrialization of a country, and China is currently in the stage of accelerated development of industrialization and urbanization. The rapid development of heavy chemical industry has become an important force to promote the process of industrialization and an important driving force to promote the development of urbanization. It will lead to the non-agricultural transformation of the rural population and the transfer of population and capital to the cities. Promote the vigorous development of the city's economy. The acceleration of urbanization and the need for large-scale urban construction are also of great significance for promoting the sustainable development of heavy chemical industry. This is because cities, especially those with large scale, will have a significant agglomeration effect, which will bring higher economies of scale, more employment opportunities, stronger impetus for scientific and technological progress, and greater economic diffusion effects. The development of heavy chemical industry is inseparable from the agglomeration benefits and economies of scale provided by urbanization. Therefore, in the context of the current era, it is particularly important to study the spatial layout of heavy chemical industry and its interrelationship and its impact on China's urbanization development.

2 BACKGROUND AND CURRENT SITUATION

Despite the rapid development of China's industry, there is still a large gap between China and developed countries. Therefore, it is necessary to do a good job of background study between China and other countries, seeking common ground while reserving differences, in order to better analyze the current problems of China's industrial development and find solutions. By analyzing the regional distribution differences of urbanization level in China, and comparing the characteristics of the chemical industry itself with the previous round of industrialization in China, this paper analyzes how the heavy chemical industry can coordinate the development of cities and industries in the new era.

2.1 The significance and background of the topic

With the deepening of the trend of global economic integration, the process of China's heavy chemical industry has also been deeply marked by globalization. Since the nineties of the last century, foreign heavy chemical industry giants have begun to increase their investment in China, and in the first few years after entering the new century, the pace of transfer of this heavy chemical industry to China has been further accelerated, especially the speed of the petrochemical industry entering China. (Jinchao Y & Yilin H 2023, 5-9)

According to statistics, almost all of the large petroleum and petrochemical companies listed in the Fortune Global 500 have invested and set up factories in China. Among the world's top 75 chemical producers, Dow Chemical, DuPont, ExxonMobil, Huntsmann, GE, BASF, Shell, BP, Rohm and Haas, Atofina, Degusa and other companies have entered China in a big way.

Therefore, in the context of the current era, it is particularly important to study the spatial layout of heavy chemical industry and its interrelationship and its impact on China's urbanization development.

2.2 Industrial development and urbanization

Due to the difference in the average rate of profit of industries, in order to pursue the maximization of profits, the factors of production will inevitably flow between different industries. At the same time,

due to the different characteristics of each industry, the spatial conditions required are also different, field is the most basic factor of production in agriculture, and agriculture has high requirements for its quantity and quality, so agriculture tends to be distributed in the vast rural areas; The industrial and service industries tend to be located in urban areas with dense population, sufficient raw materials and superior location conditions due to the characteristics of raw materials, transportation hubs, and population clusters. Therefore, along with the flow of factors in different industries, the process of urbanization came into being.

The pattern of industrialization can determine the pattern of urbanization. For industry, it needs the services of urban functions, the support of large-scale industrial infrastructure, the need for a large number of labor, the benefits of industrial agglomeration, and the need for close proximity to its largest market user - large cities, all of which determine the orientation of industrial distribution in large cities. The so-called metropolitan area, in general, consists of a large population center and a community with a high degree of economic and social integration with the center. Metropolitan urbanization is an inevitable trend of industrialization and further deepening of the interaction with urbanization.

2.2.1 Industrial Cluster Theory

Since the 90s of the 20th century, the phenomenon of industrial clusters has attracted great attention, and the theory of industrial clusters has become a new theory of regional economic development. Industrial clusters refer to the phenomenon that a large number of enterprises with close industrial ties and related supporting institutions are spatially concentrated in a specific area (usually with a leading industry as the core) and form a strong and sustainable competitive advantage. Enterprises in the industrial cluster can produce significant external economies of scale through specialized division of labor, cooperation and competition, and resource sharing, which can not only improve the innovation ability and competitiveness of enterprises in and around the cluster, but also drive the economic development of the whole region and enhance the competitiveness of the region. Industrial clusters are a widespread phenomenon in the economies of countries around the world. It is the product of the development of the market economy to a certain stage, and has become the source of power for regional development and even national development. The huge economic scale of the industrial cluster and the unusual economic growth rate have greatly contributed to the development of the regional economy.

