

## CHALLENGES OF URBAN FORM IN FAST-GROWING CHINESE CITIES: A CASE STUDY OF KUNSHAN

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**ABSTRACT:** In recent decades, China has been witnessed an astonishing 2-digit annual economic growth. However, this fast growth relies heavily on the vast investment of natural resources such as land. The Economic Development Zones (EDZs) serve as the employment centers in the urban area and change the urban form accordingly. The scattered EDZs have resulted in fragmented land use pattern within urban area and reduce the city efficiency. For this reason, the city of Kunshan appears as the epitome of fast-growing Chinese cities and is worthy of thorough anatomy. The paper is organized as following: first it introduces the fast-growing background of Kunshan from 1980s, including the urban form transformation in Kunshan's EDZ-based growth and its challenges to sustainable development; then the features of local urban form will be summarized and criticized; finally a few of urban spatial planning suggestions will be provided as the countermeasures for above challenges.

**KEYWORDS:** urban form, fast-growing, Chinese cities, challenges, EDZs

### 1 BACKGROUND

In recent decades, China has been witnessed an astonishing 2-digit annual economic growth. What is the secret behind such continuous high speed development? This has been a question revolving around in many scholars' mind. From the aspect of Economics, this kind of growth can be described as "GDP-Driven Development", during which the attraction of FDI (foreign direct investment) becomes the main concern of local governments. However, this fast growth relies heavily on the vast investment of natural resources such as land. The type of "land-consuming economy" has brought China into an extraordinary urbanization era where various Economic Development Zones (EDZs) burst out throughout the nation in order to attract foreign investment. So we can safely conclude that China's fast-growing secret mostly exists in the rapid expansion of EDZs.

This "EDZ-based economy" reflects the severe competition between Chinese cities. In order to attract foreign investment, land price in them are usually repressed under market value in order to appeal to more investors. Needless to say, the direct negative effect of such "favorable policy" is the low efficient use of land due to very low acquiring cost. Idle land can be found in most of the EDZs as well as low density developments. In the EDZs at the provincial level or above, the developed land only sums up to 13.51% of the planned area; while in the 54 national High-tech Development Zones, land use density illustrated by Floor Area Ratio (FAR) is only 0.24, and only a little bit over half of the land (57%) has been developed. The scattered EDZs have resulted in fragmented land use pattern within urban area and reduce the city efficiency. So even enjoying the benefits brought by EDZs, China is also keeping alert on the accumulative challenges in land abuse and unefficient urban physical form.

For this reason, the city of Kunshan appears as the epitome of fast-growing Chinese cities and is worthy of thorough anatomy. First, it is located at the heart of China's hottest economical developing area—Yangtz River Delta. Secondly, among totally over 2000 counties in China, Kunshan has continuously occupied the No.1 position since 2005 by the evaluation of both social and economic development. The last but not least, Kunshan has put forward land use policies in order to restrict unwound land use pattern and facilitate effective urban form. Its policies about how to stimulate compact urban form will be widely followed around this country. So a close observation on its execution is indispensable.

The paper is organized as following: first it introduces the fast-growing background of Kunshan from 1980s, including the urban form transformation in Kunshan's EDZ-based growth and its challenges to sustainable development; then the features of local urban form will be summarized and criticized; finally a few of urban policies suggestions will be provided as the countermeasures for above challenges.

## 2 KUNSHAN'S FAST-GROWING AND CHALLENGES

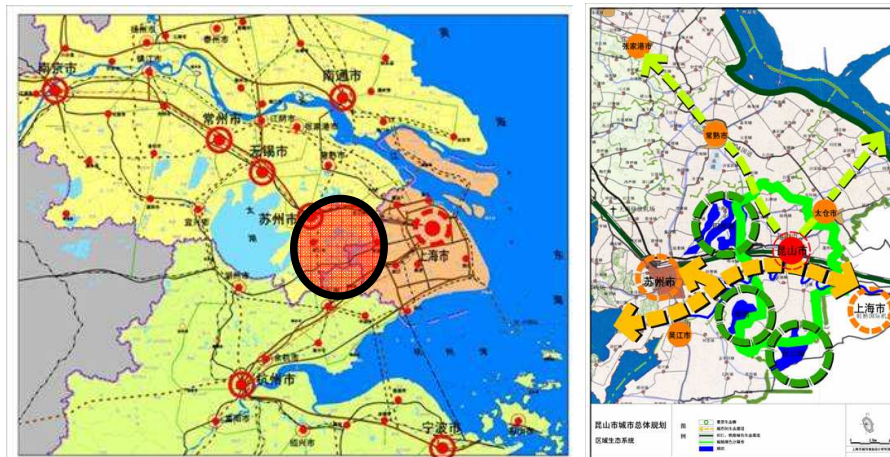
### 2.1 Kunshan's fast growth

Kunshan's fast-growing which benefits from China's reform policy can be traced back to 1980s.

