Managing urban growth in a transforming China: Evidence from Beijing

Pengjun Zhao*

New Zealand Centre for Sustainable Cities, University of Otago, 23A Mein Street, 6242, New town, Wellington, New Zealand

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A B S T R A C T

Managing urban growth in the current rapid urbanization process has become a key issue for land use policy in transformation China. This paper maps and assesses the performance of urban containment strategies in China, looking at the case of Beijing over a 19-year period (1990–2009). The analysis shows that to a large extent containment strategies perform well in terms of concentrating urban growth in planned suburban areas and promoting compact development. However, the unexpected growth in the rural–urban fringe and the decreased compactness of the fringes of the mixed urban areas and planned peripheral constellations caused by dispersed and illegal development suggest that the municipal containment strategies are being challenged by local development activities. Most sprawling developments at the local level are favoured by the new trend towards local autonomy and fiscal responsibility in the current transformation process. The results reveal that municipal growth control might not be achieved by all local jurisdictions when local economic motivations are involved. Particularly, urban sprawl has been fuelled by the development of urban real estate which can create significant revenues for local government and private developers. In the interest of future policy development, the management capacity of current containment strategies should be enhanced to mitigate the negative effects of market-led development in the present transformation context.

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Introduction

After the 1960s, urban sprawl became a worldwide problem in relation to metropolitan growth, not only in North America (Squires, 2002), Western Europe (Couch et al., 2008) and Japan (Sorensen, 1999), but also in some large cities in developing countries (Keiner et al., 2005). Many studies have shown the negative effects of urban sprawl on sustainable development, among which loss of farmland, loss of environmentally fragile lands and reduced regional open space are frequently reported (Johnson, 2001). In addition, urban sprawl is one of the significant factors influencing food production and security in rapidly growing developing countries such as China (Zhang et al., 2007). A recent United Nations report stated that urban sprawl in China has turned some ‘mega-cities’ (a city with more than 10 million residents) into ‘mega-regions’ which may stretch hundreds of kilometres across the country and be home to more than 100 million people. This ‘endless’ sprawling development could cause more serious problems for the environment if it is not managed properly in the current rapid urbanization process (UN-HABITAT, 2008).

Recognition of the costs of urban sprawl has prompted policymakers worldwide to create urban containment policies that prevent the outward expansion of the urban field and force metropolitan areas to take a more compact form. National urban containment strategies have been in place for many decades in some countries, such as the United Kingdom (Hall et al., 1973), The Netherlands (Dieleman et al., 1999) and Korea (Kim and Choe, 1997). In other countries, such as the United States (Nelson and Moore, 1996), Japan (Nakai, 1988) and Canada (Stewart, 1996), local urban containment strategies have been created by individual municipalities. In some developing countries, containment strategies have also been applied to curb urban sprawl associated with the rapid urban growth process. For example, since the 1980s, China has maintained development containment strategies to preserve agricultural land and promote efficient land use. These policies mainly include limiting city size (both in terms of population and the built-up area), tightly restricting new development in agricultural areas, encouraging intensive land development, and greenbelt management in some large cities.

However, the performance of urban containment strategies is often criticized because their original objectives are frequently inconsistent with the facts of local development (Longley et al., 1992; Nelson, 1992; Pendall, 1999). Underlying the many reasons for this are the political and institutional contexts that influence policymaking and policy implementation. Particularly, the
acceptability of containment strategies to local jurisdictions should receive more attention with respect to the impact of political decentralization and piecemeal decision-making concerning the implementation of metropolitan containment policies (Carruthers, 2002). The degree to which local governments implement national or metropolitan containment policies is one of the significant factors determining the performance of such policies. As Perelman (1999) pointed out, the ability of growth management, including containment strategies, to limit urban sprawl depends on responsible regulations invoked by local jurisdictions within the metropolitan area. Some studies suggest there is a challenge confronting the implementation of containment policies: a particular policy might be good for one municipality but might not necessarily work in all local jurisdictions. Thus, in some ways local growth management may assist in achieving metropolitan and national environmental goals but in other ways may detract from this mission (Chinitz, 1990). In particular, when local economic benefits are the primary concern of local government, local decision-making on growth – strengthened by political decentralization – may challenge municipal containment strategies. Furthermore, some research has pointed out another challenge confronting the implementation of containment policies: macro-scale containment strategies have disadvantages with respect to controlling urban sprawl fuelled by market forces (Razin, 1998). There is empirical evidence to show that supply restrictions due to growth control could have significant effects, increasing housing prices or rental costs by reducing housing supply (Dawkins and Nelson, 2002). Hence, in an open market, housing development tends to enhance housing availability and meet market demand for cheaper housing outside the range of growth control. However, as a result, sprawling development can occur in suburban jurisdictions where growth control is relaxed or absent (Moore and Nelson, 1994).

These two challenges confronting the implementation of urban containment policies in developed countries could well occur in China. Since the 1978 reforms, China’s economy has been in the process of transforming from state socialism to market capitalism. The transformation involves the interaction of three processes: globalization, marketization and decentralization (Chow, 2007). In the transformation context, there was a clear tendency towards the decentralization of economic and fiscal administration and decision-making. Local governments have now been given much more autonomy in their pursuit of growth. Moreover, the decentralization process has not only involved changes in the relationship between national and municipal governments, but also changes at the municipal, district and sub-district levels of government within a municipality, with the local district and county governments becoming more powerful social and economic decision-makers. The role of municipal governments in relation to growth is changing from ‘command-control’ to ‘governance guidance’.

In the meantime, the relationship between local government and enterprises or private developers has entered a phase of ‘local state corporatism’, as described by Oi (1992). Since the 1978 reforms, economic development has become an important criterion in the performance review of local officials, which has significantly motivated the pursuit of economic growth at the local level. The relationship between local government and the enterprises within its administrative region is viewed as similar to that of a large multilevel corporation, with local officials holding key positions and sitting on boards of directors. In some extreme cases, local leaders ‘often wear two hats with two different titles at the same time: one official, such as mayor or Party chief; the other businessman, such as chairman of the board of a local company or business conglomerate’ (Ma, 2002, p. 1552).

Consequently, the challenges first faced by urban containment strategies in Western cities may now be confronting China. Many studies have already reported that to maximize revenue gains local governments have an urgent and large demand for local development within their own jurisdictions, which has led to serious urban sprawl, for example in Beijing (Deng and Huang, 2004; Wong and Tang, 2005) and Guangzhou (Wu and Yeh, 1999). Furthermore, in the transformation context of rapid urban development and a dramatic trend towards decentralization in China, these challenges to urban containment strategies could be even greater than those faced in Western countries, suggesting that the problems faced by China could be more serious than those experienced in developed countries. In particular, the rapid changes in the institutional context mean that urban master plans often lag behind reforms implemented at national and local levels (Wei, 2005).