2.2.2 A study of industrial clusters in China

Since the 80s of the 20th century, China has also seen a relatively obvious phenomenon of industrial agglomeration, such as more than half of the country's household appliance industry concentrated in the Pearl River Delta region, (Xiaoxia W & Yan H 2022,312-325) most of the wool textile industry concentrated in Jiangsu, Zhejiang and Taihu Lake area, Ningbo, Wenzhou is concentrated in the domestic garment and leather industry.

Since China's economic growth in the previous period was mainly based on light industry, the research on industrial clusters was mainly concentrated in the light industry enterprises. However, there has been no detailed study on the clusters of enterprises in the chemical industry.

2.3 Research Ideas and Methods

By collecting and analyzing the current distribution data of China's chemical parks, as well as the scale, characteristics and development prospects of each chemical park, the distribution characteristics of China's chemical parks are summarized. At the same time, combined with the analysis of the regional distribution differences of China's urbanization level, and finally, by analyzing the characteristics of the chemical industry itself and comparing the characteristics of China's previous round of industrialization, and analyzes the problem of how to coordinate the development of cities and industries in the new era of heavy chemical industry.

3 LOCATION SELECTION FOR THE LAYOUT OF THE CHEMICAL INDUSTRY

Analyse the different types of chemical industry region selection. The location principle of chemical industry layout is analyzed from the aspects of raw materials, aggregation factors, and environmental protection.

3.1 Introduction to the chemical industry

The chemical industry is a multi-industry, multi-variety industry that serves multiple sectors of the national economy. After the raw materials are chemically processed, they change their original shape and properties to become new products. The chemical industry is classified into 12 categories, namely: petroleum and petrochemical industry; manufacturing of basic chemical raw materials; chemical fertilizer manufacturing; Chemical pesticide manufacturing; Organic chemical products manufacturing; Synthetic materials manufacturing; Specialty chemical products manufacturing; Daily chemical manufacturing industry; Chemical and pharmaceutical manufacturing; Chemical fiber manufacturing industry; Rubber products manufacturing industry; Plastic products manufacturing industry.

(Shuaiqi Y & Ming Y 2022,3-17)

3.1.1 The petrochemical industry is the leading force in the world's chemical industry

Petrochemical industry was developed in the fifties of this century, it started from oil and gas refining, producing organic chemical raw materials, synthetic resins and plastics, synthetic rubber, synthetic fibers, synthetic ammonia and other chemical products, covering petroleum processing and coking industry, chemical raw materials and products manufacturing, chemical fiber manufacturing, rubber manufacturing, plastic manufacturing, fine chemicals and other industries. The correlation between the industries involved in the petrochemical industry is very high, and the relationship between the upstream and downstream industrial chains is very close, so the petrochemical industry has a very distinct industrial chain structure and industrial chain information transmission effect. (Zahra T & Saeid S 2021 1-7)

3.1.2 Fine chemicals are an important symbol of the level of chemical science and technology

Fine chemical products have many types, high added value, wide uses, and large industrial relevance, and directly serve many industries of the national economy and various fields of high-tech industries. Vigorously developing fine chemicals has become a strategic focus for all countries in the world to adjust the structure of the chemical industry, improve the industrial level of the chemical industry and expand economic benefits. The rate of fine chemicals (the proportion of fine chemical output value in the total output value of chemicals) has become an important indicator to measure the degree of development of the chemical industry and the level of chemical science and technology in a country or region. (Cybulski J 2001 13-551)

3.2 Discussion on location principles of chemical industry layout

The location principle of chemical industry layout was analyzed from the aspects of raw materials, aggregation factors, and environmental protection. It also expounds the advantages and disadvantages of these factors on the layout of the chemical industry.

