Study on Land Resource Problems and Countermeasures in the Process of Urbanization in China

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Abstract

Rapid urbanization is the inexorable trend of social and economic development in China, but immoderate utilization of land resources and cultivated areas during urban construction was very conspicuous. In this paper, the problems of unreasonable structure of land utilization and the low utilization ratio were studied. Finally, based on the analysis of the internal reasons for these problems, some countermeasures were put forward.

Key words: urbanization, land resource, urban land utilization

I. Introduction

From the beginning of the 20th century, urbanization has been developing rapidly all over the world. According to the forecast of experts, in 2000, more than half of the population will live in the city, which will become the main arena for various human activities. Though China is in the early stage of its urbanization, cities are developing at a high speed, and particularly since the start of the Reform and Opening Policies, the progress of urbanization is much more noticeable. By the end of 1996, the urbanization level had increased rapidly from the 19.4% of 1980 to 29%. According to the report submitted to the Second Congress of UNHLA, in 2000, the urban population will increase from 3.5 hundred million of 1995 to 4.5 hundred million, and the urbanization level will rise from 29% to 35%. By 2010, the urban population will be 6.3 hundred million and the urbanization level will be 45%. Along with the growth of urbanization, more and more agricultural population will become non-agricultural. At the same time, the urban construction will develop also on a large scale over the whole of China.

Urbanization is an inexorable trend of economic development and plays an important role in recruiting rural surplus labor, promoting industrialization and driving regional economic development. Therefore, the government should not restrict the development of urbanization, or rather should carry it forward positively. However, the government should also pay attention to some urban problems, such as blind buildings and confined land utilization. Pursuit of growth speed ignoring economic benefit, concentration on economic profit without considering social and ecological benefit, or thinking only about the present and ignoring long-term development has already brought us many problems. For example, accompanied by the increase of urban population, housing conditions have worsened, and the situation of underemployment has become serious. Much cultivated land has been nibbled away by urban land utilization, and grave urban environmental pollution also stems from such urbanization. If the government does not take any effective action to control these problems from macro viewpoints, it will become a restrictive factor for economic development (Yao, 1994).

II. Trends of Cultivated Land Resources

In China, the road to urbanization has been tortuous, which means that urbanization has been developed in an irrational state for a long time. During the 30 years from 1949 to 1978, only 54 cities have emerged, and the number of organic towns did not increase, rather showed different levels of decline. The urbanization level increased from 9% to 13%, or only a 4% increase during the 30 years. This is a sharp contrast with the rapid development of world urbanization. It resulted from the unified planning economic policies and centralized management, which limited normal development of cities. Although urban-
Urbanization is at a low level, urban land utilization increased by almost double.

Since China adopted the Reform and Opening Policies, the rate of economic growth has propelled the rapid development of urbanization (Liu, 1999). Compared with 1978, the number of cities in 1995 increased by 368%, presenting an average increase rate of 28.7% per year. In addition, the number of organic towns also increased from 2800 to more than 16000, and the urbanization level increased from 13% in 1978 to 29% in 1995 (Table 1). During this very short period of 17 years, the progress of urbanization in China has been amazing, seemingly a miracle in world development.

The pattern of urbanization is reflected not only in social aspects such as multiple life styles and a complex social class system, but also in spatial change. The latter has two phenotypes. One is that a large area of farmland is transformed to urban land. The other is that the original urban land tends to be highly utilized. From the angle of land utilization study, these trends can be termed as extension and intension models for the development of urbanization, respectively. These two kinds of land utilization processes will have two negative roles. The former causes the decrease of a vast amount of high quality farmland on which small farmers rely for existence. The latter raises the price of urban land, which aggravates the burden of urban residents.

From 1978 to 1985, about 2080 km² of urban areas were expanded, at an average rate of 300 km² per year. During the following 10 years, cities encroached on farmlands at an accelerated speed. From 1985 to 1995, the total area of urban regions increased by 88.4%, converting 900 km² (90 thousand hectare) farmland per year (Figure 1). Per capita urban land also increased from 80 m² to 102 m² and, to some extent, improved the poor situation of land utilization.