- ◆ In 1985, Kunshan established the first "Industry Park" in the country, which covered 3.75 km<sup>2</sup>
- ◆ In 1987, the Development Zone in Kunshan was appraised by Jiangsu Province and then extended to 6.18 km<sup>2</sup>
- ◆ In 1992, the State Department permitted the Development Zone in Kunshan to be among national level
- ◆ In 2000, the State Department set up 15 Export Processing Zones, including the one in Kunshan
- ◆ In 2004, Kunshan was entitled as one of the 10 "Most attractive cities in China"
- ◆ From 2005, Kunshan has occupied the No.1 position in the list of "10 most developed county-level cities in China"

The reasons why Kunshan can be developed so fast in the past decades can be concluded as following:

(1) Adjacent to both Suzhou and Shanghai(Fig.1). The location between two biggest metropolises in Yangtz River Delta has made Kunshan a convenient bridge for both capital and productions transportation within this region. Compared to Suzhou and Shanghai, Kunshan owns relatively lower labor cost and land cost. So many investors, especially those from Taiwan prefer to choose Kunshan as their manufactory base. It is said that about 1/4 of the laptops in the world are produced here.



**Figure 1** The location of Kunshan within Yangtz River Delta

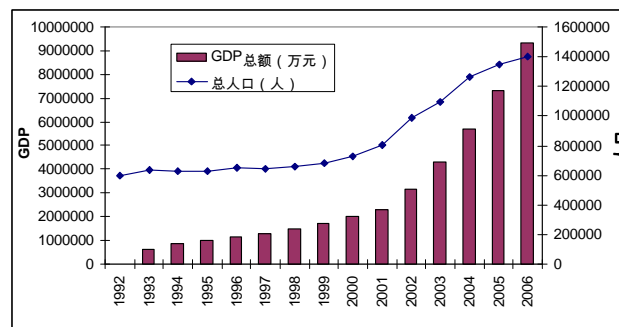
(2) The pioneer practitioner of EDZ policy. In 1990s, Kunshan has set up the first industry park in the country and then been promoted by the State Department to be in the national level, and this helps Kunshan to make the most advantages from the EDZ policy.

Soon after, various industrial parks sprang out not only in provincial or city level, but much more in the township level. At present time the industrial parks have come up to 25 around the whole city, assembling over 3000 foreign enterprises and 16.2 billion RMB of foreign investment.<sup>1</sup>

Subsequently the fast growth of local economy can be illustrated by following data. The local GDP has

<sup>1</sup> [http://www.cnestate.com/gaiban08/news/news\\_detail.asp?id=18617](http://www.cnestate.com/gaiban08/news/news_detail.asp?id=18617)

grown very fast from the early 1990s to present, together with the boom of local population (Fig.2). Within the composition of total GDP, the secondary industry owns the dominant position compared to the other two. And the workers in manufacture also increase dramatically, as the number of farmers decreases and the employers in the tertiary industry increase in a moderate manner. These show that the characteristics of local development bind tightly with the EDZ economy.



**Figure 2** The local GDP and population growth

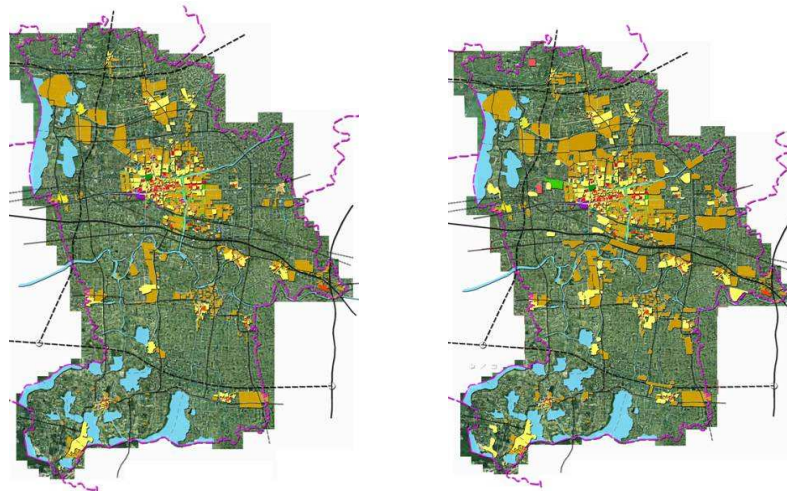
## 2.2 Kunshan's challenges of land sustainability