3.2.1 The influence of raw material factors on the layout of chemical industry

Petroleum resources are the material basis for the layout of the petroleum processing industry. For example, the quantity and guarantee level of crude oil directly affect the processing scale and development prospects of oil refining enterprises. The nature of crude oil directly affects the processing direction and processing flow of oil refining enterprises. They have a significant impact on the future construction investment, production expenses, production costs and labor productivity of the enterprise. close relationship. Therefore, when planning the layout of the petroleum processing industry, the petroleum resources should first be analyzed and evaluated. Such as analyzing and evaluating the industrial reserves of oil fields and their composition scale and type, as well as the impact on the construction scale and development of the oil refining industry.

In addition, the rational layout of the chemical industry should not only consider raw material resource conditions, but also pay attention to fuel, power conditions, transportation conditions, product user distribution, and collaborative relationships between enterprises, etc. For example, the coking chemical

industry is a sector that consumes a large amount of raw materials. If the coal industry is directly located in the coal producing area, although the transportation volume of coal can be greatly reduced, since the coking industry is closely related to the steel industry production or chemical industry production, the combination of the two can maximize the comprehensive utilization of resources. economic effect. Therefore, it is more reasonable to configure the coking chemical industry in the metallurgical industry or chemical industry. (Guandong S 2023, 6-13)

3.2.2 The influence of agglomeration factors on the layout of chemical industry

The biggest feature of chemical industry production is the comprehensive utilization of raw materials. With the development and progress of industrial production technology, the connection between the petroleum industry and the chemical industry has become increasingly close. Only through comprehensive utilization of petroleum can natural resources be fully utilized, its use value improved, manpower, material and financial resources saved, and production costs reduced.(Tiangui L & Can G 2024,volume 315)

3.2.3 The impact of environmental protection requirements on the layout of the chemical industry

The chemical industry causes great pollution to the environment. Since the chemical industry generally has safety defense requirements such as fire prevention, explosion prevention, and poison prevention, as well as environmental protection requirements. Some chemical products are also toxic, corrosive, and are hazardous chemicals. Therefore, the chemical industry must generally be arranged separately from urban residential areas, and health protection zones must be set up according to the health protection levels prescribed by the state. Chemical industries that pollute the air must be located downwind of the city's prevailing wind direction. Industries that discharge large amounts of wastewater should be located downstream of urban rivers and maintain a sufficient sanitary protection distance from urban residential areas. (Guandong S 2023, 5-13)

3.3 New characteristics of chemical industry industrial layout under the situation of economic globalization

Among the world's large multinational companies, the chemical manufacturing industry occupies a pivotal position in terms of the number of companies, business scale, profit and other indicators.

Among the global top 500 companies in 2023, there are 118 chemical manufacturing multinational companies. Among them, 5 of the top 20 companies belong to the chemical manufacturing industry. They are ExxonMobil, BP, Shell Oil, and Chevron. Texaco and Total Fina Elf. At the same time, the scale of the chemical manufacturing industry continues to expand.

The world's top 500 chemical companies are broken down by sales region, mainly concentrated in the United States and Europe. Among them, the United States has the largest number of companies, accounting for 34.6% of the top 500; the number of European companies is 142, accounting for 28.4%; followed by 86 companies in Asia, accounting for 17.2%. The world's chemical industry has formed a three-legged structure of the United States, Asia and Europe, and the Asia-Pacific region's status among the three pillars is further improving. (Statista Research Department 2024, 1-1)

4 THE ADVENT OF THE ERA OF CHINA'S HEAVY AND CHEMICAL INDUSTRY

From the early days of reform and opening up to the mid-1990s, China's industrial development was mainly driven by the light textile industry and the consumer electronics and electrical appliances industry. Since the mid-1990s, the growth rate of China's heavy and chemical industry has begun to exceed that of the light textile industry. The proportion of heavy chemical industry has surpassed that of the light textile industry and has become the main driving force of economic growth. Since the beginning of the 21st century, the trend of accelerated growth in the heavy chemical industry has become more obvious.