The decrease of cultivated area is basically consistent with the process of urbanization. During the 31 years from 1949 to 1980, only 1470 thousand hectares of cultivated land was reduced. But from 1981 to 1995, the net decreased area was 5400 thousand hectares. During the sixth five-year plan (1981–85), cultivated land decreased at an average rate of 470 thousand hectares per year, 270 thousand hectares during the seventh five-year plan (1986–90), 330 thousand

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of cities</th>
<th>Increase in number per year</th>
<th>Urban population (10⁴)</th>
<th>Urbanization level (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1958</td>
<td>184</td>
<td>6.70</td>
<td>13685.1</td>
<td>20.7</td>
</tr>
<tr>
<td>1965</td>
<td>168</td>
<td>−2.28</td>
<td>10169.9</td>
<td>14.05</td>
</tr>
<tr>
<td>1978</td>
<td>193</td>
<td>1.92</td>
<td>17242</td>
<td>17.92</td>
</tr>
<tr>
<td>1985</td>
<td>324</td>
<td>18.71</td>
<td>25094</td>
<td>23.71</td>
</tr>
<tr>
<td>1995</td>
<td>640</td>
<td>31.60</td>
<td>35174</td>
<td>29.04</td>
</tr>
<tr>
<td>1998</td>
<td>668</td>
<td>9.33</td>
<td>37942</td>
<td>30.40</td>
</tr>
</tbody>
</table>


Figure 1. Change of urban built-up area and population in China
Source: China urban statistical yearbooks, 1997.
hectares during the eighth five-year plan (1991–95), and 673 thousand hectares during the ninth five-year plan (She Liming, 2000). The situation was more serious in big cities. For example, per capita cultivated area for agricultural population in the Jingjintang (Beijing-Tianjin-Tangshan) district was reduced from 0.24 hectare at the beginning of the 1950s to 0.11 hectare at the end of 1993, dropping 55% during 40 years. Only in the single year of 1994, the decrease of cultivated land in Beijing amounted to 37 thousand hectares, 80 thousand hectares in Shanghai, and 320 thousand hectares in Guangdong. In 1992, 1994 and 1995, the net decrease of cultivated land in the whole country was about 400 thousand hectares each year. Especially for the last few years, the construction of various developing districts has converted many good farmlands. In 1994, more than 5000 developing districts were established in the whole nation, covering about 15 thousand km$^2$ farmland, which almost equals the total national urban area. Though the number decreased after rectification, there are still about 3000 developing districts, which cover 1530 thousand hectares (15.3 thousand km$^2$) of cultivated land, as large as that of Zhejiang Province. According to the investigation of the National Land Management Bureau, in only 9 months of 1992, 1951 developing districts were approved in 24 provinces, covering about 1600 thousand hectares of cultivated land. Of the 2804 developing districts checked over the whole nation in 1993, 78% of them expanded beyond the project, occupying 760 thousand hectares of cultivated lands.

Most of the land utilized for urban construction is high quality farmland (Cheng, 1991), flat with good transport facilities and service, abundant water sources, and fertile soil. From 1949 to 1980, the increase of total built-up area in Beijing was 30 thousand hectares, of which 20 thousand hectares (66.7%) had been farms with high quality vegetable fields. Our analysis of the satellite information showed the expansion of Beijing City proper, Fangshan District, and Langfang City from 1985 to 1992. During the 7 years, the area of Beijing City expanded, replacing former famous vegetable bases such as Sijiqing, Huangtugang and Shibali Xiang with built-up area. Fangshan District expanded 4 times, and Langfang City expanded 5 times. In addition, according to the statistics of Guangzhou Plan Bureau, during the years from 1987 to 1994, urban construction occupied 18086.3 hectares, of which 11870.2 hectares was farmland, accounting for 65.6% of the total area.