Although growing with very high GDP rate in recent years, Kunshan's development has been diagnosed as unsustainable for potential demand of land for further economic growth cannot be satisfied. The left side of Fig.3 Shows the constructed area in Kunshan in the year 2004, however just 3 years later, the constructed area has spread out a lot as the right side shows. The consumption of land is in such an amazing speed that the local government cannot help worrying about the future availability of land.

According to local 11th Economic and Social Development Five-year Plan, the expected GDP in 2010 will be 12,000 Dollars per capita (calculated on permanent population), while in 2020 will be up to 20,000 Dollars per capita. In this plan, the permanent population should be limited no more than 1.6 million before 2010. With such figure we can estimate that 2 million is a rather conservative population anticipation for Kunshan in 2020. So it can be reduced that the total GDP of Kunshan will be 18.2 billion Dollars in 2010 and 40 billion Dollars in 2020.

Assessed by the latest version of Kunshan's Comprehensive Plan, in Kunshan's industry parks the GDP production value only equals to 0.45 billion RMB (0.066 billion Dollars) per km<sup>2</sup>. If present land production ability remains unchanged, then it needs at least 600 km<sup>2</sup> of industrial land to fulfill the GDP growth mission in 2020. In urban planning, industrial land usually occupies no more than 1/3 of the total constructive urban area, so the whole constructive urban will sum up to at least 1800 km<sup>2</sup> at the time of year 2020.

Within its administration area Kunshan covers merely 921.3 km<sup>2</sup>, within which only 2/3 of it, that is 643 km<sup>2</sup>, is dry land. Except for the ecological preserved land, the land available for construction cannot exceed 413 km<sup>2</sup>, which means that it needs about 3 more Kunshan city to bear the weight of future economic development. Obvious, it is not possible that Kunshan keep in present track of incompact land use pattern if it wishes to realize the expected development missions. Otherwise the exhaust of land will soon become the threat of Kunshan's future development.



**Figure 3** The fast expansion of constructed land in Kunshan (Left: Year 2004; Right: Year 2007)

### 3 DIAGNOSE OF URBAN FORM IN PRESENT KUNSHAN

Although local government has put great effort to make better use of the industrial land, during the investigation of Kunshan urban spatial pattern we found quite a few important issues involving with not only various kinds of land uses, but more with the whole urban structure. They can be summarized as follows:

#### 3.1 Scattered employment centers and fragmented land use



**Figure 4** The planned location of major industrial parks

As observed, the characteristic of Kunshan's economic development or in other words, the secret of Kunshan's economic vitality, exists in the "EDZ-based Economy". Except for acting as the production centers, they also serve as employment centers. As the theory of Urban Economics points out, unified employment center is necessary to a growing city, because a big or unified labor market can create much more agglomeration effect than smaller or divided employment centers. Especially for the city over 1 million population, the internal driven force derives from the scale effect from local unified labor market.

However, the spatial distribution of industrial parks in Kunshan does not follow such rules. First, employment centers here are small and scattered rather than big and unified. There are all together 25

industrial parks at the city level or above, and even 28 more owned by townships or villages. Among the former ones, 12 parks (48%) cover less than 1000 mu (about 66.7 ha), and in the latter ones there are only 3 containing more than 200 enterprises while others below 100.<sup>2</sup> These large amount of small industrial parks actually prevent Kunshan from forming an unified and competitive labor market. Even local urban planning has strengthened this trend. As shown in the Kunshan Comprehensive Planning (2002-2010), Fig. 4 illustrates the planned locations of major industrial parks. It can be seen that the urban space is divided by these scattered employment centers. Moreover, since the administrative power is distributed among different levels of governments, there is no unified planning for these various parks, so that the infrastructure constructions like roads, electricity, water and etc. are often redundantly planned. Hence the land resource in these parks cannot be used in an efficient way.