4.1 Internal and external motivations for upgrading industrial structure

From the perspective of internal factors, the evolution of the industrialization development stage and the adjustment and transformation of the industrial structure are consistent with the stage characteristics of economic development and the structural changes in market demand. In the international economics community, per capita income level is generally used as the main criterion for dividing industrialization development stages. Experience in international economic development shows that as per capita GDP develops from US\$1,000 to US\$3,000 or even higher, the focus of the industrial structure will gradually shift from the light textile industry to the heavy chemical industry. (Tongbin Y 2024, volume 93)

4.2 Analysis of investment trends of multinational companies in China

As the trend of global economic integration continues to deepen, the process of China's heavy and chemical industry has also been deeply marked by globalization. Since the 1990s, foreign heavy and chemical industry giants have begun to increase investment in China. In the first few years of the new century, the pace of the transfer of heavy and chemical industries to China has further accelerated. Among them, industries such as petrochemicals, automobiles, machine tool manufacturing and metal smelting are growing more rapidly, with the petrochemical industry entering China at the fastest speed. According to statistics, almost all the large petroleum and petrochemical companies listed in Fortune magazine's Fortune 500 have invested and built factories in China. Among the world's top 75 chemical

manufacturers, Dow Chemical (No. 1), DuPont (No. 2), Exxon Mobil (No. 3), Huntsman (No. 4), and GE (No. 5), BASF (No. 6), Chevron-Phillips (No. 7), Shell (No. 10), BP (No. 13), Rohm-Haas (No. 14), Atofei Companies such as Namibia (No. 16) and Degusa (No. 22) have all entered China in a large scale. (Joe Z 2000, volume 123)

The proportion of foreign investment in China's chemical industry has increased significantly. The chemical industry, which is highly polluting, consumes water, and consumes electricity and capital, has begun to decline in the West. Therefore, the three high-tech industries in developed countries are moving to the third world. When considering factory layout, they usually need to be close to the market. China has a large demand for chemical products and is an ideal region for the transfer of international chemical companies. At the same time, China's technology in fine chemicals is weak and the market for technology considerations also supports foreign capital's joint ventures with domestic petrochemical companies, which has led to the creation of large-scale petrochemical projects such as CNOOC, SECO, and BASF Yangzi. At present, petrochemical giants such as ExxonMobil, BP, Shell, BASF, Bayer, and Andorra have entered China. After European and American oil giants entered mainland China, petrochemical companies in South Korea, Japan and Taiwan Province also transferred bulk petrochemical product production projects to the mainland. (Jinchao Y & Yilin H 2023, 7-9)

4.3 Analysis of the status of China's chemical industry in the world

According to statistics, the sales revenue of the world's top 500 chemical companies in 2023 will total 3.98534 billion U.S. dollars. The average annual sales revenue is 7.97 billion U.S. dollars. During the same period, the total sales revenue of China's top 500 chemical companies was approximately US\$137.64 billion. It is equivalent to 3.5% of the total annual sales of the world's top 500 chemical companies. The average sales revenue of China's top 500 chemical companies in 2023 is US\$275 million, which is equivalent to 1/30 of the revenue of the world's top 500 chemical companies. This shows that the gap between China and the world's advanced companies is very obvious.

The economic benefit ratio of crude oil - refined oil and cracked materials - ethylene - basic chemical raw materials - synthetic materials - fine chemicals during the processing of petrochemical products from oil head to chemical tail is 1: 8: 16:32:64:128. Generally speaking, fine chemical products have the characteristics of high added value and belong to industries with high technology development

investment. New product varieties, new production processes and new technical standards can greatly increase the added value of products and increase corporate profits. (Chao C & Genserik R 2020, 5-13)

5 ANALYSIS OF SPATIAL LAYOUT OF CHINA'S CHEMICAL INDUSTRY

This part analyzes the spatial layout and future regional trends of China's chemical companies.

Analyses the layout of three typical chemical enterprises: chemical cities, national enterprises planned by the Chinese government, and private enterprises oriented to the economy and market. Analyzed the layout of China's major chemical industries from a geographical perspective.

