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Original Research

China's Dilemma on Controlling Urban Sprawl: Planning Regulations, Evaluation, and Prospects for Revision

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Abstract

This paper outlines a brief history of Chinese urban policies during the last half century, in particular describing the 'State Planning Regulations' that aim to control urban expansion. But evidence from data analysis on land occupation rates suggests the regulations did not achieve their expected outcomes. In order to reveal the problems, discussions not only about the regulations themselves but also of the contradiction between central and local authorities are interpreted. The core issue is that local authorities need to purchase more land to accommodate rapid urbanization and benefit from land releasing, while the central government is more concerned with sustainability.

Keywords: china, policies, urban sprawl, planning regulations

Introduction

During the last two decades, China has experienced an epoch of rapid urbanization due to the benefits of economic development and increasing prosperity. According to a circular by the Ministry of Housing and Urban-Rural Development of China (2008), by the end of 2007 there were 655 cities with a total population of 340 million and an urban built-up area of 35,000 km^2. Based on the current projections from circulars in urbanization, by 2050 another 450 million people will have moved into cities, with the prospect of over 100,000 km^2 of built-up urban area. It is likely that China could achieve this projected level of growth based on recent trends.

However, could China achieve such rapid growth while aiming to meet the objectives of its sustainable development strategy in the coming years? The benefits of prosperity coexist with the potential threat of urban sprawl.

For planning academics, the core issue of urbanization is not a matter of what the rate should be, but the quality of development [1]. Until now, most of the literature and debates on urban sprawl have been based on the experience of western countries. Urban sprawl is defined as 'a pattern of land use in an urbanized area that exhibits low levels of some combination of eight distinct dimensions: density, continuity, concentration, clustering, centrality, mixed uses, and proximity' [2, 3]. Or, as Peiser suggests, the term sprawl 'is used variously to mean the gluttonous use of land, leapfrog discontinuous development, and inefficient use of land' [4]. However, sprawl is not an exclusively North American phenomenon. As Richardson and Bae suggest, many of the trends observed in the USA, such as the growth of suburban lifestyles, have also been experienced in Europe [5]. Studies concerned with this uncontrolled expansion of urban land use mention innumerable social, economic, and environmental impacts. Especially in the environmental aspect, losing green space, farmland, and important ecosystems, are all at the hand of urban sprawl. As urban areas grow, the environmental problems grow exponentially, as the decrease in water quality, decrease in air quality, less groundwater, loss of farmland, loss of wetlands, loss of green space, light pollution, loss of wildlife, etc.

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In this sense, how to control urban sprawl will cause much effect in environmental issues.

Although the exact meaning of 'urban sprawl' in a Chinese context remains different to the western world, the term 'sprawl' has already been invoked to describe urban expansion in China [6]. As is frequently discussed in Chinese literature, the general definition of Chinese 'urban sprawl' should contain the following features: It has to be an inefficient or excessive urban expansion, which certainly involves some benchmark of "normal" urban structure; If determined to be inefficient or excessive, the spatial pattern may be in leapfrog development, of low density, or some other form [7-9]. But in this paper, the definition of 'urban sprawl' might be used to describe the inefficient patterns of urban construction in China, in this instance more closely related to 'urban expansion.' According to the state's regulation and in order to indicate the tendency of urban sprawl, the term of 'land capacity per person' (m^2/p) is introduced. This unit reflects the density of urban land usage and partially relates to the compaction of land use [10].

Concerning the high speed of urbanization in recent decades, not only the central government but also the local authorities have begun to feel the pressure of demands on land resources and the negative environmental effects of overdevelopment.

In order to save enough land for future development, the central government has devised a series of policies to control sprawl. In turn, a set of polices aimed at maintaining the land resource was published since 1990. In response to the requirements of central government, the local authorities had to review their potential development plans and moderate their ambitious land acquisition schemes [11].

'The State Planning Regulation of Urban Land Classification and Land Allocated to Development (GBJ137-90),' which was promulgated in 1990, is one of the policies aimed at restricting local authorities' planning actions. According to the description, it is a state regulation of urban land dimensions and urban spatial structure, and in particular should be referred to in the local plan-making process. During the past two decades, this regulation has played a key role in the Chinese planning system, providing the basic technical criteria for superior administrations to approve the plans made by subordinate authorities. As the target of the regulation is to constrain local actions, this article tries to answer the following questions: First, how does the regulation influence the local plan-making process and urban development? Secondly, as the regulation has remained unchanged since its publication in 1990, is it still suitable for cities today [12, 13]?

Chinese Planning Trends in Urban Land Management

Main Urban Development Policies in the Last Half Century

Since 1949, China has experienced a long period of urban reconstruction and development with many varying policies and adjustments to urban planning. Table 1 gives the annual growth of urbanization rate in the last half century which reflects changing opinions in the field of urban development.

Table 1. Comparison of Chinese urbanization rate in different periods.

Period	1949-57	1958-78	1979-2006
Annual growth of urbanization rate (%)	0.60	0.12	0.93

Edited by author, with statistical data from the National Bureau of Statistics of China.
Available online: http://www.stats.gov.cn.