III. Urban Land Utilization Efficiency

In order to judge the rationality of land utilization of urban expansion, rational coefficient should be used. The expansive coefficient (EC) is equal to the ratio of growth rate of urban land (RUL) utilization to that of urban population (RUP), namely $EC = \frac{RUL}{RUP}$. According to the studies of the Institute of Urban Plan, the rational EC should be 1.12 in China. If it is bigger than 1.12, it means a decrease of the land utilization ratio (Liu, 1998). From 1984 to 1992, the areal expansion of urban land increased by 64% at an average rate of 6.39% a year. At the same time, the non-agricultural population in the city increased by 41% at an average rate of 4.39% a year. The EC was 1.46 during these 8 years, which is bigger than the rational increase level. From 1985 to 1994, the urban area increased at an average rate of 7.3% a year. The growth rate of non-agricultural population was 4.6%. Thus, the EC was 1.59. The coefficient of these 10 years is much bigger than that of the previous 8 years, which indicated that the expansion of urban land-use was too fast. The investigated result of the National Land Management Bureau using remote sensing technique also showed that this trend existed markedly in the 31 especially big cities and 24 big or medium cities. In 31 especially big cities, the RUL was 50.2% from 1986 to 1996, or 5.0% a year on average, and in the same period, the RUP was 21.9%, thus EC of city land utilization was 2.29 (Li, 1997) (Table 2), which was 2.05 times as large as the rational coefficient (1.12).

In 24 big or medium cities, the net increase of urban area was 1166.6 km$^2$ from 1950 to 1986, at an average rate of 3.4% a year. The net increase of urban population was 18322 thousand, at an average rate of 2.6% a year. Compared with that of 1986, in 1996, the urban area increased by 1668.8 km$^2$, at an average rate of 4.5% a year. The urban population increased by 2.3% a year, thus expansive coefficient of urban land utilization was 1.96, which was 1.75 times as large as the rational coefficient (1.12).

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that the utilization ratio of urban land decreased. As shown in Table 3, the land per resident of 24 big or medium cities was 42.7 m² in 1950, 53.9 m² in 1980, and in 1995 it reached 72.9 m². Among these cities, Guangzhou stood at 29.4 m² in 1950, and 59.4 m² in 1980, increasing 102% during 30 years. It is established at 124.3 m² in 2010; that is to say, it will increase another 100% in thirty years.

Urbanization will result in a population transfer from countryside to city on one hand, and on the other hand, it will gradually cause the conversion of farmlands by urban land-use. To keep a rational ratio between the increase of urban population and the expansion of urban land is important not only for the reasonable utilization of land but also for the protection of limited farmlands.

According to the previous urbanization process in our country, urbanization reflected to some extent not only the economic development trend but also urbanization policies. This is an inevitable result of the slow increase of urban population due to the strict control of the census register.

But it cannot be denied that the cities expanded so fast, especially in the developing district, as to cause waste of land resources. In order to protect the land resources particularly of the fertile farmland around the cities, a reasonable speed of increase in urbanization should be maintained.

IV. Regional Difference of Urban Land Utilization

The urbanization level is a major index that mirrors regional economic development. In general, when a region changes with rapid economic growth, the process of its urbanization is also fast. During the 9 years from 1985 to 1994, the urban area throughout the country increased 1.88 times. It increased 2.22 times in East region, 1.79 times for Middle region and 1.62 times for West region. The increase of urban area of Middle and West region was obviously lower than the average level of the whole country (Lu, 1997), while the expansion coefficient of urban land utilization of East region greatly surpassed that of Middle and West region (Table 4).

The reason is that East region is lined in the forward position of China’s Reform and Opening
Policy, and that the economic development level and speed are higher than that of Middle and West region. It reflects not only the expansion scale of big or medium cities but also the rapid formation and growth of small cities. Compared with Middle and West regions, the development of urbanization in East region has some special characteristics, such as plurality and multi-administrative levels. For example, particular cities, the coastal developing cities, and the opening port cities have been developed rapidly because of their location, economic foundation, and the favorable terms given by the government. Meanwhile they have also promoted the development of medium and small cities around them. In addition, the industrial growth of small towns in East region occupies the first place in the country, which was a major driving force for the development of small cities and towns in East region.

A lot of land will be occupied no matter by the expansion of urban scale or by the formation of a new city. Because the process of urbanization in East region was faster than that of West and Middle regions, the occupation of land and cultivated land in East region was also greater than that of West and Middle regions. In 1993, the increased area for urban land utilization in East region was 3.6 times and 5.7 times larger than that of Middle and West regions respectively. The occupation of cultivated land was 3.8 times and 5.9 times respectively. From the absolute number of increased areas and occupied cultivated land areas, East region was judged more advanced than West and Middle regions. However the percentage of occupied cultivated area was more than 50% all over the country regardless of region (Figure 2). Therefore, from this point it is possible to catch sight of the negative effect of urbanization in China; that is to say, the problem of the sharp decrease of cultivated land. Urbanization is an inexorable trend of economic development (Liu, 1994). The city is the focal space for the economic development. So it is impossible to restrain urbanization growth to save cultivated lands. For the sake of high-speed sustainable development of the economy, the government should handle the conflict of land utilization between urban construction and agricultural production correctly. Meanwhile, the government should pay more attention to formulate policies for urban growth and land-use of different regions.