5.1 Several main forms of China's chemical industry layout

Chemical city is mainly formed based on the natural geographical distribution of petroleum and salt resources. China's oil fields are mainly distributed in Northeast China, North China and other places and the coastal continental shelf. China's land oil fields are mainly distributed in Daqing, Shengli, Liaohe, Jilin, Dagang, North China, Xinjiang Karamay, Tarim, Tuha, Qinghai, Yumen, Changqing, Yanchang, Sichuan, Henan, Jiangnan, Jiangsu, Zhongyuan and other major oil fields.

There are a large number of petrochemical companies in my country and their production capacity is scattered. Most of them belong to China Petroleum and Chemical Corporation (referred to as "Sinopec") and China National Petroleum Corporation (referred to as "PetroChina"). Sinopec was founded in 1983 by the state, which centralized large and extra-large petrochemical enterprises that were originally owned by five ministries including the Ministry of Petroleum, the Ministry of Chemical Industry, the Ministry of Textiles, the Ministry of Light Industry, and the Ministry of Commerce and were scattered in more than 20 provinces, municipalities, and autonomous regions. As a result, Sinopec Corporation, which was formed, has an absolute monopoly in the domestic market. (Focus on Catalysts, August 2022, Page 4)

Industrial development zones refer to areas with special location environments created by national or regional governments, enterprises and institutions to implement specific economic goals. It is a basic tool for implementing industrial regional development policies, and its purpose is to attract new industries. Invest in improving the industrial layout of the country or region to solve the social and environmental problems caused by the mix of residential areas and industrial areas. A chemical park or chemical development zone is a type of development zone or a component of a certain development zone. Concentrating chemical enterprises in a regional area is conducive to making full use of public

engineering facilities to implement comprehensive environmental management, resulting in comprehensive scale effects, logistics agglomeration effects, and energy conservation and environmental protection effects.

5.2 Spatial distribution characteristics of China's chemical industry

This paper analyzes the layout of China's major chemical industries from a geographical perspective and to discussed the relationship between the layout of China's chemical industry and the local geographical location, and predicted the location of more chemical plants in the future.

5.2.1 Crude oil processing and petrochemical upstream enterprise layout

China's crude oil processing enterprises are mainly located in Northeast China, East China and Central and South China. The production capacity and resource distribution of the entire industry are relatively low in symmetry.