As the stages in China's economic development contain very different features, Duan, Li, and Dong suggest that the research against the half century after 1949 can be divided into several certain periods [14, 15]:

The first period is from 1949 to 1957. Since it was a time of confidence following the independence of the nation, policies focused on reconstruction, especially reconstructing the public infrastructure which was damaged during World War II. Most development was concentrated within the territory of existing cities. The state's slogan for this period was depicted as 'Changing the consumption cities into production ones'[15]. However, after 1953 the central government instituted a strategy of industrialization and set up hundreds of large-scale projects across China. A large number of new industrial cities were built, and alongside this was a mass population movement toward western China [14]. Post-1953, the nation focused its efforts on the renovation and expansion of existing cities while setting up hundreds of new cities for the purpose of industrial growth.

The second period ran from 1958 to 1978, and can be considered to be an era of uncertainty before the economic reform of contemporary China [15]. From 1958 to 1960, influenced by unrestrained industrialization strategies and urban expansion, the state enclosed massive tracts of suburban land for new construction. However, the massive construction effort exhausted the frail economic system and, consequently, some districts were left with large quantities of vacant land. From 1960 to 1978 the central government shifted the focus of economic policy from urban to rural areas. Agriculture was once more proclaimed to be a pillar of the economic system. Large parcels of vacant urban land were returned to farm use, and a more restrictive policy on urban land acquisition also was adopted. The policy required the local authorities to reclaim every possible inch of space in the city. Under this policy the original open spaces of downtown areas were engaged, the streets were occupied by temporary buildings, and innumerable historic buildings and heritage sites were purchased as factories and residential uses.

The third period was depicted as the 'Transition Epoch' of China, which lasted from 1979 to 1990. The Eleventh Central Committee of the CPC in 1978 formulated an 'Open Up' policy for the economy, which meant that local authorities could attract foreign investment to help

implement their development plans. In response to this policy, many cities announced proposed mega projects, both in inner city and fringe areas. However, both potential foreign investors and local governors were concerned by the fluctuating political trends of central government. Only a small part of the proposed development had been completed by 1989. But in 1989 the first 'Urban Planning Act' was formulated by the National People's Congress and was then implemented the following year, which means urban planning became the core element in local development.

The fourth period began in 1991 and continues to the present day. It has been described as the 'Boom Time' of China, both in terms of economic growth and urban development.

After his 'Southern Tour' in spring 1992, the ex-prime minister Deng Xiaoping declared China's determination to pursue an "Open Up" policy, after which China became more fully emerged in the free-market system. On the market, urban land turned out to be a precious resource, especially city center areas. Some mega cities such as Shanghai, Beijing, and Guangzhou discovered that downtown areas could become the 'Golden District,' which absorbed a variety of developers and investors. Local authorities received more funds than they expected through the land market, and so could afford the expenditure on other public facilities. Attracted by the financial benefits, many local authorities neglected the rational density and spatial structure within the city. As a result, large tower blocks in the city center and new development areas in the urban fringe caused problems such as over-used facilities, congestion, and a lack of open spaces. Furthermore, many local authorities also enclosed large amounts of land in the suburbs to set up 'Development Zones' to attract industrial investment, this action caused a movement of land acquisition even on the highly productive agriculture land. This trend thus caused the concern of the central government. In 1993 the central government decided to implement a set of constricting policies in order to readjust local development movements. It was envisaged in these policies that numerous proposals for mega-projects within the urban territory would be abolished alongside a sharp reduction of new land acquisition. The annual growth of urbanization from 1993-96 is only 0.37%, which is nearly 1/3 of the average rate from 1990 to 2007. The No. 11 and No. 18 State Circulars of 1996 emphasized the need to control rapid urbanization and maintain enough agricultural land for food safety [16].

Nevertheless, accompanying the renaissance of the housing market and domestic investment, the driving forces of urbanization also revived in 2000. The upward trend continued in the following years, in which the period proved to be a boom time of mega-construction in contemporary China. More and more local authorities realized that they could one hand make massive profits through land release, on the other hand would probably receive promotion due to the rapid growth of local GDP. This stimulated the local willingness for land acquisition and releasing through the market. The annual growth of urbanization from 2000-03 increased to 1.45%, a rate nearly four times that of the period from 1993 to 1996 [17, 18].

With the sudden urban expansion after 2000, again the central authorities had to adopt readjustment and control mechanisms. During 2003-06 more than 10 individual policies on land management were released by central government. In light of these policies, the local governments declared that they would abolish up to 2,046 proposals for 'Development Zones' during 2003-04. In 2004, the State Council announced the cessation of land acquisition by transferring farmland into urban land. In December 2006 the Ministry of Urban and Rural Development also released two notices: 'the Constrained Usage Land List' and 'the Forbidden Usage Land List.' In accordance with these two lists, any constructions of 'villa districts,' 'golf courses,' and 'equestrian parks' were clearly prohibited in the future, while 'motor racing circuits,' 'movie production towns,' and 'large-scale cemeteries' were restricted [19, 20].