What is more, the local employment areas are also divided by “greenery planning”, both in the city level and individual industry parks. First, believing that the agglomeration of employment centers will bring many negative effects, Kunshan as many other cities prefers to plug green corridors and greenbelts between different sub-city districts, in order to create visionary scenery and to prevent the sub-centers merging with each other(Fig.5). Secondly, in industry parks Kunshan even wish to produce some sort of “Garden Plant” regardless of the inefficient land use pattern. The right side of Fig.5 shows that in the plan for Wusongjiang Industry Park the whole area has been cut into small groups by greenbelts.



**Figure 5** Greenery planning in city-wide scope(left) and industrial park(right)

### 3.2 Two extreme land use patterns

#### (1) Mixed use of land in fast-growing periphery

Before 1990s, the scale of towns in Kunshan used to be very small, so that the towns were usually surrounded by serried villages. With the fast-growing especially the booming of various industrial parks, the scope of towns has been in a rapid increase. Thus most of the circumjacent villages were swallowed by urban expansion. However, in order to reduce the development cost and to increase the constructing speed, the towns normally chose to keep away from these villages when building the industrial parks. The direct consequence is that the villages or farm land are left within industrial districts or coexist within commercial areas(Fig.6). This phenomenon is prevalent in fast-growing Chinese cities and often called as ‘urban villages’.

<sup>2</sup> <http://www.kunshannews.cn/msyd/Detail.aspx?ContentID=3670&ItemID=74>



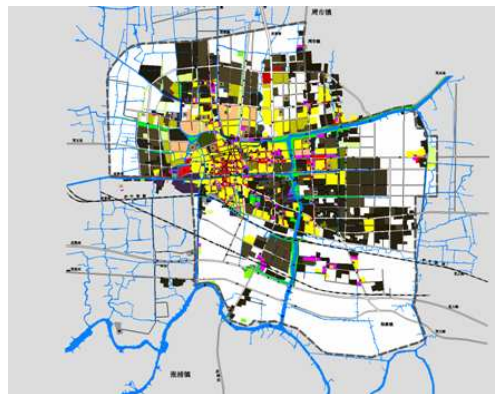


**Figure 6** Mixed use of land

What is more, as other cities in Yangtz River Delta, Kunshan used to establish a quantity of Village-Owned Enterprises (VOE). Despite most of them have been moved into industrial parks, there are still over 200 enterprises remain in situ.<sup>3</sup> The mixed use of the industrial land and village land requires additional infrastructure investment and as a result reduces the efficiency of land use.

With the surge of industrial enterprises, hundreds of thousands migrant workers need to be provided dormitories. In our field survey, we found that some enterprises would like to construct dormitories within industrial districts. By doing this, individual enterprise can save its transportation cost for its workers, however, for the entire industrial district due to the extension of connection cost and the reduction of agglomeration effect, the total land use efficiency actually has been reduced.

(2) Isolation of both residential and industrial land



**Figure 7** Isolation of residential(left) and industrial(right) land use

Besides the mix use of different kinds of land, we also can see another extreme of isolated land use. Some newly developments appear to be “isolated islands”, far away from schools, shops and other public services. This will lower the efficiency of public transportation, water supply, sewer etc., while encouraging the use of private cars and aggravating the smash of agricultural land. (Fig.7)

Moreover, the newly constructed industrial land does not blend in existing industrial structure as well. As Fig.8 shows, this kind of land use pattern will result in the inefficient use of infrastructure and further fragmented land use.

### 3.3 Low density in Central Business District (CBD)

Except for the existing industrial parks, in recent years Kunshan wish to upgrade its industries, so it has planned new business district named Huaqiao International Business Zone (HIBZ), which performs as the central business district of Kunshan(Fig.8). According to international planning experiences, the plans of such kind of employment center often bear a high population density or land use density. However, compared with the oversea cases, CBDs in Chinese cities are often planned with quite low FAR and very high greenery ratio. As far as HIBZ, the relative FAR comes to be only 1.43 while the Greenery Area being

<sup>3</sup> <http://www.kunshannews.cn/msyd/Detail.aspx?ContentID=3670&ItemID=74>

more than 20% of the total land. Fig.9 has shown the comparison between Chinese CBDs.



