Admittance and Management of Urban Industrial Lands

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Abstract. Because of the increasingly serious situation of environmental protection and lands supply in China, the research on control technology of industrial lands must be carried out to eliminate the enterprises of outdated technology and overcapacity, optimize industrial structure and protect land resources. Through the methods of statistical analysis and comparative analysis, the paper studies the index system of industrial lands in typical cities of Yangtze River Delta, Pearl River Delta and the Central Urban Agglomeration, analyzes the problems existing in approval and management of industrial lands, and puts forward suggestions on the construction of the index system and management process of industrial lands.

1. Research background
Since the 1980s, in order to attract enterprise investment to promote economic development and urban construction, local governments have approved a large number of industrial lands with low transfer prices and preferential tax in China. A case study in Wuhan, according to the analysis of remote sensing images of industrial lands, the total area of industrial lands in 2002 were 74.77 square kilometers, reaching 108.52 square kilometers in 2006, 15660 square kilometers in 2010, and the average annual growth rate was 10.23 square kilometers per year, with nearly 10% of annual average growth rate [1]. By 2015, the municipal government planned 385 square kilometers of industrial lands [2]. Many industrial parks have low completion rate and plot ratio. The infrastructures are incomplete too. Lands output efficiency of some industrial parks is very low. In 2010, the average output value of industrial lands were 3.85 billion per square kilometer in Wuhan, less than 50% of that in developed cities such as Shanghai and Guangzhou in the same period [2].

The inefficient examination and management in industrial lands have brought a lot of problems to urban development. The contradiction among urban industrial structure, lands supply and environmental pollution is becoming more and more prominent. The loose lands policies of admittance and management are no longer reasonable. In order to strengthen the management of industrial projects to achieve the economical and intensive of lands use, Ministry of Land and Resources of the People's Republic of China issued and implemented two versions of "Lands Control Index of Industrial Projects" in 2004 and 2008 to guide the supply and development of industrials lands. According to the technical standards, various local governments have also formulated the quota standards or relevant documents of the local industrial lands.

2. Construction of index system
"Lands Control Index of Industrial Projects" (2008) establishes the index framework of admittance and management of industrial lands in China. It gives two industry catalogues of prohibition and restriction, in addition, five indicators. The five indicators include three universal indicators:
building coefficient, proportion of land for administrative office and living service facilities, and green space rate; two basic indicators: plot ratio and investment intensity. On the basis of the national standard of 2008, each city has added some indicators, mainly including project construction index such as lands quota; economic output indicators such as lands output ratio unit area, lands tax output ratio unit area, etc. Some regions have tried to add energy consumption indicators and pollutant discharge indicators.

In the Yangtze River Delta of China, the government of Shanghai and Zhejiang are the first to study and formulate the indicators of industrial lands in domestic urban. They pay special attention to the economic indicators of lands, as the input and output value of unit land. The economic access standard of lands is relatively high, and the threshold value at different levels is set. But there are no indicators of industrial energy consumption and environmental protection in Shanghai and Zhejiang, which is a big defect. Jiangsu, another region in the Yangtze River Delta, has only added a very detailed land quota index. According to the characteristics of the industry, the quota of land use is divided into smaller sub subclass.

In the Pearl River Delta of China, the government of Guangzhou and Shenzhen are stricter than Shanghai and Zhejiang. They pay special attention to the admittance conditions for enterprises and construction intensity index of industrial projects. A large number of industries are restricted or prohibited by the relevant industry catalogue and energy consumption index in Guangzhou, where 31 kinds of traditional manufacturing industries have been banned. The advantageous industries are guided by the scientific and technological contribution rate and economic growth rate index in Shenzhen, which also put forward the industrial withdrawal system through flexible period of rent lands index. But there is no pollutant emission indicator to be set in this two cities. Dongguan, another boom city in the Pearl River Delta, has set seven indicators. Three indicators among them, the volume ratio, investment intensity and output intensity, are very high, close to Shenzhen’s standard.