Urban Land Management Policy – the State Planning Regulations (GBJ137-90)

Among the policies of urban land management, the State Planning Regulation that was implemented in 1990 plays a key role, as it provides basic technical criteria for governmental administrations to approve the plans made by local authorities.

As the first state criteria concerning urban land use and land occupation standards in contemporary China, the regulation was designed as a guide for urban land scale, classification, and the ratios of certain kinds of land within the city extension [10, 13].

According to its main purpose, the regulation contains two separate sections: 'Urban Land Classification' and 'land structure criteria.' The former gives guidance on how to classify urban land use during the plan-making process. Urban land uses were divided into different classes: 10 main classes, 46 mediums classes, and 73 detail classes. Each category refers to a certain land use. The later section lists criteria for urban land capacity and structure, which is the main topic of this paper. Urban land occupation rate is given by the term of how many land capita per citizen, represented by the unit of m^2/p. Referring to different types of cities, the regulation provides four levels of planning criteria. Level one prescribes 60-75 m^2 land capita per person, level two 75-90 m^2, level three 90-105 m^2, and level four 105-120 m^2. When local authorities make a plan, the planning land scale should be estimated based on the expected population by the end of the planning term. All kinds of cities should rely on the criterion for land acquisition and not exceed their prescribed planning standard. But a significant point is that whatever the type of city, land occupation for an individual person should not exceed 120 m^2/p. Using120 m^2/p as the upper limit is aimed at restraining unlimited urban expansion, and the central government has calculated that 120 m^2/p is sufficient for typical urban development [18].

Evidence to Review the Options of Using State Regulation

Analysis of Statistics

The statistical evidence discussed in this section will reflect the upward trend of expanding urban land use. Comparison of data over several time periods allows distinct features to be drawn that help to explain this tendency.

According to the study of the Chinese Academy of Urban Planning and Design [18], the average level of urban built-up land from 1987 to 1995 could be separated into two parts. During the period from 1987 to 1990, four years before the regulation was implemented, the rate of land capacity per person rose from 83.89 m^2/p to 87.14 m^2/p, with average annual growth of 1.08 m^2/p. But in the five years after 1990 the rate increased to 104.18 m^2/p with an annual growth of 2.57 m^2/p. This implied increasing urban expansion after 1990, but still does not explain whether the regulation had affected land control.

Between 1996 and 2007 the annual growth rate reached 3.58 m^2/p, which exceeds the rate between 1991 to1995, and was even triple the rate seen prior to 1990. Thus the growth rate accelerated after 1990 and increased even more rapidly in later years. As the regulations could not prevent the upward trend of urban expansion, this partially reveals the inefficiency of the regulation. Another notable feature of the data is the average rate exceeded 120 m^2/p after 2003, going beyond the permitted upper limit according to the regulation. This indicates a more acute problem in the period post-2003.

Distributional Observations from Database Maps

Given the changes of land occupation rates observed above, how is this change distributed among Chinese cities? With regards to the question, statistical data on urban land use from all Chinese prefecture-level cities from 1990 to 2005 was collected. As counted in the Chinese Cities Statistic Annuals, there are 379 prefecture-level cities in China. Based on this data, a GIS map of Chinese urban territory was formed. The colour relating to each boundary represents a different land occupation situation. The majority of the data for Tibet and Qing Hai, and some cities at Yun Nan, Gui Zhou, Nei Menggu, and Hei Longjiang is unavailable at present, but almost all the cities of eastern and middle China are included.

Considering that the upper limit of the land occupation criteria is 120 m^2/p, cities were simply separated into