Figure 8 Huaqiao International Business Zone

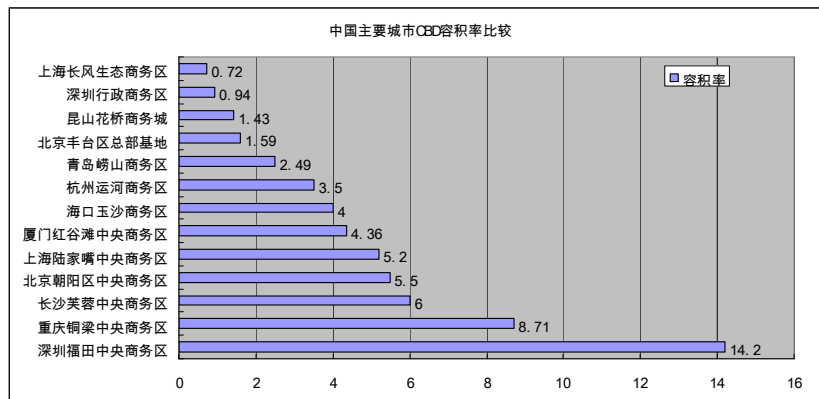
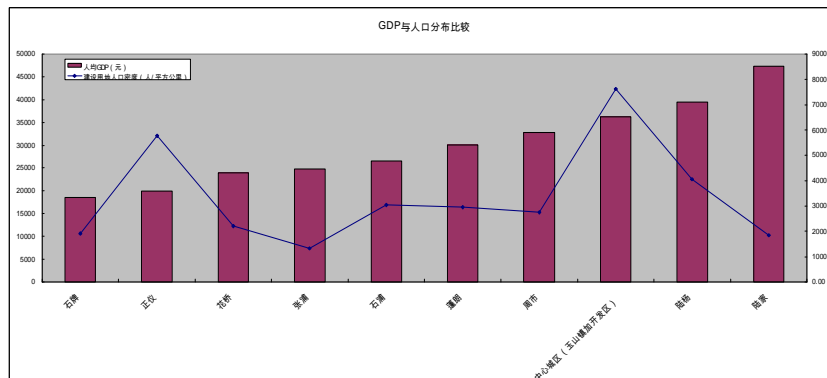


Figure 9 Typical employment density in Chinese CBDs

### 3.4 Incompact land use in urban planning

The land consumption per capita has surpassed the national planning criteria. According to the local comprehensive plan in 2002, the land consumption per capita in central district has come up to 166.5 m<sup>2</sup> at present time, while in the long term it will be a little bit lower to 120 m<sup>2</sup>. But, in the national criteria for land use in different kinds of cities, there are 4 levels for land use and the highest level of 120 m<sup>2</sup> is only appointed to national capital (Beijing) and special economy zone (like Shenzhen). This means that the land consumption now in Kunshan has largely exceeded the highest limitation in national planning criteria.

Also, the incompact land use can be seen from the low density of population distribution compared with the GDP production. In 2002 the administration area in Kunshan can be divided into 15 towns plus 1 Development District. Except for 5 of them preserved traditional towns, including Zhouzhuang, Jinxi, Dianshanhu, Qiandeng and Bacheng, the other 11 towns together with the Development District are all planned in local 2002 Comprehensive Plan to take industry as the major land use. Generally speaking, it is assumed that the GDP per capita should be direct proportional to the population density, for the more people live there, usually the more production the employment center has. However Fig.10 has shown the comparison between the GDP per capita and population density in the constructed land, from which we cannot see any positive relationship between them.



**Figure 10** The GDP per capita and population density in constructed land of Kunshan towns

Although local government pays much attention on the industrial land use, it cannot be ignored that the residential land also takes up a large proportion in the inefficiently used land. Basically this situation does not change very much that farmers keep living in a dispersive way in rural villages. According to statistics, there are in sum 2263 villages in Kunshan, with 121 thousand households in them. The total land used for housing construction calculates to be more than 90 thousand mu (about 6000 ha), which means that the average residential area of a rural family covers 0.74 mu (about 500 square meters). Although local government encourages farmers moving into towns or central city, the relocated families have not reached 20% of the total amount, and the diminished villages during this process only count to 10%.<sup>4</sup>

### 3.5 Defects of current policies

To keep the GDP growth with anticipated, local government regards industrialization as the engine of economic growth, for industrialization has been proved to be the necessary path to urbanization. For this reason the local government has released a series of land use policies and restrictions aimed to industrial land use.