To sum up, the followings are characteristics of urban land utilization in China. (1) The urbanization process is fast in the developed region, where the absolute quantity of occupied land and occupied cultivated land is great and the speed of development is also fast. (2) Not only in the developed region but also in the underdeveloped region, the percentage of occupied cultivated ar-

Table 4. The urban expansion in three regions

<table>
<thead>
<tr>
<th>Regions</th>
<th>Urban area (km²)</th>
<th>Average rate of a year</th>
<th>Urban population</th>
<th>Average rate of a year</th>
<th>Expansion coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nation</td>
<td>9522.4</td>
<td>17939.5</td>
<td>7.3%</td>
<td>11755.8</td>
<td>17665.5</td>
</tr>
<tr>
<td>East</td>
<td>3757.6</td>
<td>8360.1</td>
<td>9.3%</td>
<td>5819.1</td>
<td>8761.2</td>
</tr>
<tr>
<td>Middle</td>
<td>3659.2</td>
<td>6540.9</td>
<td>6.7%</td>
<td>3961.4</td>
<td>6167.5</td>
</tr>
<tr>
<td>West</td>
<td>1625.4</td>
<td>2638.5</td>
<td>5.5%</td>
<td>1975.3</td>
<td>2736.8</td>
</tr>
</tbody>
</table>

Source: Arranged from the urban building statistical yearbooks, 1996.
V. Structure of Urban Land-use

Land is not only an important resource but also a kind of goods. Under the condition of market economy, the regional differentiation of various economic and social activities within a city depends on their ability to pay rent. As regards the dwelling, land rent comes from a part of the income of the residents. With regard to industrial activities, the extra value, which comes from economic activities, is the source of the rent. The type of economic activity decides the extra value per unit area. Even for the same economic activities, there are some differences in abilities due to the differences of location. For this reason, competition exists among various economic activities. Those who can afford higher rent will occupy more favorable space. Usually, commercial and financial sectors are concentrated in the center of a city, where the location is best and the rent is highest. And the urban edge is often utilized for the industrial region where the rent is lower.

At present, because the spatial structure of urban land utilization is closely connected to the long-term plan and administrative regulation, the real value of land cannot be reflected. The land for industry in the big city is 26% of the total built-up area, and this rate is 10% higher than that of the developed country. Quite many industrial enterprises that are less efficient, more energy wasting, and seriously polluting, occupied the center of the city. For example, in the center of Shanghai, the rate of industrial land is more than 20%, and residential land is 28.8%, while the land for business and service trade is only 2.84%, with 13.5% for traffic. It is inconceivable that the percentage of industrial land in headquarters' district, or a golden section for trade is as high as 9%. In the developed countries, industrial land is no more than 5% and commercial land is 5–15% in the center of the city. The situation is the same in Beijing. According to the investigation, there are more than 90 factories, which occupied 190 hectares located in old Beijing proper. Most of those lands would have higher value but are being used inefficiently. The land for industry within the third circle road also commands more than 20%. Although the government began to regulate land utilization by changing the rent, the control of space structure of economic activities in a city follows after or lags behind the development of the economic structure. At the same time, in the urban industrial structure, the proportion of secondary industry is quite high, while tertiary industry develops at a high speed with commercial business, especially some retail stores and catering trade, as its main body. Tertiary industry activities that can afford higher rent, are still in the process of formation. Therefore, the irrational urban land-use structure will remain for a period. In order to achieve the optimum use of land resource and to obtain sustainable development, the government should regulate the land-use structure by means of land rent as well as formulate various policies by law to limit urban industrial distribution. In addition, it may be necessary to order the industries located in the center of a city to move within a specific time. In view of the situation that excessive installations were already constructed, the center of development in tertiary industry should be transferred to finance, insurance, information, press, printing and so on. Finally, with the effect of economic rent, laws, and administration, the land should be used economically, intensively, and efficiently.