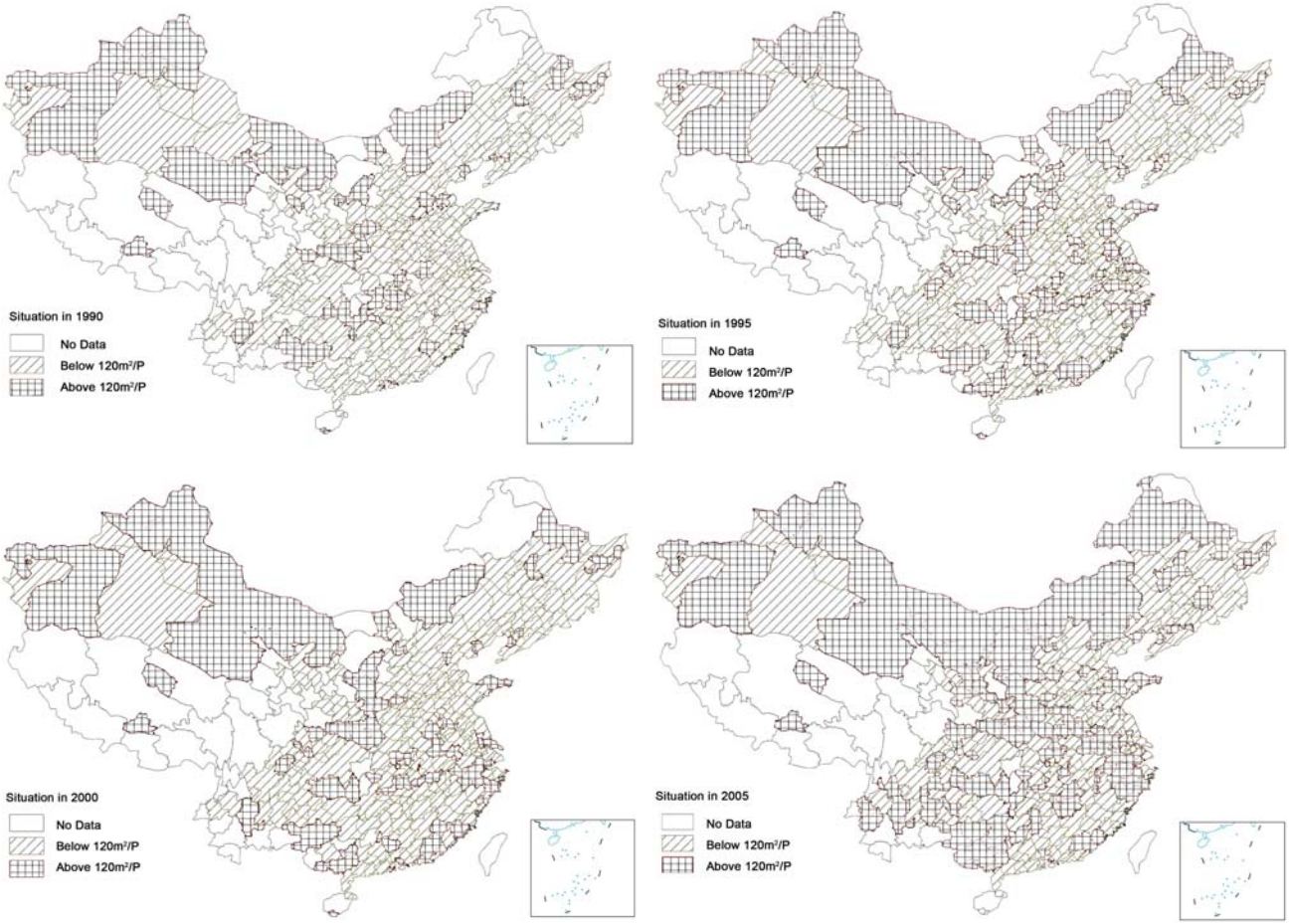

Fig. 1. Changes in land occupation of cities across the state territory. (Every 5 years from 1990-2005).
The figures are portrayed by the author on the basis of GIS.
Sources: Chinese Cities Statistic Annuals (1990-2005).

'Below 120 m²/p' and 'above 120 m²/p'. In order to observe the changes in different periods, the maps show changes in the land occupation rate at five-year intervals from1990 to draw out the distribution features of urban expansion of China.

The analysis index is defined as:

$$D_i = L_i/P_i - 120$$

...where:

D_i – expansion rate in year i

L_i – area of urban developed land in year i

P_i – population in year i

...if:

$D_i > 0$ the city exceeds the regulation, indicating expansion

$D_i < 0$ the city fits the regulation, indicating compaction

The maps use different colours to indicate the change of D_i.

Fig. 1 gives four snapshots from 1990 to 2005. In 1990 the majority of cities in middle China and nearly all cities in eastern China were below 120 m²/p. 61 cases out of all 287 valid samples (21%) exceeded 120 m²/p, most of which are located in the northern and western districts. Over time, acceleration in increasing density is shown. In the image of 1995, it can be clearly seen that many more cities than in 1990 exceed 120 m²/p. In 1995 there are 100 cities from 298 valid samples (34%), exceeding 120 m²/p, and most of the new cases cluster in Middle and eastern China. This period corresponds with the beginning of the so-called 'Boom Time' of Chinese urban development, which has been explained in the previous section of the paper. During the 'Boom Time', the local authorities of developed districts such as Zhe Jiang and Jiang Su provinces in the east and Hu Nan and Sichuan provinces in the middle took advantage of existing conditions, sparing no effort to attract both domestic and foreign investment [21, 22]. As a result of these actions, the urbanized area of those districts began to expand. But after this period, a 'macroscopic readjustment and control' policy was put forward in 1996 [23]. This readjustment policy helps to explain why the situation did not deteriorate further between 1995 and 2000. So only 73 cities out of 259 (28%) exceeded 120 m²/p in 2000, even fewer than in 1995.