The debates introduced above concerning the effectiveness of urban containment strategies reinforce the importance of empirical studies. As mentioned above, some researchers have examined the appearance of urban sprawl in China; however, little attention has been paid to the effects of urban containment strategies on urban sprawl. The research presented here is a first step in this direction. Taking Beijing as a case study, this paper examines the performance of urban containment strategies in China. In view of the ever-growing and significant role of China’s megacities in world urbanization, this empirical evaluation should be of theoretical, practical and political importance. Theoretically, many studies have already assessed urban containment strategies. However, the existing literature is dominated by case studies from Western countries, especially from the United States, while cases from developing and transitional countries are scarce. This study provides an opportunity to examine the challenges confronting containment strategies in a transformation context, with few countries having experienced such dramatic growth and transformation over such a short period as China. In practice, this study can provide actual case studies for policymakers working on urban growth management in fast-growing metropolitan areas. Politically, this study provides information for policymakers concerning the ways to curb urban sprawl through containment strategies in transitional and developing countries, especially in China.

Urban containment strategies in China

Since market reform started in 1978, China has experienced rapid urbanization and industrialization. During the period 1978–2009 China had an average urban growth ratio of 0.93 percent per annum and by the end of 2009 China’s overall urban population had reached 622 million, nearly one-fifth (19%) of the world’s total city population (CSB, various years). According to official forecasting, in 2020 there will be 850 million people living in China’s cities, making up 56 percent of the total population of China. As a result, there is a strong need to balance agricultural land protection and economic growth as China has a growing population to feed, requiring good-quality agricultural land.

Concomitant to the rapid urban expansion, urban containment strategies have been implemented since the 1980s. The key objective of containment strategies has been to preserve farmland in the rapid urbanization process and enhance the compactness of development. The containment strategies were implemented through a series of policies relating to the strict protection of farmland, intensive and high-density land use, the restriction of new development permission, control of the overall size of big cities and high-density community development. These policies were implemented at all administrative levels, from the macro-level (national, provincial and municipal) to the micro-level (county, town, village
and community). The regulations related to urban containment strategies were enacted in stages, beginning in 1986 and continuing at present.

The containment strategies place tough restrictions on new developments in the rural–urban fringe. The Land Management Act China (1986) prescribed the strict protection of farmland by the government. In the 1999 Amendment to the Land Management Act, even stricter farmland protection policies were enacted. The amendment states that the ‘efficient use and strict protection of farmland is a primary national strategy’ (CPGPRC, 1999). The amendment added four detailed policies for the protection of farmland: the ‘national management of land categories’, ‘the primary farmland protection system’, ‘limiting the total area of development’ and the ‘land development monitoring system’ which has led to the implementation of ‘land use change registration’ and the ‘land survey and statistics system’. In order to implement these policies, the amendment clearly stipulated the adoption of the land use planning system.

Various land use planning decisions were made at all administrative levels – national, provincial, county, city or town – as an important tool in implementing containment policies. The land use plans were authorized by higher jurisdictions and strictly enforced. In the land use planning system, containment strategies were implemented in two ways; firstly, by ‘controlling the total amount of land development’. For example, in 1997, the national land management bureau introduced the national land use plan (1997–2010), which stated that the area of new development on agricultural land was to be strictly limited to less than 2 million hectares until 2010 (CPGPRC, 1997). According to the national land use plan, local governments at different jurisdictional levels must develop a land use plan which is consistent with the national land use plan. The second implementation method involved ‘intensive and efficient urban land use’. For example, in Beijing, the total area of urban land was to be limited to 61,000 hectares up to 2010. New development land would be concentrated in the areas designated as key new towns and industrial zones, such as Tongzhou New Town, the CBD, Yizhuang Economic and Technology Development Zone and certain peripheral constellations (see Fig. 1). In the other areas, urban land development was severely limited. The residents of villages were encouraged to move to towns and factories concentrated in industrial zones. Furthermore, urban redevelopment and infilling development were encouraged in the existing built-up areas, especially in the city centre.

The containment strategies applied within the urban planning system in China include the strict control of the urban size (both in terms of population size and the built-up size) of big cities (having non-agricultural residential populations over 500,000 in the urban and nearby suburban areas), and a major effort to achieve intensive and high-density land use. The big cities have become the main places where urban sprawl has occurred, as these cities have undergone a dramatic urbanization process (Ma, 2004). The big cities accommodated 61 percent of the total number of new urban residents from 1990 to 2009 (CSB, various years). Hence, controlling urban size and urban expansion is one of the main policies of national containment strategies. For example, in the first City Planning Act (1989), the urban size of China’s big cities was strictly limited. Many policies have been implemented to limit the urban growth of the big cities. For example, new migrants moving from rural to urban areas are encouraged to live in small cities or towns outside the big cities. Additionally, the system of household res-
identical permits is also used to control this migration (Chan and Zhang, 1999). Restricting land development permission is another policy applied in big cities. As well as limiting the urban size of big cities, [i]ntensive and high-density land use' was promoted in these big cities through urban planning. In particular, density was controlled by the planning regulations. For instance, in 1990, the National Urban Land Use Classification and Planning Standard (GB 137-90) prescribed that the residential population density in big cities was to be no less than an average of 140 persons per hectare. In addition, the city's facilities (for example, schools, hospitals, shops) and utilities (for example, water, sewerage, electricity), and even some infrastructure (such as roads), were planned according to existing and future trends in residential population density.

In some big cities, a 'decentralized concentration' strategy was applied to shape compact urban form at the city level. For example, since 1983, Beijing has implemented a decentralized concentration strategy, which officially encourages compact development on the urban fringe (BIUPD, 1983, 1991, 2004). This decentralized concentration strategy was greatly enhanced in the latest two versions of the Beijing urban master plan (BIUPD, 1991, 2004). The aim of the decentralized concentration strategy is to encourage concentrated development in planned suburban areas, with the population in the city centre being dispersed into the suburbs. According to this strategy, the city is classified into three areas: the city centre, main urban area and suburban area. New towns are located in the suburban area. The main urban area is zoned into four parts: mixed urban areas, greenbelt, peripheral constellations, and the rural–urban fringe (Fig. 1). There are three main components of the decentralized concentration strategy: development of select new towns in the suburban area, development of peripheral constellations and greenbelt management. According to the strategy, further developments occurring in the suburbs would be concentrated in several planned new towns and ten planned peripheral constellations. The greenbelt was located between the mixed urban area and the peripheral industrial areas to act as a buffer, restricting further growth and development in the mixed urban areas and the city centre. The development in the rural–urban area is strictly limited by the municipal government.