In the Central Urban Agglomeration of China, such as Wuhan, Chengdu and Jiangxi, the management indexes of industrial land are relatively few, and the index value is far lower than that of the typical cities in Yangtze River Delta and Pearl River Delta. Chengdu has not added any indicators, but consistent with the national general standards. Wuhan has added two important indicators, energy consumption per output value and land output rate, but it's barely implemented. Jiangxi Province, like Jiangsu Province, has only formulated land quota unit output. See Table 1 below.

| Number of indicators | Additional indicators                                      |
|---------------------|----------------------------------------------------------|
| Shanghai            | lands output unit area, lands tax output unit area         |
| Zhejiang            | lands output unit area, lands tax output unit area         |
| Jiangsu             | Land quota                                                |
| Guangzhou           | Land quota, energy consumption per output value, contribution rate of technology |
| Shenzhen            | Land output unit area, land tax output unit area, energy consumption per output value, economic growth rate, flexible period of rent lands |
| Dongguan            | lands output unit area, lands tax output unit area         |
| Wuhan               | lands output unit area, energy consumption per output value |
| Chengdu             | no indicators added                                       |
| Jiangxi             | Land quota                                                |

3. Admittance system and Management system

3.1 The planning idea of industrial lands
The composition of industrial lands index should consider more planning ideas. First of all, lands are a kind of non-renewable resources. We should not only consider the land saving and intensive use, but also adopt a compact development model rather than blindly expand. It is necessary to establish effective indicators of construction intensity and economic output intensity. Some low-end manufacturing of high energy consumption and low output must be restricted or eliminated. Secondly, we must persist in the idea of ecological benefits and sustainable development. The ecological and economic benefits of lands are mutually restricted. The pursuit of a single value of economic effect will inevitably bring about ecological environment problems, and leading to the damage of overall and long-term economic benefits. The main idea of the sustainable and healthy development is to formulate the corresponding energy consumption and pollution control indicators, prohibition and limit the enterprises which is backward technology, overcapacity and serious pollution. Thirdly, life cycle theory [3]. This means the management of the whole process. The industrial development has always gone through the cycle of innovation breakthrough and renewal elimination. Industrial park should have established both entry and exit system in different stages. When the enterprise does not live up to the requirements of development, it must be withdrawn.

3.2 The process and various phases of management

A perfect index system of industrial lands should include construction intensity index, economic intensity index, energy consumption and pollution control index, and so on. They have formed a complex and multi-target integrated system, including three industry catalogues and 15 indicators. These indicators are managed by different management departments separately, which is easy to lead to management confusion, low efficiency and poor implementation. We need to establish a unified coordination organization. As shown in Figure 1, it is an urgent research topic of how to form a convenient, efficient and strict management process.

![Figure 1. Industrial land management process.](image)

3.3 Admittance indicators, elastic indicators and process control indicators

According to the actual process of industrial lands approval and management, these complex system had better divide into admittance indicators, elastic indicators and process control indicators. Admittance indicators refer to the conditions when enterprises are entering and settling in. It should be simple and convenient, including forbidden industry catalogues, restricted industry catalogues and investment intensity index. Elastic indicators are auxiliary indicators that optimizes further the industrial structure when the industrial park develops to a certain period. It should include advantageous industries catalogues, the contribution rate of science and technology, economic growth rate and flexible period of rent lands. Process control indicators are the most important indicators used for continuous assessment during the operation period after the enterprise is completed and put into operation. Process control indicators must be strictly and effective to control all aspects, mainly including construction intensity index, output intensity index, energy consumption and pollution
control index. Construction intensity index includes plot ratio, building density, proportion of lands for administrative office and living service facilities and green space rate; output intensity index includes lands output unit area, lands tax output unit area; energy consumption and pollution control indicators include energy consumption per output value, waste water discharge rate, waste discharge rate, solid waste discharge rate, noise control value. See Table 2 below.