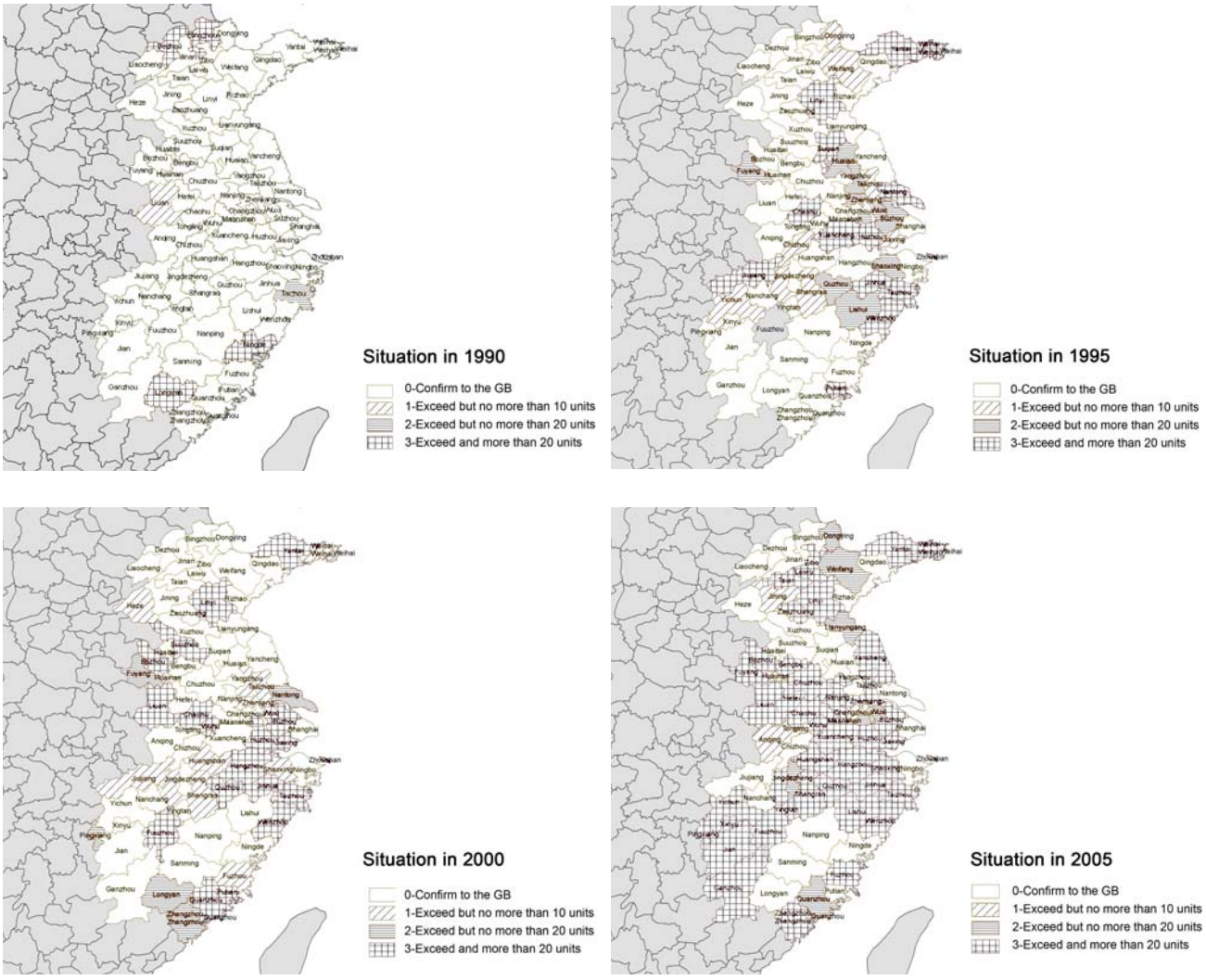

Fig. 2. Changes of land capacity in cities of eastern China. (Every five years from 1990).
The GIS maps are drawn by the author, relying on statistical data.
Sources: Chinese Cities Statistic Annuals (1990-2005).

It seems that the year 2000 marked a watershed in the urban development of China. Post-2000, the revival of the housing market and domestic enterprise was sufficient to negate the impacts of readjustment actions. In this sense, the picture in 2005 demonstrates this situation: there are 138 cases out of 282 valid samples exceeding the limit, reaching an incredible proportion of 49%. Cities all over China seem to be expanding, regardless of location. In addition, nearly every city in provinces such as Zhe Jiang, Jiang Su, An Hui, Hu Nan, Hei Nan, and Guang Xi exceeded the limit.

Moreover, a detailed observation was carried out on the cities of eastern China, the most developed region of China containing the highest population density. As a general consideration, the higher population density means the land resource is much more precious. But observations show that urban expansion can still be seen even in such a densely populated region.

Fig. 2 is the simulated result of implementing the State Planning Regulation in individual cities every five years from 1990 to 2005. The shading of each boundary indicates the urban land occupation rate. There are four implementation scenarios.

The implementation index is defined as:

$$D_i = L_i/P_i - 120$$

...where

D_i – expansion rate in year i

L_i – area of urban developed land in year i

P_i – population in year i

...if:

$D_i<0$ indicating the regulation has had overall constraint on local expansion, legend marks 0

$0<D_i<10$ indicating the regulation has had some impact on local expansion, legend marks 1

$10<D_i<20$ indicating the regulation has had little impact on local expansion, legend marks 2

$D_i>20$ indicating the regulation has had no impact on local expansion, legend marks 3

The deeper the color, the greater extent to which the cities have violated the regulation (Fig. 2).

