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Impacts of state-led and bottom-up urbanization on land use change in the peri-urban areas of Shanghai: Planned growth or uncontrolled sprawl?

Li Tian [a,*], Biqing Ge [b], Yongfu Li [c]

[a] Department of Urban Planning, Tongji University, Shanghai, 1239 Siping Road, 200092, China
[b] Shanghai Xiandai Architectural Design (Group) Co. Ltd, China
[c] Department of Architecture, Shanghai University, China

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ABSTRACT

During the last several decades since the opening reform, peri-urbanization emerged in the developed areas of China. In Shanghai, peri-urban areas expanded rapidly, and land use in these areas experienced significant changes and restructuring. This paper examines the expansion of peri-urban areas, and their social-economic characteristics in Shanghai from 1990 to 2009. By combining Landsat TM images and land use maps based on site survey, this paper analyzes the spatio-temporal characteristics of land use change in the peri-urban areas of Shanghai, and we find that expansion of non-agricultural land has been mainly characterized by the growth of industrial land, and has caused significant loss of cultivated and forested land. This paper then examines the driving forces of land use change from the perspectives of state-led growth and bottom-up development. It argues that state-led growth has played a dominant role in the expansion of non-agricultural land, and the impact of bottom-up development has been much less significant. Planning has played a critical role in regulating the space to accommodate the increasing demand of population and economic growth while at the same time promoting space growth to attract outside investment.

1. Introduction

The rapid urbanization which has taken place in Southeast Asia since 1970 has exhibited a process different from that of developed countries in the West. In the West, urbanization is now occuring predominantly in already densely populated rural regions on the fringe of cities, and does not need a massive rural-to-urban migration (McGee, 1991; Sui & Zeng, 2000). Conversely, the rapid urbanization in Southeast Asia is characterized by the economic transformation of heavily populated areas from agricultural to non-agricultural activities. This phenomenon has been widely known as the *desakota* regions by Ginsburg (1991) or peri-urban areas (Adell, 1999; Leaf, 2002).

With the acceleration of the industrialization and urbanization processes, manufacturing driven peri-urbanization has been underway in many developed areas of China (Webster, Cai, Muller, & Luo, 2003). As the largest and most developed area of China, Shanghai is of no exception. Since the opening reform, the peri-urban area of Shanghai has expanded rapidly, and its land use has experienced significant changes and restructuring. As a consequence, the spatial structure, land use and environment of the Shanghai municipality has been greatly influenced.

So far, research on peri-urban areas has mainly consisted of empirical studies. For example, Webster and Muller's research on the peri-urban area in the Ningbo–Hangzhou corridor of the Yangtze River Delta (2002); Zheng and Liu's research on the peri-urban area in Dongguan city of the Pearl River Delta (2003), and Zhu and Hu's research on the land use in the peri-urban area of Beijing (2009). Moreover, there are a few studies trying to model the land use dynamics of peri-urban regions, measure and characterize peri-urbanizing systems in the peri-urban areas through applying GIS tool and remote sensing images (Sui & Zeng, 2000; Heikkila, Shen, & Yang, 2003; Long, Tang, & Li, 2007; Tian & Zhu, 2013). Generally speaking, the research on peri-urbanization and peri-urban areas is far from substantial (Adell, 1999).

This paper is an attempt to enrich the already existing empirical studies of land use change in the peri-urban areas and help explain the driving forces of land use change. It focuses on two research questions: (1) what have been the characteristics of land use change in the peri-urban areas of Shanghai from 1990 to 2009? (2) What are the impacts of state-led and bottom-up urbanization on land use change in the peri-urban areas? It firstly explains how to define the boundary of the Shanghai peri-urban areas, and then illustrates data resources and research methods. The part analyzes the social and economic characteristics of peri-urban areas, and examines the land use change characteristics by applying landscape ecology indices and land use change matrix. Then, the driving forces of land use change from the perspectives of state-led growth and bottom-up development are explored, and

* Corresponding author.
E-mail addresses: Litian262@hotmail.com (L. Tian), zhizhitracy529@126.com (B. Ge), li_yf@126.com (Y. Li).

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social-economic data are used to analyze major driving forces triggering land-use change. It concludes with potential research topics for the future.

2. Urbanization and its impacts on urban sprawl in China

Since the reform opening, there have been two distinct patterns of urbanization in China: top-down urbanization characterized by planned development where government is responsible for financial resources needed for urban capital construction, and bottom-up urbanization characterized by spontaneous institutional change induced by market-forces and initiated by non-state/private sectors such as rural communities and township-village-enterprises (Gu & Li, 2000). While the bottom-up model has significantly contributed to urban and rural development, it has been responsible for scattered, fragmented land use and urban sprawl (Gu & Li, 2000; Zhu & Hu, 2009; Tian & Zhu, 2013; Tian, 2015a).