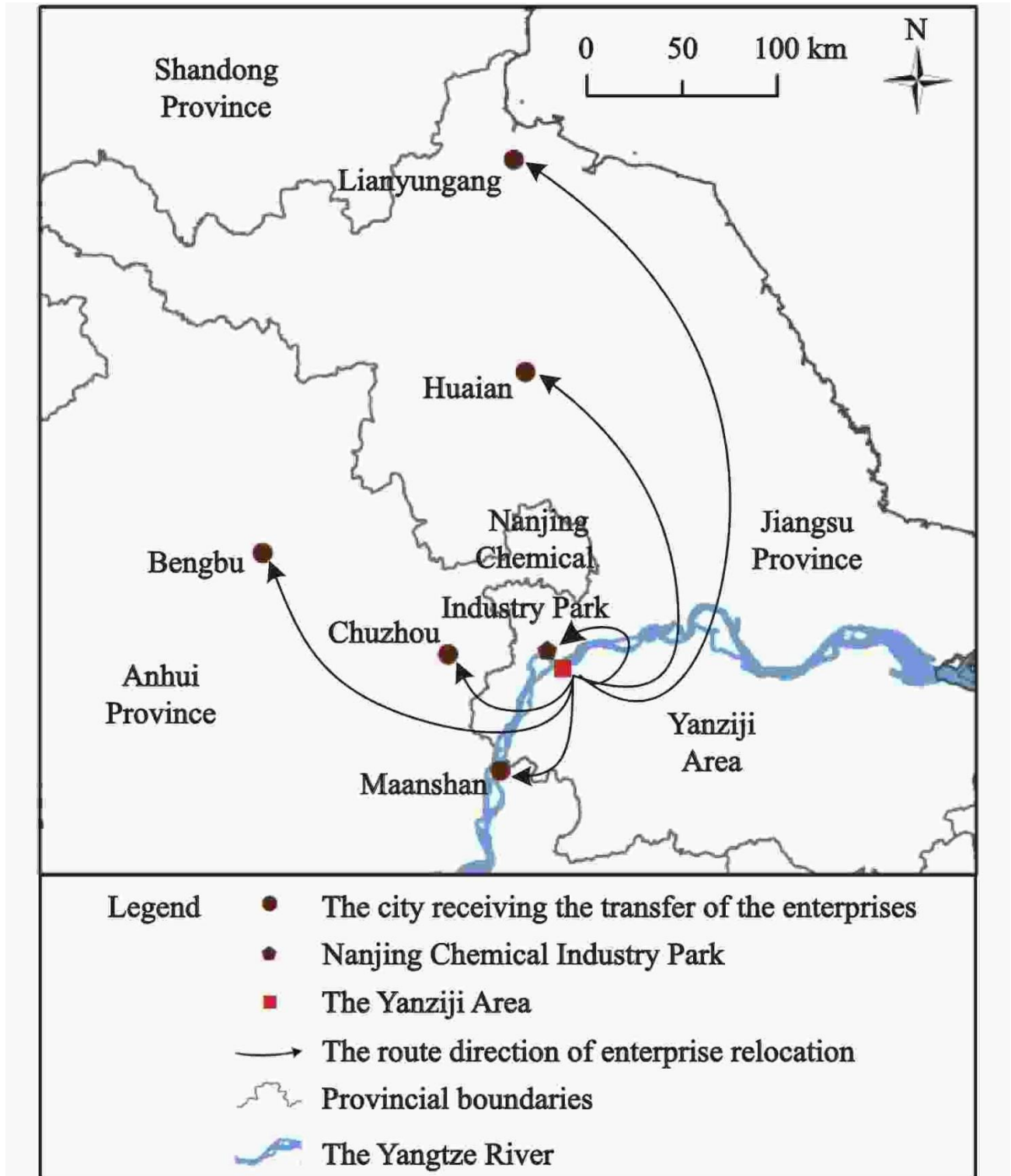
Judging from the distribution of Chinese petroleum companies shortlisted for China's top 100 chemicals in 2023, they are mainly distributed in the northeast, northwest and central regions, roughly matching the spatial distribution of my country's oil fields.

5.2.2 Spatial distribution of major chemical industrial parks across the country

At present, there are about 60 chemical industry parks at the national, provincial and municipal levels. A number of chemical industry parks with unique characteristics have been built in the economic belt along the Yangtze River and in developed coastal areas such as Guangdong, Zhejiang, Fujian, and Shandong. There are parks focusing on natural gas chemical industry such as Huzhou in Sichuan and Changshou in Chongqing; there are Daya Bay and Maoming in Guangdong, Quangan in Fujian and other parks headed by large petrochemical enterprises; there are parks in Shanghai and Jiangsu such as Nanjing, Changzhou, Suzhou Nantong, There are chemical industry parks with unique characteristics such as Zhangjiagang and Yangzhou; there are parks located in new chemical materials and fine chemicals such as Shangyu, Jiaxing and Ningbo in Zhejiang.

Chemical industrial parks can be established in the following ways: introducing huge amounts of capital (mainly foreign capital) and technology, establishing large-scale comprehensive chemical bases

or refining bases, and focusing on the production of upstream and midstream products. This is how foreign countries such as Singapore's Jurong Island Chemical Industry Base and domestically such as Shanghai Chemical Industrial Park, Nanjing Chemical Industrial Park, Huizhou Daya Bay Economic and Technological Development Zone Petrochemical Park, and Quanzhou Meizhou Bay Petrochemical Industrial Base were established.



PICTURE 1. Urban Chemical Industrial Cluster Area Restructuring and Determinants (Zou 2022, 32)

5.3 Spatial layout trend of China's chemical industry

Since the beginning of the 21st century, with the acceleration of economic globalization and the rapid development of China's economy, the domestic petrochemical product market is undergoing profound changes. China's petrochemical industry, China National Petroleum Corporation, Sinopec, and CNOOC, the three major monopoly companies, have been busy with their own business in recent years. layout adjustment, and coastal petrochemical bases have always been an important area of competition.