Table 2. Index system of industrial lands management.

| Type                      | Indicator name                                                                 |
|---------------------------|-------------------------------------------------------------------------------|
| admittance indicators     | forbidden industry catalogues, restricted industry catalogues and              |
|                           | investment intensity                                                          |
| elastic indicators        | advantageous industries catalogues, the contribution rate of science and       |
|                           | technology, economic growth rate, flexible period of rent lands                |
| process control indicators| construction intensity index: plot ratio, land quota, building density,       |
|                           | proportion of lands for administrative office and living service facilities,    |
|                           | green space rate                                                               |
|                           | output intensity index: lands output unit area, lands tax output unit area      |
|                           | energy consumption and pollution control index: energy consumption per output   |
|                           | value, waste water discharge rate, waste discharge rate, solid waste discharge  |
|                           | rate, noise control value                                                      |

4. Average and expected value

Comparing industrial lands indicators formulated in different regions, general indicators such as building coefficient, proportion of administrative office and service facilities, green space rate, are relatively unified planning indicators. In order to improve the economy and intensivism of industrial lands, the building coefficient should be as large as possible, which must be more than 30% and even 50%. The proportion of administrative office and service facilities shall not exceed 7% in the whole country. But the innovative headquarters can be appropriately enlarged, which must be submitted and deliberated one by one at technical conferences [4-5]. The green space rate refers to the enterprise’s own interests. It is not suitable to set more than 15% of independent green space, except for the protective green space, such as around hospitals, dangerous goods factories, etc. We can expand the green space through technical means, such as roof greening and wall greening, or design an open green space to connect with the urban public space.

If we study the key basic indicators of the volume ratio, investment intensity, unit land output and unit land tax output of the traditional manufacturing industry through the technical documents of each city, the economic indicators of typical urban in Yangtze River Delta are the highest in all regions, and the construction indicators of typical urban in Pearl River Delta are the highest in all cities, while the cities of central urban agglomeration are very low in both aspects. See Table 3 below.

Table 3. Average of main indicators of each city.

| City    | plot ratio | investment intensity (million yuan / mu) | lands output unit area (million yuan / mu) | input-output ratio | lands tax output unit area (million yuan / mu) |
|---------|------------|------------------------------------------|--------------------------------------------|--------------------|-----------------------------------------------|
| Shanghai| 1.12       | 365                                      | 1054                                       | 2.9                | 291                                           |
| Zhejiang| 0.87       | 250                                      | 395                                        | 1.6                | 25                                            |
| Jiangsu | 0.84       | 234                                      | -                                          | -                  | -                                             |
| Guangzhou| 1.11     | 256                                      | 337                                        | 1.3                | -                                             |
| Shenzhen| 1.88       | 283                                      | 345                                        | 1.2                | 76                                            |
| Dongguan| 1.69       | 263                                      | 465                                        | 1.8                | 77                                            |
| Wuhan   | 0.77       | 186                                      | 313                                        | 1.7                | -                                             |
| Chengdu | -          | 166                                      | -                                          | -                  | -                                             |
| Jiangxi | 0.83       | 184                                      | -                                          | -                  | -                                             |
According to the statistical data of technical standards in industrial parks, we can recommend the following common index values. Plot ratio is small in many industrial parks in China, which must have a minimum value, but is not necessary to control the maximum value. Compared with developed areas, the plot ratio of most manufacturing industries should not be less than 1.0. Except for Petroleum, metallurgy, energy production and supply industries, which should not be less than 0.5 in general. Economic indicators vary greatly in different regions and industries, the minimum standard of national industrial park is no less than 3 million yuan / mu, and that of provincial industrial park is no less than 2 million yuan / mu. The input-output ratio should not be less than 1.5, so the land output value should not be less than 3 million yuan / mu. The output of land tax is estimated at comprehensive tax rate of one tenth, so it should not be less than 300,000 yuan / mu.

Other indicators such as energy consumption and pollution control indicators, contribution rate of science and technology, economic growth rate, flexible period of rent lands, are also very important indicators. However, these indicators have few statistical data, few related studies, and very difficult to implement, which need to further study.

5. Conclusions
The control technology of industrial lands is an important and urgent topic to every city. The access index system should be simple and scientific, consistent with the urban development strategy. The process management index system should be strict and perfect, so as to ensure the integration of economic, social and ecological effects. At present, the research of industrial lands use lags behind urban development. The number of statistical samples is not enough, which leads to the poor applicability of land use indicators. We should make a further study on the index value by establishing big data of industrial lands and combining with the evaluation feedback of land use efficiency. At the same time, industrial control indicators should be divided into small categories according to different scales and different regions, so as to provide more flexible and accurate guidance.

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