(1) Creating the criterion of “Investment Density” to enhance industrial land use density. The “Investment Density” means the investment capital on one unit of land. In 2004, local government put forth a ‘6543’ criterion on the land use in EDZs, requiring that investment density should not below 600 thousand Dollars per mu in Kunshan Export Processing District, 500 thousand Dollars per mu in Kunshan Development District, 400 thousand Dollars per mu in EDZs set up by townships and 2500 thousand RMB per mu when invested by domestic private enterprises. As a consequence, the average investment density in 2003 had been largely improved. For example, the investment density of foreign-funded enterprises in Kunshan Export Processing District had reached 685 thousand Dollars per mu at the end of 2005, while the average data of whole city was only 244.4 thousand Dollars per mu 2 years before.<sup>5</sup>

(2) Raising up urban planning standards aimed for more intensive industrial land use. For this purpose local planning bureau requires that the FAR for industrial use must beyond 0.6 and multi-level manufactory buildings are encouraged, while at the same time the planning for ‘Garden Plant’ is strictly forbidden.<sup>6</sup>

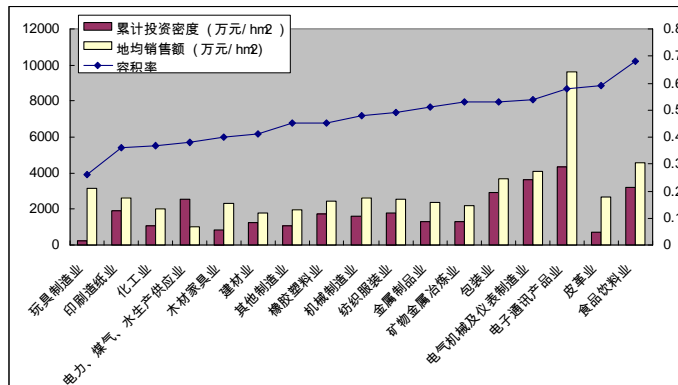
Although these policies aim to increase the land use intensity, however, the attention on FAR does not change the whole thing because of its ignorance of the relationship between urban form and GDP growth.

<sup>4</sup> <http://www.kunshannews.cn/msyd/Detail.aspx?ContentID=3670&ItemID=74>

<sup>5</sup> [http://www.cnestate.com/gaiban08/news/news\\_detail.asp?id=18617](http://www.cnestate.com/gaiban08/news/news_detail.asp?id=18617)

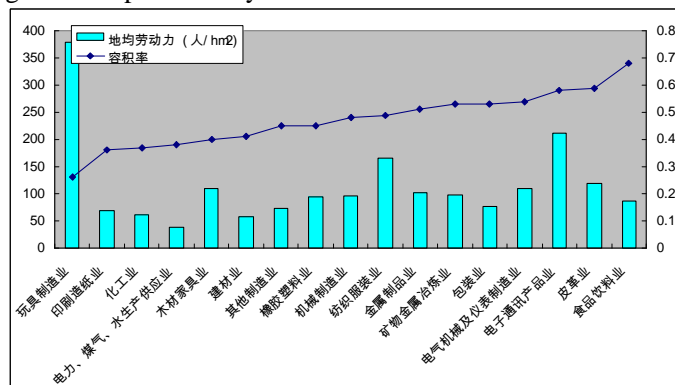
<sup>6</sup> [http://www.gov.cn/ztzl/2005-12/29/content\\_141373.htm](http://www.gov.cn/ztzl/2005-12/29/content_141373.htm)





**Figure 11** The relationship between FAR, Investment Density and Sales Density

Fig. 11 illustrates the relationship between FAR of various industries in Kunshan's industry parks (sort ascending) and their respective Investment Density and Sales Density. From the figure we can tell that there is no significant positive relationship between FAR and the other two outcomes. Actually the Investment Density and Sales Density vary so much along as FAR growing up and fall into uneven values. Taking the leather industry as example, the land it occupies has been among the highest level of FAR but possesses disproportionately low Investment Density and Sales Density. Moreover, even the Investment Density and the Sales Density have no direct connection in these industries. Although the investment density in the toy manufacturing is not high, it is able to produce multiple values. These cases show that 1) FAR could not be an appropriate index to measure industrial land production, since various industries with different levels of FAR actually have distinct productivities, and 2) Sales Density seems more important than Investment Density when measuring the final productivity of land.