5.3.1 South China is China's largest consumer market for refined oil and chemical raw materials.

In the process of the world's petrochemical industry becoming large-scale, port-oriented and accelerating its transfer to China, Guangzhou has a comparative advantage in developing the petrochemical industry in South China.

Guangzhou is China's largest oil product transit, storage and transportation port. Its oil transit, storage and transportation capabilities rank first in the country, and it plays a decisive role in the country.(Danlu 2015, 8-12) The price of Guangdong's petroleum products, especially fuel oil, based on the Guangzhou "Huangpu Price" has actually It has initially become the benchmark price for fuel oil in my country. At present, major international companies such as Shell, BP, and Exxon Mobil have settled in Guangdong. PetroChina, Sinopec, and China National Offshore Oil Corporation have also made Guangdong the strategic focus of their business development.(Xintong W & Yongtu L 2022, volume253)

5.3.2 Major domestic economic zones compete for international heavy chemical industry transfer opportunities

At present, the international transfer of heavy chemical industry is accelerating, and China is already equipped to undertake this transfer. The competition among the Pearl River Delta, Yangtze River Delta, Bohai Rim and Northeast China is centered around this kind of undertaking.

The Yangtze River Delta region has always had a good foundation for the development of today's heavy industry. It has a high starting point, abundant capital and broad economic radiation. Once the port-based large-scale industries, mainly heavy and chemical industries, are integrated with capital and market demand, their explosive growth momentum will be astonishing. The national-level Shanghai Chemical Industry Zone in the zone is the chemical zone with the largest scale of construction in the country and the largest number of foreign companies entering it. It has China's largest 900,000-ton ethylene device; the zone also houses the Nanjing Chemical Industrial Zone, the large leading state-owned enterprise Shanghai Petrochemical, and the Jiangsu and Zhejiang Chemical Industry Zone. The chemical industry bases along the line are connected together, forming a chemical industry belt of 60-100 kilometers around Hangzhou Bay. As the largest habitat for international capital, the development of heavy and chemical industries in the Yangtze River Delta region is no longer limited to domestic regional competition, but also focuses on serving as a world-class manufacturing belt.

Compared with the Yangtze River Delta, the Pearl River Delta's biggest weakness is heavy chemical industry. To this end, Guangdong has begun to make a fuss around industries such as automobiles, shipbuilding, steel, and petrochemicals. From Daya Bay to the Pearl River Estuary, from Zhuhai West District to Zhanjiang East Island, on the 3,000-kilometer-long coastline of Guangdong. Large-scale installations of heavy and chemical industries are deployed. (Xiaoxia W & Yan H 2022,312-325)

6 THE RELATIONSHIP BETWEEN CHEMICAL INDUSTRY DEVELOPMENT AND CITY DEVELOPMENT

The chemical industry is usually a capital-intensive and technology-intensive industry that can provide a large number of jobs and drive the development of related industrial chains, such as manufacturing, logistics and services.

Judging from the law of industrial development, the economies of all countries in the world are basically developing along the trajectory of "agriculture, light industry, heavy chemical industry, high-tech industry, and service industry."

6.1 The impact of chemical industry development on urbanization

Industrialization is the historical evolution process from traditional agricultural society to modern industrial society. It is a process of continuous development and improvement of industry, especially manufacturing. The main manifestation is that the proportion of industrial output value in industrial and agricultural output value and the proportion of industrial population in the total population continue to increase, while the proportion of agricultural output value and the proportion of agricultural population continue to decrease. If the output value and employment-to-population ratio of a country's industrial sector dominate the national economy, it is considered to have achieved industrialization.