Experience from Western countries shows that the objectives of urban containment strategies are not successfully achieved in most cases, as macro-growth management is often not well implemented by local jurisdictions (Longley et al., 1992; Nelson, 1992; Pendall, 1993). For example, Allerman (1997) conducted a cross-national comparison of institutional, national and contextual factors influencing the implementation of urban containment strategies. The author came to the conclusion that the effectiveness of urban containment strategies was moderate and that stringent legal controls, for example, planning laws, are not enough to control urban sprawl. The criticisms of the effectiveness of urban containment strategies reveal that alongside the strategies themselves, institutional factors have a significant influence on how the strategies are implemented and therefore their success. In particular, the relationship between state government, local government and private developers affects the degree to which the objectives of the strategies can be achieved by actual developments at the local level (Carruthers, 2002). In fact, objections to the implementation of urban containment strategies particularly arise in places where market forces operate freely with the support and assistance of the local government (Frenkel, 2004). International experience reveals that the effectiveness of urban containment strategies could be weak in China where political decentralization and marketization have greatly increased the power of local government and the market in local urban development. In fact, urban sprawl has occurred in big cities despite strict urban containment policies (Deng and Huang, 2004; Wong and Tang, 2005).

Urban transformation of China

Since the reforms of the 1980s, China has been undergoing an obvious transformation, which has at least two fundamental characteristics. The first is that it involves three contemporary and interrelated processes: decentralization, marketization and globalization (Chow, 2007; Wei, 2001). The second is that the transformation in China has been a gradual process in which the market system and the planning system coexist (Zhu, 2000). The transformation process has created new institutional and social contexts for urban development and land development management.

In the decentralization process, the hierarchical relationship between the state and the city has been complicated by the two issues of local autonomy and fiscal responsibility. Before 1978, the power of the administrative system in China was highly centralized and hierarchical, with the Party-state playing multiple roles in urban growth and management as an ultimate decision-maker, regulator and participant. After the early 1980s, there was a clear tendency towards decentralization in fiscal administration and decision-making. The retreat from an ideology of central planning, the decentralization of decision-making and the injection of foreign investment into local economies have contributed to a reorganization of the decision-making system, from a 'top-down' model in which the central Party-state determines the 'rules of the game', to a negotiation and interactive system in which local jurisdictions, firms and residents participate more in the decision-making process (Ma, 2002). The relationship between state, local jurisdictions and enterprises has been rescaled dramatically in the decentralization process (Shen, 2005). Local government has become increasingly important to the urban growth process since the introduction of decentralization and marketization. For example, since the 1980s, local governments have emerged as major agents of investment, while the central government now plays a less significant role in investment allocation (Wei, 2001). Municipal governments are changing their roles from 'government control' to 'governance guidance' in growth management. Local district and county governments are becoming more powerful and acquiring greater administrative control in the social and economic decision-making process through new regulatory, taxation and licensing powers (Wank, 1999, p. 250). The relationship between local government and enterprises or firms has developed into what Oi (1992, 1998, 1999) has called 'local state corporatism', in which the local government treats enterprises within its administrative jurisdiction as one constituent of the local corporate whole (Zhu, 2000). Furthermore, the state has also granted more decision-making rights to state-owned enterprises (SOEs). SOEs have thus become more autonomous and have been relieved of the burden of planning quotas to the extent that they can make decisions based on the market demand for production (Hay, 1994; Naughton, 1995; Zhu, 2000).

In the marketization process, market rules have become important in determining the 'rules of the game'. Marketization has opened much space for enterprises other than SOEs to become involved in urban development, such as private, joint-venture or foreign enterprises. A multi-stakeholder arrangement (MSA) for urban development has been introduced. In China's cities, among all the marketization reforms, housing and land market reform may be two of the most important. The housing and land market reforms have led to two changes in property right: marketization and privatization. In the planned system in the pre-reform era, housing and land were allocated through administrative orders that were determined according to the economic plan. Land was not considered a commodity and had no 'value' (or market price) (Ding, 2003). Housing was seen as a form of social welfare rather than a commodity and it was provided to all employees for free or at
low rent (Ma, 2004; Wang et al., 2005). Housing ownership was dominated by public ownership. Since the 1980s, when urban land reform and housing reform were implemented, market rules mediated by price mechanisms have emerged in allocating land use rights and housing ownership. In the urban land market reform process, land use right has been separated from state-owned land ownership. Land use rights can now be transferred according to a determined monetary value (Walker and Li, 1994). At the same time, non-government organizations have been given legal access to a land use right transfer system (Xie et al., 2002; Zhang, 2000).

In the housing reform process, housing was commoditized and as a result real estate markets have now emerged in China (Chen, 1998; Dowall, 1993). The housing reforms aimed to transform the socialist welfare-oriented housing system into a market-oriented system through the privatization of housing ownership (Huang, 2004; Huang and Clark, 2002; Wang and Murie, 1999).

In the privatization process, occupiers have been encouraged to take full ownership of their homes through a ‘purchasing’ process (Huang, 2005; Li, 2000; Li and Li, 2006). For example, in Beijing, the empirical findings show that workers who resided in public housing provided by danwei (a state or collectively owned work unit) have gradually moved from renting their work-unit housing to owner occupation over the period since the 1980s (Li and Yi, 2007). Housing reform broke the public sector-dominated housing system and diversified housing provision and investment (Wang and Murie, 1996). According to research by Li and his colleagues (Li, 2000; Li and Tang, 1998), four types of commodity housing sources can be identified: the open market, danwei (state-owned work unit), housing bureau and resettlement housing. Public housing within a danwei declined although it was the main source of commodity housing (housing sold on the open market) at the beginning of the housing market reform period. For example, in 2005, commodity housing (the housing sold on the open market) bought privately amounted to 89.3 percent of the total commodity housing in Beijing (Beijing Real Estate Association, various years).