VI. Urban Scale and Reasonable Use of Land Resource

As shown in Table 5, the urban per capita land is inversely proportional to the urban scale. That is to say, the bigger the urban scale, the smaller the per capita land (Table 5). In the super-sized city, the per capita land is 2.4 times more intensive than that of the small city. The intensity is nearly 2 times higher when comparing the big city with small ones. Thus it can be seen that the land was extensively used in the small city and the efficiency of scale economy cannot function. It is imperative to control this situation. In many small cities, the leaders pursue the city scale eagerly during the process of urbanization. During our investigation in Shandong Province, we found that a square before a municipal government house is larger than Tian'anmen Square. Such phenomenon of misuse of land is very obvi-
ous in some medium and small cities.

In addition, the situation is much worse in organic towns. According to the China census register, from 1983 to 1995, the number of organic towns increased from 2786 to 16702. During 12 years it increased 6 times. The reasons for the rapid increase of urban land-use in organic towns are as follows: (1) Because the enterprises of villages and towns are not separated from the government, the land used by these enterprises is almost free. For this kind of free resource, the “requirement mulct”, or unsustainable exploitation, would be limitless and the land cannot be used effectively. (2) The distribution of small town enterprises was scattered, and the efficiency of collection was poor. The public utilities were constructed separately. (3) The private dwellings occupied a lot of farmlands, most of which were fertile.

In conclusion, in China, for the overall urban plan of the new period, in order to save land resource and improve the efficiency of land-use, the government should control such irrational phenomena as the small city occupying excessive land, and should encourage them to develop in a proper way. The government should regard the organic town plan as an important point to control the expanding waste of cultivated land by economic and legislative means.

VII. The Internal Reasons and the Countermeasures

The reasons for the immoderate expansion of built-up area and the rapid reduction of cultivated land accompanying urbanization are expressed in the following respects.

(1) The drive of economic benefit: The rural government adjacent to the city sells its land immoderately for the money. They obtain wealth from the land. Large areas of the cultivated land have been sold at a low price.

(2) The land managing system is not suited to the needs of the development of market economy, which affect the sound development of the land market. The local governments are both the possessor and user of the land. They are also the managers. The real value of land cannot be reflected under this system.

(3) The main reason for the excessive expansion of the urban land-use is the demand for perfect urban character and function, and the pursuit of big scale.

(4) The overall plan for land-use does not harmonize with the urban plan; they are independent of each other. At present, China’s urbanization level is lower than that of the developed countries or some developing countries. The level is only 29%. Therefore, its urbanization will maintain a high speed of development in this century. It is bound to aggravate the shortage of land resources further. It will also intensify the contradiction between urban construction and agricultural production. At the same time, the underdevelopment of the urban infrastructure and high-speed urbanization will worsen such problems as environmental degradation and water shortage. Moreover, the profit-maximizing location selection by enterprises and individuals will also result in such problems as soaring of land rent or deterioration of traffic condition and pollution. If the government does not control these problems from macro viewpoints, the whole economic and ecological benefit in a region or a city would decrease finally, and the capacity of sustainable development would also be lost. According to these characteristics, reasons and changing tendency of resources and environment, which are affected by the development of urbanization, the government should adopt the following countermeasures.

(1) To establish and amplify a land management system which is required for the market economy. To clarify and define the relationship among the land property rights. To change the
current situation that the government is the possessor, user, and manager of the land. The real value of land should be embodied through the land market so as to adjust the land-use orientation.

(2) While protecting the existing cultivated land, the government should also bring reserved resources under cultivation energetically. Especially under the prerequisite not to destroy the ecological environment, to use and transform the land resources in a planned way in the Middle and West regions of China. To raise the comprehensive utilization ratio and the per unit land productivity.

(3) The government should adopt a growth model of urban land utilization that combines both the extensional and intentional model. For the city that has large per capita area, the government should take an intentional model to raise per unit land efficiency. For the city with small per capita area, the government should select a combination of both intentional and extensional model. While speeding up the construction of new districts, the government must encourage the reforming of old districts. At the same time, the government should also set up and perfect the land market mechanisms to change irrational phenomena and reduce the waste in urban land-use through the function of economic rent.

(4) The government should clarify and define the relationship between the land-use overall plan and the city overall plan. In the meantime, to handle the contradiction between city and village in strict accordance with the law, the government should set up different cultivated land use taxes in line with the regional differentiation of land resources.

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References