**Figure 12** The relationship between FAR and Labor Force Density

Fig. 12 illustrates the relationship between FAR of various industries in Kunshan's industry parks (sort ascending) and Labor Force Density. It is quite amazing to find that toy manufacturing processing the lowest FAR unexpectedly provides maximum employment positions among all the industries. Therefore it is obvious that the FAR cannot reflect the intensive use of industrial land, nor does it be consistent with job amount. Thus FAR should not be relied as sole index of urban spatial development any more.

#### 4 POLICIES SUGGESTIONS

China is still in its transition path towards the market economy, so the most of its urban policies still appear to be of the conventional command style. In the way to pursue a more sustainable growth, it has to explore more effective tools. Thus our suggestions for China's urban development strategy are around these respects:

- (1) To define local Primary Function Area (PFA) within Kunshan city

Recently China has created new policy named Primary Function Area which aims to divide the country

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land into 4 types according to their primary function: 1) Development Optimized Zone, which is designated for areas having high development density and huge environmental pressure; 2) Development Focus Zone, which is designated to areas having relatively strong economic potential together with good environment quality; 3) Development Restriction Zone, which is designated to areas having weak environment quality or being the ecological sensible places; 4) Development Forbidden Zone, which is designated to areas of significant environmental importance, like national parks or preserved zones.

Although the PFA policy has been expected to play an important role to make better use of national land, however, the execution of PFA policy is staying in national level yet, because in local level it is rather difficult to define the scope of various PFAs. The case of Kunshan has given a just-in-time opportunity to solve this problem.

So we could divide the whole city into 4 types of areas, depending on their development possibility and ecological sensibility. The traditional towns like Zhouzhuang should be appointed as the Development Restriction Zone and all the present industrial parks should be removed out of it. Additionally, the central district and CBD should be treated as Development Focus Areas. The development of Kunshan should not be evaluated only basing on the GDP value. Only the GDP-driven mode being changed thoroughly, can the scattered employment centers become more agglomerated.

(2) To set up Urban Growth Boundary(UGB)

In order to restrain the out-of-control development of cities like Kunshan, we could borrow the ideas of UGB from American experience. UGB has been used to prevent the urban sprawl in America, which has some similarities with what happens in China. Traditionally, local government always have impulses to expand the constructed urban area, even far beyond the scope of public facilities. This is the intrinsic reason for the troubles like Urban Villages.

To solve such problems, some boundary for rational urban growth is necessary. The Chinese type of UGB should be discussed and permitted by local People's Deputy Conference, which can hold the internal impulse of local government. Of course, for China has experienced a fast developing era, the UGB can be revised every 3 to 5 years. It would be better that the scheme avoids consistent with the administration period of local municipal, which can guarantee the UGB keeping unchanged after re-election of mayor.

(3) To increase the agglomeration effect of certain urban areas

First, the development density in central district and employment centers like business parks need to be promoted. Second, the amount of industrial parks ought to be reduced in order to concentrate on the development of bigger employment centers. Third, greenery land dividing urban sub centers and industrial parks should be eliminated or decreased, which will help to increase the land use efficiency

(4) To pay more attention on urban form rather than individual blocks

From above analysis, there is little positive relationship between development density(FAR) and GDP production. Thus moving the eyes for individual blocks to the whole urban structure may be a wiser choice. There are several more important things waiting to do:

1) Reduction of the mix use of land and reduce the isolated land use. For this purpose, regulatory planning is a good tool to make things clear. Regulatory planning is basically a Chinese version of "zoning", which is used to direct the land use and prevent negative effects.

2) To revise the development control standard in industry parks basing on various industrial uses. Different from conventional input-oriented standard, a renewed output-oriented standard will take the place. The Investment Density is no longer important, but Sales Density or Labor Force Density will become the new criteria for evaluating the efficiency of land use.

3) Increasing the residential land use density. As the urbanization goes at a very high speed in China, annually many farmers change their identification (Hukou) from rural one to civil one. Yet, their houses stay in a village way, which consumes a lot of land and prevent the whole city become an efficient part. Therefore it is necessary to assemble these urban villages hence to increase the residential density.

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