The housing market has become one of the major factors stimulating suburban development in China’s cities. Transformation in China is an ‘experimental and gradual’ process in which the old planned system and new market system coexist. Compared with eastern European socialist countries, the transformation towards a market system in China has been a gradual process which started in 1978 and continues to the present-day. The dualism resulting from the coexistence of marketization and central planning creates a unique institutional context for urban development and growth management, as central planning has often been largely retained, while some aspects of capitalism have been allowed to operate. The market system is strongly controlled by the forces of centralized government and its planning apparatus, although it is very apparent in some parts of the country.

There are four dimensions to this dualism in China’s urban development (Zhu, 2000). Firstly, the central planning system has retained great power in the decision-making process (Hu, 2000), with the notion of ‘managed openness’ being part of the traditional ideology relating to China’s reform process (Weiss, 1999). According to the conception of ‘managed openness’, marketization is not only favoured by government but also monitored by the central government. Secondly, the state-owned danwei still play an important role in most cities, although the scale and importance of state-owned enterprises (SOEs) has declined in the past decades (Wang et al., 2005). Thirdly, the emerging land market coexists along with land allocation occurring through a command-control process (Yeh, 2005; Yeh and Wu, 1996). For example, in Beijing, 9219.05 hectares, which is nearly 98 percent of the total land allocated during 1992–2002, was transferred through negotiations between government and developers, despite the fact that dramatic market-oriented land reforms were carried out during the same period (Beijing Real Estate Association, various years). The coexistence of the land allocation system and the free market creates the so-called ‘double-track system’ (Ding, 2003) or ‘double-track land system’ (Zhang, 1997). It indicates that the land market in China is still far from mature (Wu, 2001; Xie et al., 2002; ZHU, 2004), despite many reforms relating to land development and management. One main reason for the dualism in the land market is the ambiguous nature of land use rights in China (Lin and Ho, 2005; Zhu, 2005). The fourth aspect of the dualism occurs in the property market, where two kinds of property rights still coexist. One is the full property right, available to commodity housing which can be bought and sold on the open market at market prices. The other is the limited property right, available to non-commodity housing which cannot be freely bought and sold on the open market. The main reason is that housing reform has enabled state enterprises to withdraw from direct housing production; however, housing consumption is still often subsidized and allocated through state danweis (Wang and Murie, 1996; Wu, 1996). Danweis are still the important purchasers and distributors of commodity housing and such a traditional redistribution system, as suggested above, still exerts a large influence on housing consumption, in particular in some less open cities, for example, Beijing and some other cities in the remote west of China, where fewer market-oriented reforms have been conducted than in other cities (Li, 2000). In these less open cities, market reforms will usually not be implemented until they have been successfully tested in the more open cities, as it is considered more important to maintain political stability and preserve management systems than to encourage economic reforms.

In summary, the dramatic urban transformation in Beijing has created a unique institutional context for urban development and land development management. Market forces are growing and play an important role. Affecting urban development and land development management. However, marketization does not mean there is no intervention by the state and local governments. Transformation in China is characterized by a dualism in which the growing market coexists alongside the remaining centrally planned system. In some areas the market plays a major role, but in other areas command-control by the government continues to exert considerable influence. This dualism creates a unique institutional context for urban development and growth management in China’s cities.

The case of Beijing and methodology

In this section, the paper will use Beijing as a case to evaluate urban containment strategies. The city of Beijing has existed for more than 3000 years and is China’s capital. In 2008, its total population was 16.95 million, with a total land area of 16,410 km² (BSB [Beijing Statistic Bureau], various years). Its administrative area comprises sixteen districts and two counties. The city is divided into three zones: the city centre, the main urban area and the suburban area (see Fig. 2). This paper looks at the main urban area and the city centre, two zones which provided 79.1 percent of the employment and made up 68.3 percent of the population of the city in 2009 (BSB [Beijing Statistic Bureau], various years). The main urban area in particular is the primary zone in which urban expansion has occurred in Beijing since the 1990s and it consists of the mixed urban area, greenbelt, peripheral constellations and the rural–urban fringe, shown in Fig. 1.

The study period for this paper is from 1990 to 2009, with 1990 being selected principally because it marks the start of the most rapid process of urbanization in Beijing, which continued throughout the 1990s. At the same time, several fundamental policies were
developed in relation to urban growth management, such as the National City Planning Act, enacted in 1989, and, in particular, the new version of the City Master Plan of Beijing (1992–2010), in which containment strategies were emphasized as one of the most important principles of growth management in Beijing.

The analysis units are the 139 sub-districts located in the main urban area and city centre of Beijing. These sub-districts consist of street areas (jiedao) and townships (xiangzhen). There are three levels of administrative management in Beijing. The first level is the municipal government level, the second is the district or county level and the third is the sub-district level, the basic administrative unit in Beijing. There are two sorts of administrative units at the sub-district level. One is the street area, the other is the township area. Street areas are usually located in urban regions with state land ownership. Townships are usually located within the rural–urban fringes with predominantly collective land ownership. These two different administrative units are treated equally in the analysis as they have a similar geographical scale. The reason why the sub-district is selected as the analysis unit in this paper is because it is the basic administrative unit of Beijing. Most of the municipal policies are implemented at this level. For research aiming at policy evaluation, this geographical scale would thus be the best choice.

This study will evaluate the performance of containment strategies by examining the gaps between the objectives of containment strategies and development facts. Containing further urban growth in planned areas and shaping a compact urban form are two of the important objectives of containment strategies. This paper constructs several key indicators to measure urban growth and changes in compactness and then evaluates to what extent the containment goals have been achieved by actual local developments (see Tables 1 and 2). Two types of indicators are constructed to evaluate the urban containment strategies. The first is an urban growth indicator, which is represented by population growth, housing growth and the growth of industrial development. The population data used in the study comes from the Beijing statistics yearbooks of 1990 and 2009. The population here refers to the 'long-term population' (chang zhu ren kou). According to a note in the Beijing Statistical Yearbook, the ‘long-term population’ is defined as those residents who have resided in Beijing for at least one year when the statistics surveys were conducted. Temporary residents, also referred to as the ‘floating population’, are not included in this study because their numbers cannot be accurately measured by the authorities. Housing growth is measured by changes in the number of houses. Industrial growth is indicated by changes in the number of registered enterprises.