There have been a wealth of literature documenting the urban sprawl in the US. Urban sprawl is non-compact, fragmented, and incomplete (Geddes, 1997), and the consequences of urban sprawl include traffic congestion, environmental contamination, and income and racial segregation (Black, 1996; Downs, 1999). Moreover, urban sprawl is regarded as the result of increasing suburbanization due to the rising incomes and lower transportation costs since the Second World War (Bao, 2010). Urban sprawl in China is different from that in the US in terms of both characteristics and driving forces. The concept of "urban sprawl in China" was first introduced by Fung (1981), and he argues that urban sprawl in China was a direct result of internal economic changes by the government that resulted in spreading economic activities into peripheral areas. He attributes this sprawl to the government's "squandering behavior and emulation of soviet regulations in land development." Zhang (2000) defines the rapid city growth in the early 1990s as the Chinese version of urban sprawl and ascribes the urban sprawl of China to the combination of market forces and government reaction to the marketplace (especially at the local level). Tian (2014) points out that the city expansion speed was much higher than that of urban population growth, and the advanced rapid growth rate of the urbanized area was driven not only by the demand of the increasing urban population but also by the ambition of local governments to raise local revenue and attract investment through land leasing. Moreover, driving forces of urban sprawl vary from region to region. According to Webster and Muller (2002), the Beijing peri-urban areas are influenced by the service-industry due to the spill-over effects of the central city, which is the service and innovation focus of China. Inland urban regions such as Chengdu, Wuhan, and Chongqing, are more dependent on domestic investment and subnational regional markets to drive employment creation in their peri-urban areas. In the Pearl River Delta, peri-urban areas are driven by international investment and the manufacturing industry.

In China, urban sprawl presents different patterns. Deng and Huang (2004) argue that the expansion of a large number of development zones and semi-urbanized villages are two typical forms of urban sprawl in China, and both are inefficient and a waste of land resources. The under-development of semi-urbanized villages and the over-development of development zones pose a paradox, which can be explained by uneven land reform that arbitrarily segregates urban land and rural land. Wei and Zhao (2009) state the physical expansion of China's megacities can be viewed as a combination of "urban spill over" and "local urban sprawl" and the contradictions of different policies and regulations in the use of rural lands for urban construction have led to intensive and unhealthy competition among stakeholders. Fang, Liu, and Hong (2007) identify four sprawl patterns: random expansion at the fringe, strip development along or between highways, scattered development of land, and leapfrog development of urban and industrial areas.

In general, urbanization in China has been strongly characterized by "land-centered urbanization" (Heikkila, 2007; Lin, 2007, 2014), and the rapid economic growth has been accompanied with extensive urban sprawl. Driven by the incentive to maximize benefits of land leasing and the pressure from developers to acquire land, local governments have been trapped by an oversupply of land, leading to urban sprawl (Tian, 2014). Under the land finance regime, the state power reshuffling, urban land development, and local finance have become interconnected and reinforced one another to drive the growth and transformation (Lin, 2014). Under such circumstances, the state has rearticulated its function in land governance, and regulatory land control is becoming a new way for the state to be involved in space commodification (Xu, Yeh, & WU, 2009). Therefore, the combination of state force and market force contributed to the urban sprawl of China.

3. Study area, data sources and research methods

3.1. Definition of peri-urban areas

Up to now the definition of peri-urban areas has included qualitative and quantitative methods. In terms of the qualitative method, Webster and Muller (2002) divide Peri-urban areas into Inner Peri-urban and Outer Peri-urban areas. The area within 50 km from the city center is defined as the Inner Peri-urban area; 50 km outside the rim of the center is called the Outer Peri-urban area. Jia and Liu (2002) identifies the Peri-urban areas as those areas which have some initial features and functionality of cities but are not yet defined as cities, including the rural–urban interface, small town, township and village with developed non-agricultural industries. As for the quantitative analysis method, Heikkila et al. (2003) measure and describe the typical peri-urban areas of China, Southeast Asia and other rapidly urbanizing areas through the establishment of mathematical methods of fuzzy sets and entropy. The qualitative method is relatively rough, while the quantitative method based on land use characteristics is more precise. Nevertheless, due to the lack of corresponding socio-economic statistical data, it is difficult to conduct future studies. In this research, in order to obtain the socio-economic statistic data, the administrative boundary is still regarded as the basis of the definition of a peri-urban area.

Shanghai consists of three distinct areas: the central city area includes 10 administrative districts, and the counties are specified as the

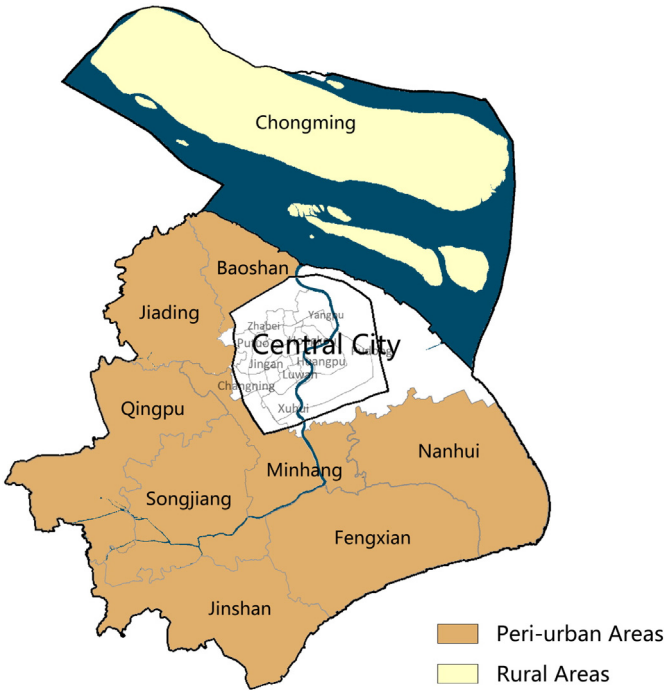

Fig. 1. Boundary of peri-urban areas in Shanghai in 2009.

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