Beginning in 1990, only 6 cities out of all 69 were noticed not to conform to the regulations. But after the first rapid development period from 1991 to 1995, it appears that 8 cities exceeded the regulation but by less than 10 m^2/p (refer to legend marks 1), and another 8 cities exceeded but by less than 20 m^2/p (refer to legend marks 2). But 14 cities had exceeded the criteria by more than 20 m^2/p (legend marks 3) in 1995. The image of 2000 remains similar to 1995. But the result of 2005 is remarkable, in which only 23 cities conformed to the criteria, with 10 cities exceeding the regulation but by less than 10 m^2/p, and another 10 exceeded but less than 20 m^2/p. On the contrary, the cities exceeded the criteria by more than 20 m^2/p and increased in 34 cities. The outputs of 2005 revealed the weakening effects of the State Planning Regulation. Again, the upward trend occurring in recent decades reveals that urban expansion in China occurs even in high population density areas, reflecting the ineffectiveness of the regulation.

The analysis of both national statistics and of cities in particular districts indicates that implementation of the State Planning Regulation has been unsuccessful, and urban expansion in many parts of China is now beyond the control of the Regulation.

Discussions of the Problems

Different Attitudes between Central Government and Local Authorities

The analysis of the previous sections has revealed some evidence to demonstrate the ineffectiveness of the state planning regulation in providing a long-term solution to control expansion. As a matter of fact, the problem of urban land reflects the main conflict between central and local governments [19], and the regulation sometimes turns out to be the game tool between them [20]. Therefore, on the political stage, the problems of implementing the regulation reveals the different attitudes toward land management issues between the central government and local authorities.

During the last two decades, the central government focussed its efforts on preventing severe urban expansion over the country, even setting rigid thresholds for local authorities to reserve equivalent agricultural land for food security (the State Council 2006). Nevertheless, considering the balance of economic development in different regions, the central government would also encourage land market transactions to fund local public services in some instances. However, it is difficult to predict how much land is sufficient for local development and under what circumstances the central government might cease further land acquisition. Whenever serious problems seemed to be occurring, a set of more restrictive policies would be implemented by the central government. As illustrated earlier in this paper, both the readjustment and constraint policies on 1994 and 2003 resulted in expected consequences. The local authorities announced the abandonment of over 1,200 'Development Zones' along with a proposed 1,300 km^2 of land acquisitions at the end of 1996 [24]. And the number of abolished 'Development Zones' had reached 4,813 in 2004, with an area of 24,900 km^2 returned to agricultural use [25]. This revealed the potential contravention between the central and local governments. Furthermore, the central government also attempted to manage local planning decisions utilizing the criteria of the State Planning Regulation, which means that any local master plans could be rejected if it failed to meet the criterion of the regulations [26].

At the local level, the actions of local authorities reveal a very different approach. According to the structure of the Chinese taxation system, all revenues from land-releasing through the market belong to local government (the Sate Council, 1994). These revenues constitute the main income source for local authority budgets [26]. There is no doubt that an increase in local revenue provides authorities with the ability to invest in other public facilities such as trans-

portation, parks and open spaces, and local commercial areas. The improvement of the urban environment should then attract more investors and business opportunities.

This produces a likely "win-win" situation whereby both the local authority and investors can benefit from the land market, and may be the reason why local authorities are increasingly in favour of land release. Chong Qin, the largest city in Western China, claimed income of 37 billion Yuan (5.4 billion US dollar) from land-releasing in 2007, 47% of the city's total revenue for that financial year [26]. As reported by the Department of Reform and Development of the State, the overall revenue from land-releasing in local cities reached 913 billion Yuan (134 billion US Dollar) in 2007, accounting for 17.7% of China's National Annual Financial Income of 5,132.18 billion Yuan (753 billion US Dollar) (Ministry of Land and Resource 2008). Calculating the effect on local government finances, the statistics imply that the land-releasing revenue accounted for nearly 60% of all local governments' income in 2008 (Reform and Development Institute of the State Council, 2008) [27]. Obtaining a bigger slice of the "cake," therefore, becomes a major attraction to local governors, who will seek to acquire even more land, including high-quality agricultural land.

Considering local authorities' aims of development and public investment, this behaviour seems sensible as land release could support many other public ventures. But besides selling land, some local authorities also find speculation on the land market to be a good business opportunity. As a common solution to the problem of raising revenues, lands on the urban fringe or in rural districts will be acquired at low price, having been earmarked for the proposed building of public facilities like roads, schools, hospitals, or any other non-profit usage. Following acquisition, the authorities will probably change their plan and instead allocate the land for proposed development into commercial or residential use. In this situation, the same parcel of land could increase in value dramatically in an instant. As a consequence, the authorities can improve their profit margins without any difficulty [28, 29].

A famous example is the case of 'Oriental University Town' in Shan Dong Province. The local authority of Wei Fang (a city of Shan Dong Province) acquired massive tracts of land from farmers at a cost of 30,000 to 50,000 Yuan (1 Yuan=0.15 US Dollar) per mu (1 mu= 0.06ha), proposing to build a new university town. However, even before the construction of the campus, a 108-hole golf complex was built, accompanied by several luxury hotels and restaurants around the site. Ironically, the golf course was then claimed to be a part of the campus of He Bei Physical Educational College when its development was criticized by local press. But in fact, the students could not afford the golf club membership of around 200,000 Yuan per year. With the development of the golf course, hotels, and restaurants the land price increased rapidly. The final audit of the scheme shows that the development company, which reports to local government, made a net profit of 1.28 billion Yuan after four years' land marketing (State Audit Bureau 2004).