The second indicator is related to urban form and is employed to measure the changes in urban compactness. This paper examines urban compactness over two aspects of urban form, the functional and the physical aspects (see Table 1). In relation to the functional aspect, density is measured using four indicators. Firstly, the gross density of the population is the gross population of a sub-district, measured in persons per hectare. This measure is most commonly used in urban research because the data is easy to obtain from the population census (Galster et al., 2001; Tsai, 2003). However, the indicators cannot describe the actual urban development situation in one administrative area. Thus, in the second density indicator, the administrative land area is replaced by the built-up land area to show the ‘net’ density of the population in the urban development area, omitting the non-built-up areas such as greenland and farmland. The third density indicator is the net employment density in a built-up area, which can measure the degree of activity intensification in one area. The fourth density indicator is the household density per hectare in a built-up area. This indicator is used to detect residential density and real estate development in one area.

Mixed land use can be measured by the degree of diversity, which depends on the geographical scale of the analysis (Batty et al., 2003). There is different diversity at different levels, such as city, district and neighbourhood. Galster et al. (2001) quantified diversity in a single square-mile grid scale using an exposure index. This index could show land use diversity in a specific area by showing the average density of residential land use in relation to other non-residential land use. Song and Knaap (2004) measured the land use mix with the concept of entropy at the TAZ level (Traffic Analysis Zone). The entropy measure is used widely to examine the degree of mixed land use (Cervero, 1989; Frank and Pivo, 1995). The diversity of urban land use (in terms of commercial or business uses, for example) can be reflected in the diversity of employment activities. Therefore, this paper uses the diversity of employment activities to measure the degree of mixed use in the primary administrative units. The entropy indicator is weighted by the population of the local unit. The higher the entropy in the urban area, the higher the degree of mixed use in the local unit.

\[
\text{Me}_i = \frac{-\sum_{j=1}^{s} p_i \ln(p_j)/\ln(s)}{p_i}
\]

where \(\text{Me}_i\) is the degree of mixed employment activities in unit \(i\); \(p_i\) shows the proportion of each of the five employment types, such as agricultural employment, industrial employment, commercial employment, state and municipal government employment, education and research employment and employment in other tertiary sectors; \(p_i\) presents the size of the population in unit \(i\); and \(s\) is the number of employment types. In this case, \(s\) is 5.

The degree of mix in employment activities is just one aspect of mixed use. The other important aspect is the balance between households and jobs at the local level. The entropy index can also be used to measure the jobs–housing balance (Frank, 1994). However, the entropy index requires detailed data concerning land use categories. Cervero (1996) used an indicator of the ratio of jobs to employed residents to measure the jobs–housing balance in the large cities of the San Francisco Bay area. Peng (1997) employed the jobs–housing ratio to determine the jobs–housing balance in Port-
land, Oregon. The ratio method is the simplest and most frequently used measure; however, this method neglects the land use factor. In this article, a jobs–housing balance indicator is measured by the standard deviation between household density and job density in each local area. The higher the standard deviation between household density and job density, the more unbalanced the relationship between households and jobs within a local jurisdiction.

In the local development process, containment policies limit the development of strip and scattered patches of land use. The shape of patch development is one important indicator when evaluating the performance of urban form at the local level. This paper uses an area–perimeter ratio (APR) of one patch to measure the shape of local land development. The higher the APR of one patch, the higher the degree of concentration. The average value of the total APR of patches represents the degree of concentration in sub-areas.

Another measure is a continuity indicator used to measure physical attributes in the polycentric city. The continuity of urban form can be measured by the Moran coefficient. The Moran coefficient is a quantitative index used to measure the degree of continuity in the high-density clusters (Tsai, 2005). It can also measure continuity in a built-up area. A high Moran coefficient means that a built-up area has good characteristics in relation to clustered and continuous development. This paper employs the local Moran’s index, which measures the degree of spatial continuity at the local level, based on feature locations and attribute values.

Assessment of urban containment strategies

Changes in urban growth

Beijing has experienced rapid population growth following rapid urbanization and a booming economy since the 1990s. However, the growth of the population has occurred at a different pace in different areas. Table 2 shows that the sub-districts located in planned peripheral constellations have had the highest population growth and the highest growth in industrial development on average. The city centre experienced a dramatic decrease in population. Of all the factors influencing the distribution of the population and industrial sites, urban growth management is important. In particular, the development of industrial parks is strongly managed by the municipal government. These population and industrial growth facts suggest that urban containment strategies have achieved their two main aims: to encourage urban growth in the planned peripheral constellations and new towns and to limit population growth in the city centre.

However, Table 2 shows that outside the planned peripheral constellations, the sub-districts located in the rural–urban fringe also had a relatively high population growth and the highest housing development. The results are inconsistent with one of the main aims of urban containment strategies – that further population growth and housing development in the suburbs is substantially influenced by the market. Especially in relation to commercial housing development, private developers and the local government (district, county and town) play a more active role than the municipal government. The main reason for this is that the local government needs revenues from real estate development to cover the high costs of providing local public social services. Since the 1990s, commercial housing prices have been increasing in Beijing, with the housing price soaring after 2001. Between 2001 and 2008 the commercial housing price increased on average by 216.5 percent (BMCHURD [Beijing Municipal Commission of Housing and Urban-Rural Development], 2009). The booming

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Table 1
Selected key performances indicators and measures.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Explanation</th>
<th>Measure</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban growth indicators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population growth</td>
<td>Persons</td>
<td>Persons per hectare</td>
<td>BSB, various years (1990–2009)</td>
</tr>
<tr>
<td>Housing growth</td>
<td>Number of housing</td>
<td>Employees per hectare in built-up area</td>
<td>BSB, various years (1990–2009)</td>
</tr>
<tr>
<td>Industrial growth</td>
<td>Number of registered enterprises</td>
<td>Households per hectare in built-up area</td>
<td>BSB, various years (1990–2009)</td>
</tr>
<tr>
<td>Urban form indicators</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross density of population</td>
<td>Persons per hectare</td>
<td>Persons per hectare in built-up area</td>
<td>BSB, various years and BLHB (1990, 2009)</td>
</tr>
<tr>
<td>Density</td>
<td>Net density of population</td>
<td>Persons per hectare in built-up area</td>
<td>BSB, various years and BLHB (1990, 2009)</td>
</tr>
<tr>
<td>Mixed land use</td>
<td>Net density of employment</td>
<td>Employees per hectare in built-up area</td>
<td>BSB, various years and BLHB (1990, 2009)</td>
</tr>
<tr>
<td>Concentration</td>
<td>The degree of distribution equality of households and jobs</td>
<td>Standard deviation</td>
<td>BSB (1996) and BLHB (2010)</td>
</tr>
<tr>
<td>Continuity</td>
<td>The continuous degree of the built-up areas</td>
<td>Local Moran’s I</td>
<td>BLHB (1990, 2009)</td>
</tr>
</tbody>
</table>