The basic trend and general law of the evolution of world industrialization itself is: the industrial structure goes through three stages in sequence: light textile or labor-intensive, heavy chemical industry or capital-intensive, and information or technology-intensive. The center of gravity of the industrial structure first transitions from agriculture to industry and then from industry to the service industry; the employment structure first means that the rural labor force tends to decline relative to the industrial labor force, and then the industrial labor force tends to decline relative to the service industry labor force; the changes in urban and rural structure are the output value of rural areas, Employment status has always been relatively declining, while urban output and employment status have always been on the rise, that is, the urbanization rate continues to increase; the income structure is first due to the decline in rural employment lagging behind the decline in output value, resulting in the income of

rural residents being lower than that of urban residents, and then Gradually tend to shrink and integrate.(Xian Y & Boqing X 2024,volume 70)

6.2 Chemical industry development affects urban layout

The development of the chemical industry and city development are complementary to each other, the development of the chemical industry will promote the development of the city economy, and the policy of city development will in turn affect the future of the chemical industry.

6.2.1 Promoted the rapid expansion of urban land scale

Generally speaking, compared with traditional textile and light industries, the chemical industry has low land use intensity and a large area. In addition, under the fierce competition situation of economic globalization and market internationalization, new chemical projects must be large-scale to be sufficiently competitive. The establishment of integrated refining and chemical complexes has become the preferred target for new projects. The competitive requirements of refining and chemical integration have led to the formation of many large chemical bases around the world. For example, the Gulf of Mexico petrochemical industrial belt led by Houston in the United States, the Ludwig Chemical Industry Zone in Germany, the Antwerp Chemical Industry Zone in Belgium, the Chiba Petrochemical Center in Japan, the Jurong Island Chemical Industry Base in Singapore, the Yecheon Petrochemical Base in South Korea, and the Jubail Petrochemical Industry in Saudi Arabia Base etc. The U.S. Gulf of Mexico Chemical Industry Zone, centered on Houston, extends to Louisiana in the east and Texas in the west, stretching 483 kilometers of coastline. Hundreds of companies have built production facilities here.

Due to its own production layout and industry competition characteristics, the development of the chemical industry will inevitably drive the large-scale expansion of urban land. Moreover, the massive development of the chemical industry will directly lead to a rapid increase in the demand for land for various public infrastructure facilities, which will greatly promote the urbanization process from the perspective of land landscape.(Xiaowei C & Mengyao X 2023,volume 344)

6.2.2 Jumping out of the enclave situation to form a chemical city

On the one hand, new projects integrating refining and chemical industry occupy a large area, and the old city and the edge of the old city are difficult to meet the construction land demand of the project. On the other hand, the chemical industry is generally a "high-pollution" and "high-risk" enterprise, and its layout requires it to be far away from urban living areas. The characteristics of the industry determine that when the chemical industry, as the leading industry, begins to develop rapidly in a city, the layout of the city will also change accordingly.

6.2.3 Barriers to economies of scale prompt the petrochemical industry to become increasingly concentrated

The petrochemical industry is an industry with very obvious economies of scale. Before reaching the optimal technical and economical production scale, generally the larger the production scale, the less the equipment investment per unit output and the processing fee per unit raw material, and the lower the cost of various production auxiliary facilities. The higher the utilization rate, and thus the lower the unit product cost, the more market competitive it will be. The existence of economies of scale forces new entrants to invest huge sums of money at the beginning to be competitive when they reach the same production scale, thus forming barriers to entry.

7 CONCLUSION

The rational layout of the chemical industry can significantly promote the growth of the urban economy. The investment and production activities of the chemical industry not only directly increase the industrial output value of the city, but also promote the development of related industries through the linkage effect of the upstream and downstream industrial chains. This industrial agglomeration effect is especially obvious in some areas with abundant resources and convenient transportation. However, China must also recognize the challenges that the chemical industry poses to urban environments and ecosystems. Pollutants from chemical production processes, if not properly handled, can wreak havoc on air, water and soil, threatening the health and quality of life of urban residents. Therefore, strengthening environmental protection measures and technological innovation and promoting the development of green chemical industry are the key to realizing the coordinated development of the chemical industry and urban economy.

In short, the layout of the chemical industry plays an important role in promoting China's urban economic development, but it also faces the dual challenges of environmental protection and sustainable development. In the future, the government, enterprises and all sectors of society should work together to build a scientific and rational industrial layout, promote the research and development and application of environmental protection technologies, achieve a win-win situation of economic and ecological benefits, and contribute to the high-quality development of China's urban economy.

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