This raises the question: since the State Planning Regulation sets tight limits for land occupation to manage local behaviour, how can local authorities bypass the criterion of regulations?

Under the Chinese planning system, land acquisitions can only be allowed within the framework of local master plans. In contrast with the British concept of master plans, the master plan in China attempts to predict population growth and the development of urban land. Maps in the master plan will clearly designate which areas are allocated for development within the urban territory. Of course the master plan should conform to the requirements of the State Planning Regulation, including the criteria on land occupation rate per capita and spatial structure for various land functions. If the local master plan fails to meet the regulation, superior departments such as the provincial or central administration could reject the planning proposal. This means the local authorities will have no statutory rights to purchase any additional land beyond the existing urban area.

In order to meet the strict criteria and gain permission for new land acquisition, local authorities need to produce plans according to a rational and scientific process. Nevertheless, there still remain some common methods to circumvent the regulations [30].

One common solution is to use different definitions of urban population as it is the basis for calculating the land occupation rate. In the Chinese system for monitoring population statistics, there remain several concepts of population: non-agricultural population, temporary residents, and permanent residents. Generally, the non-agricultural population is lower than permanent residents, but both of them are much larger than temporary residents. When local authorities are making a master plan, the permanent resident population is normally adopted to predict a lower land occupation rate that satisfies the criterion. The local authorities insist that the entire urban dwelling population will consume land resources, so the non-agricultural population figure is unable to account for this fact. But in calculating the public facilities they need to develop, local authorities will base this on the non-agricultural population will be used rather than the figure for permanent residents. This is because the smaller population means less public service provision, which could save the government a large amount of money [31].

Another way is to play with the land numbers. The local authorities sometimes will leave lands blank on the planning maps to reduce the total amount available. This also can help them to meet the criteria of the regulation. Taking NingBo (a city in Zhe Jiang province) as an example, this paper can reveal the usual technique of the game [32]. In 2002, the NingBo municipal authority agreed to a joint venture with a foreign Chemistry Group to establish a chemical industry park in the north district. The park was expected to cover nearly 20 km^2, equal to nearly 1/10 of NingBo's urban built-up area (224 km^2). In order to get the urban master plan approved by central government and obtain permission to purchase land, the local authority of NingBo left the map blank where the proposed chemical park would be.

Table 2. The Revised Edition of State Planning Regulation of Land Occupation (m^2/P).

Climate Zone	Current Situation	Planning Interval	Adjusting Range for Planning Standard		
			Planning Population ≤0.2 Million	Planning Population 0.2 ~ 0.5 Million	Planning Population >0.5 Million
I, II, VI, VII	≤65.0	65.0 ~ 85.0	>0.0	>0.0	>0.0
	65.1 ~ 75.0	65.0 ~ 95.0	+0.1 ~ +20.0	+0.1 ~ +20.0	+0.1 ~ +20.0
	75.1 ~ 85.0	75.0 ~ 105.0	+0.1 ~ +20.0	+0.1 ~ +20.0	+0.1 ~ +15.0
	85.1 ~ 95.0	80.0 ~ 110.0	+0.1 ~ +20.0	-5.0 ~ +20.0	-5.0 ~ +15.0
	95.1 ~ 105.0	90.0 ~ 110.0	-5.0 ~ +15.0	-10.0 ~ +15.0	-10.0 ~ +10.0
	105.1 ~ 115.0	95.0 ~ 115.0	-10.0 ~ -0.1	-15.0 ~ -0.1	-20.0 ~ -0.1
	>115.0	≤115.0	<0.0	<0.0	<0.0
III, IV, V	≤65.0	65.0 ~ 85.0	>0.0	>0.0	>0.0
	65.1 ~ 75.0	65.0 ~ 95.0	+0.1 ~ +20.0	+0.1 ~ 20.0	+0.1 ~ +20.0
	75.1 ~ 85.0	75.0 ~ 100.0	-5.0 ~ +20.0	-5.0 ~ +20.0	-5.0 ~ +15.0
	85.1 ~ 95.0	80.0 ~ 105.0	-10.0 ~ +15.0	-10.0 ~ +15.0	-10.0 ~ +10.0
	95.1 ~ 105.0	85.0 ~ 105.0	-15.0 ~ +10.0	-15.0 ~ +10.0	-15.0 ~ +5.0
	105.1 ~ 115.0	90.0 ~ 110.0	-20.0 ~ -0.1	-20.0 ~ -0.1	-25.0 ~ -5.0
	>115.0	≤110.0	<0.0	<0.0	<0.0

Source: the revision of 'the State Planning Regulation of Urban Land Classification and Land Allocated to Development (GB50137-2011)', available online: www.cin.gov.cn.