Table 2

<table>
<thead>
<tr>
<th>Number of units</th>
<th>Changes in population on average (%)</th>
<th>Changes in the number of persons on average (%)</th>
<th>Changes in the number of registered enterprises on average (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>City centre</td>
<td>28</td>
<td>-10.3</td>
<td>44.5</td>
</tr>
<tr>
<td>Mixed urban areas</td>
<td>49</td>
<td>66.5</td>
<td>129.2</td>
</tr>
<tr>
<td>Planned peripheral constellations</td>
<td>28</td>
<td>137.2</td>
<td>173.5</td>
</tr>
<tr>
<td>Green belt</td>
<td>18</td>
<td>93.7</td>
<td>135.1</td>
</tr>
<tr>
<td>Rural–urban area</td>
<td>16</td>
<td>120.6</td>
<td>167.7</td>
</tr>
<tr>
<td>Total</td>
<td>139</td>
<td>104.5</td>
<td>130.0</td>
</tr>
</tbody>
</table>
real estate market provides local government with the opportunity to obtain increased revenue from housing development. Local revenue from land development is called ‘extra income outside the state budget’ (yu suan wai shou ru).

According to the regulation governing the distribution of revenue arising from the transfer of the land use right from the state to private ownership, 60 percent of the total revenue arising from land development is collected by the state and 40 percent is retained by the municipal governments. Each year, the municipal governments redistribute their share to the local governments (districts, counties and towns) based on the revenue that each have contributed. This means that increased land development and higher contributions will bring greater local revenue return, although it is also often the case that local governments retain revenue that should be paid to the state and municipal governments (Chen, 2003). In some cases, revenue from land development amounts to over one-third of total local revenue (Jia and Le, 2010). This trend has not obviously changed, despite the fact that the state and the municipal governments have introduced several strict land policies requiring local governments to control their land permission grants and against land hoarding and real estate speculators since 2003.

The above results suggest that actual urban growth at the local sub-district level in the rural–urban fringe conflicts with the aims of macro-urban growth management at the municipal level. Market-led real estate development particularly influences land development in the rural–urban fringe.

Overall changes in urban compactness

From the indicators of urban compactness, a general conclusion can be drawn that the overall functional aspects of urban form have become more compact since the 1990s, except with regard to individual aspects such as a decrease in the density of employment (see Table 3). In relation to physical form, local development had a higher compactness in 2009 than in 1990.

The density of the gross population increased from an average of 126 persons per hectare to 151 persons per hectare. In addition, gross population density shows a more even trend, with the standard deviation of gross population density in the sub-areas decreasing from 124 to 116 since 1990. The two other density indicators, the net population density and net household density, also show obvious growth. The increased density indicators imply that to a large extent containment strategies performed well with respect to the objective of enhancing urban compactness in the rapid urban growth process.

However, the average net density of employees declined from 85 persons per hectare to 68 persons per hectare, while most density indicators increased. The decreases in employment density reveal one challenge faced by current municipal containment policy: the conflict between municipal land control and huge local demand for land development in the local industrialization process. Like most big cities in China, Beijing aims to achieve a successful level of industrialization and become an economically independent industrialized city. Local industrial developments outside the city centre play a significant role in this industrialization process. For example, the gross output value of industry in suburban districts accounted for 67.3 percent of the total gross output value of industry in Beijing in 2009 (BSB (Beijing Statistic Bureau), various years).

Among the factors influencing the local industrialization process, the need to enhance local revenue is one of the most important (Wu, 1990a, 1990b). Since the 1990s, greater fiscal responsibility and competition between local jurisdictions have led local governments to stress the need for rapid local industrialization. Many town or village enterprises (xiangzhen qiye) have been developed in various local industrial development zones which are managed by the local district or county government. In Beijing, the number of industrial development zones reached 470 by the end of 2003, and they were located across all suburban areas (Li, 2007). Of these industrial development zones, 94 percent were authorized by local governments (district, county or town), while at the state and municipal levels they were seen as illegal. Relatively rapid land development in local industrial zones is one main reason for a decrease in the density of employment. When these illegal industrial development zones were closed by the state and municipal governments in 2003, 467 km$^2$ of land which had been assigned to be developed was saved. The decrease in the density of employment alongside rapid local industrialization suggests that current municipal containment strategies are being challenged by growth-oriented development. Clearly, there is at least one policy challenge confronting containment strategies in the growing city of Beijing: the objectives of municipal containment strategies are likely to conflict with the facts of local development in the current transformation process as a result of local governments being encouraged to make their own decisions on economic development.

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The analysis shows that the average degree of mixed use increased during the period 1990–2009. The increasing indicator of 'mix entropy', which measures the diversity of employment, shows that the degree of mixed use has been upgraded at the municipal level. In a similar way, the jobs–housing balance indicator, which is measured by the standard deviation between the net density of households and employment, also verifies the fact that the jobs–housing balance has improved. The average standard deviation between the net density of households and employment declined distinctly, from 29.80 in 1990 to 19.76 in 2009. The results suggest that containment strategies perform well in promoting overall mixed land use.

The results also show that the shape of areas developed for urban land use has greater continuity in 2009 than in 1990. The average value of the local Moran’s I indicator increased from 0.0018 in 1990 to 0.0035 in 2009. This means that to some extent the containment strategies achieved their goal of enhancing overall compact urban form by encouraging new development located adjacent to the existing built-up area. The APR indicator for built-up areas increased from 177.53 in 1990 to 274.85 in 2009. This result indicates that urban expansion in Beijing tends to take a compact form when containment strategies are implemented.

**Changes in the density of Beijing**

The results of the comparison of the figures for 1990 and 2009 show that the sub-districts located in the city centre had negative growth in population, household and employment density. In 2009, the population and household density of these sub-districts decreased by 13.7 and 10.9 percent on average, respectively (see Fig. 3). The employment density of these sub-districts also decreased by 8.6 percent on average. The main reason for the lesser decrease in employment is that while the decentralized concentration policy tends to disperse population and households outside the city centre with the aim of reducing the congestion in the city centre, the local government tends to replace old communities in the city centre with high-density office buildings for commercial functions in order to increase local revenue (Fang and Zhang, 2003).

As a result, employment density declined relatively slowly while population and household density decreased rapidly.

Despite this trend, population density in some sub-districts close to the centre has increased. In particular, because of the decentralized concentration strategy, ten peripheral constellations became the ‘growth poles’ where most population and employment became concentrated. The sub-districts located in the planned peripheral constellations had a growth of 11.4 percent in population density and 18.5 percent in employment density on average. However, the results show that some sub-districts located in the rural–urban fringe experienced obvious decreases in population density. The density of employment and households changed in the same way as population density. The result indicates that land development on the fringes of urban areas in Beijing proceeded at a faster rate than population and employment growth. This suggests that the municipal environmental goal to increase the intensification of land use was not being achieved by some sub-districts on the urban fringe.

**Changes in mixed land use in Beijing**

In 1990, the city centre had the highest value for the mixed use indicator. However, by 2009, the degree of mixed use in the city centre had declined, while most sub-districts in the mixed urban area and the greenbelt had become more mixed (see Fig. 4). A reason for an increase in mixed land use in these areas might be that the new suburban industrial areas, encouraged by the decentralized concentration strategy, attracted greater numbers of residents. The decreased mixed use in the centre owes much to market-led urban development, which favours non-residential development in urban central areas and has been pursued by local officials and private developers for economic benefits.

Most sub-districts in the peripheral constellations experienced high growth in relation to the jobs–housing balance. The main reason is that the decentralized concentration strategy encourages self-contained development, with a high level of mixed land use in the peripheral constellations. The result indicates that the decentralized concentration strategy performed well to a large extent, despite there being a citywide trend towards revenue-enhancing development as a result of the current marketization process. However, some sub-districts in the rural–urban fringe have had dramatic decreases in the degree of mixed land use. For example, Zhongguancun, which is known as ‘China’s Silicon Valley’, is
located between Xiyuan, one of the ten planned peripheral constellations (see Fig. 1), and the mixed urban area. Zhongguancun has shown a considerable decline in mixed land use. This was due to revenue-enhancing development which addressed the requirement for rapid commercial and retail development while inhibiting housing development, in particular, social housing development. According to the municipal ‘decentralized concentration strategy’, new developments in the planned peripheral constellations should have a high level of mixed land use. The results, however, show that the actual local developments are inconsistent with the objectives of macro-development management at the municipal level.

Changes in the concentration and continuity of Beijing

The analysis shows that in the period from 1990 to 2009 development had taken a more compact urban form at the local level close to the city centre (see Fig. 5). Peripheral constellations, especially, achieved a more compact development shape as these areas fell under the control of strict municipal containment strategies. At the same time, some sub-districts on the edge of the rural–urban fringe show decreases in the degree of local concentration. This fact suggests that new developments in the local towns and villages on the urban fringe are likely to have taken an irregular form and would challenge containment strategies which have the singular objective of achieving concentrated development rather than allowing urban sprawl in urban fringe areas.

The value of the local Moran’s I indicator shows that since 1990, the city centre has had a relatively higher value and that the developments had high continuity. In fact, most of the development in the city centre occurred as infilling redevelopment encouraged by containment strategies. Outside the city centre, some new developments in the surrounding greenbelt occurred in a more diverse manner. The main reason for this was that some individual local jurisdictions with a strong desire for local growth permit-
ted developments based on their individual benefits, although new development in the greenbelt was strictly limited by the municipal government. The results reveal that in the greenbelt areas the conflict between local demands for land development and the municipal controls on new development is becoming fierce. The greenbelt, one of the most important tools of the municipal containment strategy, faces challenges from local developments. This result is consistent with the findings of previous studies which have investigated failures in Beijing’s greenbelt strategy (Jun and Zhou, 2007). Similar findings have also been reported in Western cities (Millward, 2006; Munton, 1983).

The analysis shows that outside the greenbelt areas, some local jurisdictions in the rural–urban fringe have an increased local Moran’s I value. This reveals that the containment strategy of limiting discontinuous development performed well in these areas. However, some sub-districts in the rural–urban fringe show an obvious decrease in the local Moran’s I value, indicating that urban development in some sub-districts is still occurring in an increasingly discontinuous and scattered manner.

**Discussion**

Similarly to the experiences of Western countries, rapid urbanization has greatly contributed to the promotion of economic growth and social wellbeing in China. Meanwhile, the environmental effects of urban expansion, particularly urban sprawl, are increasingly attracting the attention of politicians and researchers. Considering the ever-growing urban population and the huge demand for land for development within developing countries, containment strategies designed to curb urban sprawl and enhance effective land use are vital aspects of land use policies. However, in practice the experiences of developed countries suggest that there are conflicts between macro-growth management and the local requirement for development. These conflicts tend to challenge the implementation of urban containment strategies. This challenge becomes far more serious in a transformation country where the power influencing urban development has fundamentally changed, with an increase in the authority of local government and the power of the market.

The analysis undertaken in this paper provides evidence on the performance of urban containment strategies in the case of Beijing. The analysis found that the objectives of containment strategies to encourage urban growth in planned peripheral constellations and to increase urban compactness have been achieved. The sub-districts located inside the planned peripheral constellations experienced higher growth in population numbers and density. The overall average density of the population, employment and households increased, and mixed land use and the jobs–housing balance also improved. The results suggest that since 1990 to a large extent the containment strategies have performed well in Beijing.

However, this study also found three trends that are contrary to the municipal containment strategy objective of encouraging compact urban development. Firstly, the sub-districts located in the rural–urban fringe had dramatic unexpected population growth and housing development. Secondly, some sub-districts on the edge of rural–urban fringe experienced obvious decreases in urban compactness, as indicated by residential density, employment density, the concentration of land use and its pattern, and the continuity of land development. Thirdly, mixed use and the jobs–housing balance greatly decreased in the centre and some sub-districts in the peripheral constellations.

These contrary trends indicate that urban sprawl has still occurred on the urban fringe of Beijing, although relatively strict urban containment strategies have been implemented at the municipal level. There are many reasons for this. However, the deep institutional context is the most important. In Western cities, sprawl is characterized by low-density housing and commercial strip development which is a result of and dependent upon extensive automobile use. Essentially, urban sprawl in Western cities is promoted by lifestyle changes (Squires, 2002). In China, as well as social factors based on lifestyle changes, urban sprawl is strongly influenced by political decentralization and marketization. Firstly, as mentioned above, local fiscal responsibility has led local governments to promote local industrialization as a means of enhancing fiscal income. However, since this local industrial development is often dominated by scattered town-village enterprises in suburban areas, fiscal reform has ultimately stimulated urban sprawl.