The blank area was designated as reserve land for future development in the master plan, but nevertheless it was already included in the schedule of the detailed plan. In the detailed plan, most of the area was designated for industrial use rather than kept as reserve land, as shown in the master plan. The master plan was approved by the central government in 2004, but ironically the detailed plan had already been approved by local government in 2003.

Actually, many local authorities would act as NingBo did, to make sure their master plan could be approved by the superior administration. Without a legal master plan, any mega developments would not be permitted, nor any extra land acquisition. But some developed cities such as NingBo, Shanghai, and Guangzhou are suffering a shortage of land to meet further development demands. If they completely conformed to the requirements of the state regulation, local authority funds for public service provision would be severely strained.

The Way forward for a New Management System

At the beginning of the Twenty-first Century, the Chinese central government announced that it would adopt a more systematic approach to achieve sustainable development, even making sustainable development a strategic policy (16th State Congress 2002). In the framework for sustainable development, making more efficient use of land resources as well as reducing the environmental impact of urban growth became an immediate problem. In accordance with this, the Ministry of Land Resource issued a research bulletin on sustainable land use management, setting several standards in order to meet the requirement of sustainability [22]. The state council also released a circular on 'Rigorous Enforcement of Intensive Land Resource Use' to call for a more compact development mode and cease urban expansion (the State Council 2008). In this document, again, all departments of local authorities are requested to comply with statutory planning and related regulations.

In responding to the requirements of the State Council and also concerned by the problems of current state planning regulations, the Ministry of Housing, Urban and Rural Development appointed a committee to revise the regulations. The committee consists of several universities and research institutes from different parts of China and was convened in 2007.

After collecting data from cities across the country and interviewing hundreds of planning-related personnel, a retrospective evaluation was completed in mid-2008.Within the evaluation report, the main defects of the present regulations were examined. The committee indicates that the first reason why the regulation lost its power is irrationality and the second reason is inertia. Considering the first reason, irrationality, it was found that the criteria for regulation lacks justification, such as the upper limit of urban land occupation rate being set at 120 m^2/p but without a firm basis. Inertia refers to the regulation not being updated in 20 years while remaining the main tool to manage numerous types of cities all over China.

Based on the retrospective evaluation and the requirement to develop China sustainably, the committee submitted an improvement scheme at the end of 2009. In this scheme, a more flexible planning regulation was proposed in order to accommodate the variations among cities all across the nation. In this modification scheme, a 'Multi-Criteria Control Mechanism' is presented, which could provide respective management solutions for different cities [33]. For instance, when planners calculate land requirements for future development, populations should no longer be the only consideration – planners also need to consider the other elements of a certain city.

In 2011 the Ministry of Housing, Urban, and Rural Development published out the Revised Edition of the State Planning Regulation. According to the revision, the standard of planning land occupation will refer to three elements: where the city locates (climate zone), the development style of the city (current situation), and how the population will be in the future (planning population). Then the planners could evaluate the exact land occupation standard of the city (Table 2).

These elements form the criteria used to control the land use of each kind of city. With the use of multiple criteria, the regulation is expected to be a more accurate management tool, even in the case of future uncertainty.

Conclusion
the Chinese Style to Control Urban Sprawl

However, the revision of the planning regulation is only the first stage to rectify the implementation problems. The even more crucial key is how to reconcile the conflicts on land issues between central and local governments. As explained earlier in the paper, local authorities won't forego the massive revenues that can be obtained through the land market because they can't afford public services without it. From this point of view, the local authorities are in a dilemma. On one hand they should conform to sustainable development policies to achieve a more compact form of urban development, while on the other hand they need to collect funds through the land market (Newspaper of China Construction 2008). Many debates also argue that the central authorities should modify the distributive taxation system and grant more revenue to local authorities [34, 35]. These debates put central government into a dilemma as well, as reform of the taxation system will cause other problems such as trying to maintain the balance between different types of cities and sustaining undeveloped areas.

Facing this problem, the central government decided to use a rigid solution to limit the local governments' action on land. From 2006, the central government announced reserving 1.2 million km^2 (1,800 million mu) cultivated land as the red line of the whole nation. And also allocates annual index of land resources for each province, then the province will allocate the index for certain cities. The index must be followed, otherwise the local governors would be punished by political process. Since the local governments couldn't do any land acquisition beyond the index, the annual growth of urban land in China remains at a more reasonable level. But the criticism still remains. The policy by allocation the index of land resource seems to be a typical plan-oriented way, considering no market issues, since some cities lack an index when others can't use it up at all. Nevertheless, after several years' operation, the policy is proving to be a useful solution to controlling urban sprawl in China.

During the last two decades, nearly all cities in China have experienced a remarkable growth in industrialization, urbanization and modernization. Among these processes, the problem of land turns out to be one of the most sensitive problems. The analysis of this paper demonstrates that both central and local governments were immersed in a dilemma situation brought about by urban sprawl. Fortunately, core departments of the Chinese government became aware of the issue and a new management solution is now being developed. The new solution can be useful in preventing further urban expansion, but it would first be desirable for central government and local authorities to reach a consensus on sustainable development.

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