Secondly, the local authorities’ need for local revenue from land rental and the competition for investment are the main factors determining dispersed development in suburban areas (Deng and Huang, 2004). Since the 1980s, urban land reform, in which a land use right can be transferred as a component of the ‘price’, has allowed local governments to obtain large fiscal benefits from land development. For example, the state allows local governments to keep up to 60 percent of land revenues to encourage land use rights sales. There are two kinds of fiscal benefit arising from land development. The first is the direct land development income from land rental and revenue arising from land use right transfer. The second kind is indirect land development benefits. For example, the local government takes their provision of land as a substitute for direct capital investment when they enter into partnerships with other foreign investors (Zhu, 1999). In some extreme situations, land can be provided free to investors by local government as a ‘preferential policy’ to attract investment. As a result, urgent, high demand for land development, combined with severe competition for local economic growth among local jurisdictions, has led to the scattered, even illegal, sprawling development around Beijing.

Thirdly, land development is a more fragmented process due to imperfect land market reform in China. Many studies have pointed out that a land market has emerged in China (Chen, 1998; Dowall, 1993). In this land marketization process, the market mechanism replaces central planning controls and the land use right is separated from land ownership. Land users have been allowed to let, transfer, rent and mortgage their land use right. However, in the current, more gradual transformation process, the land market in China is not ‘perfect’, as it still allows unusual types of transfers (Kong, 1995; Ding, 2003). For example, Yeh and Wu (1996, p. 336) argued that ‘because of the introduction of the paid transfer of land use rights, a dual land use system composed of market-based allocation and non-market administrative allocation has begun to emerge in China’. Some land can be bought on the market at the market price through tender and auction, while other land is allocated administratively without a price or at a price negotiated between developers and local government (Zhu, 2000). Therefore, Haile (2007, p. 7) has argued that ‘a formalized market model does not exist in China’. The fragmented mechanism of the land use right is one main reason for the loss of control of land markets and scattered land development in China (Ding, 2003).

In addition, land ownership also influences urban sprawl in Beijing. As mentioned above, there are three levels of administrative management in Beijing. The first level is the municipal government level, the second is the district or county level, and the third is the street or township level. There are also two different land ownership systems and related land management systems. The terms ‘county’ and ‘township’ refer to aspects of the collective ownership system in the rural counties or towns, while the terms ‘district’ and ‘street area’ refer to elements of state land ownership in the urban areas. Most of the land development management at the municipal
level covers both collective and state ownership systems. In some cases, collective land ownership is managed by individual suburban villages on the urban fringe. Generally speaking, the implementation of land development management in the urban districts and street areas is stricter than in the rural counties and townships. The relaxed land development management of collectively owned land in suburban counties and townships is believed to be one main reason for urban sprawl on the urban fringe of Beijing (Deng and Huang, 2004). In particular, rapid real estate development favoured by the growing housing market in the suburban areas tends to aggravate urban sprawl, as indicated by the findings in the above analysis.

Fourthly, the increase in revenue-enhancing development is one main reason for the decline in mixed land use. Against the background of fiscal responsibility, local government tends to take any opportunity to gain as much local revenue as possible. In the actual urban development process, the developments which can bring higher local revenue are given priority, such as office buildings, business parks and high-quality apartment blocks, while developments that have a low-revenue contribution, for example, social housing and public facilities, are rarely considered by local government. Consequently, these micro-development activities have resulted in a decrease in the degree of mixed land use at the regional level.

The three contrary trends mentioned above actually verify a generalizable challenge confronting the implementation of containment strategies, which has already been reported in developed countries. This is that a particular policy which might be good for one municipality might not necessarily work for all. In some ways, local growth management will assist in the achievement of metropolitan and national environmental goals but in other ways it will detract from this mission (Carruthers, 2002; Chinitz, 1990). In particular, when local economic benefits are the main concern of the local government, local decision-making on growth, strengthened by political decentralization, may create challenges to municipal containment policies. This challenge could be greater when market factors are involved. The empirical findings from Beijing presented above show that the booming real estate market in China is a major factor causing a decline in the effectiveness of urban containment strategies. The findings are consistent with pre­

Conclusions

Urban containment strategies should play an important role in managing land development towards greater sustainability in the context of transformation and development in China, as they are one of the best known land use policies for managing urban sprawl. However, the empirical evidence from this study suggests that although containment strategies generally perform well, in the current transformation context they nevertheless face serious challenges from local development fuelled by marketization and political decentralization. With respect to future policy development, closer attention should be paid to local solutions. The ability of containment strategies to limit urban sprawl depends on the responsible application of the regulations employed by local jurisdictions. In this respect, the municipal containment strategies in China should examine the decentralization trend and local demand for growth. The key issue for containment strategies at this stage in Beijing would not only be to make the controls over local development more strict, as is the case in developed countries, but also to emphasize the need for guidance at the local level so that development proceeds in a more sustainable way and uncoordinated rapid urban growth is avoided. Local benefits and the equity of these benefits, in particular economic benefits, should be taken into account by municipal governments. Furthermore, they should put more effort into harmonizing the relationship between municipal growth control and local growth, using ‘market’ strategies such as fiscal arrangements and tax redistribution rather than mere command-control.

At the same time, the management capacity of the current containment strategies should be enhanced to mitigate the negative effects of market-led development in the current transformation context. In relation to this context, it is important to establish a clear mechanism for determining accountability as a means of achieving the goal of increasing administrative capacity. In the transformation context, urban development is characterized by unpredictable situations because of the lack of clarity about the accountability of different sectors. The determination of accountability would provide clear and stable rules concerning relative powers, functions and resources, and as a result would enhance the administrative capacity of different levels of government, enabling them to coordinate the various sectors – private, NGOs and CBs – to achieve the municipal containment strategy objectives.

In relation to future research directions, further assessment of containment strategies in developing and transforming countries should be undertaken. The empirical evaluation of containment strategies is attracting attention in land use research. However, with the realization that containment policies are widely viewed as important tools in curbing urban sprawl, at least two advances remain to be made in the research. Firstly, few empirical studies have been devoted to developing countries and as a result the research on containment strategies does not represent a general global view. The empirical evaluation of containment strategies has already been widely investigated in North America and Europe, and it is now necessary that this becomes the focus of debate in developing countries, given the emergence of sprawling urban development in these countries. Secondly, current research into the verification of the effects of containment strategies limits itself to the topics of housing development, environmental effects and social effects. Little attention has been paid to the acceptability of such strategies to local jurisdictions, and there is often no explicit recognition of the institutional context. The complex institutional situation in a developing and transformation country such as China may provide a good opportunity to study the role and influence of institutional factors in the implementation of urban containment strategies.

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