

Wuhan's Changing Peri-urban Zone:

The Case of Dongxihu District

by

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ABSTRACT

Peri-urbanization is a process in which previously rural areas on the outskirts of established cities become more urban in character. This process is of great significance in China, because peri-urbanization is often manufacturing and Foreign Direct Investment (FDI) driven. After witnessing the dramatic development of the Eastern Coastal Region from the mid-1980s, China recently changed its regional development focus to interior regions to pursue more spatial equity within the nation. Wuhan, as the most populous city in central China, is experiencing significant peri-urbanization. The thesis focuses on Dongxihu District, a representative peri-urban area in Wuhan Municipality.

To explore peri-urbanization in Dongxihu, this study first documents the metrics of ongoing peri-urbanization in the District from land use, economic, demographic and institutional perspectives. Causality is explored by relating peri-urban outcomes to drivers within the framework of research questions, namely: (i) What is driving peri-urban change in Dongxihu? (ii) Which drivers of peri-urbanization in the District are most important? (iii) How can Dong Xi Hu's peri-urbanization process and outcomes best be characterized? and (iv) What policy implications can be drawn from Dong Xi Hu's peri-urbanization experience?

The primary conclusion is that Dongxihu's peri-urbanization is primarily manufacturing driven, resembling previous first generation peri-urbanization on the coast more than the more diverse peri-urban outcomes now emerging in wealthy coastal metropolitan areas, e.g., Shanghai.

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CHAPTER 1

INTRODUCTION

1.1 Objectives

The primary objective of this thesis is to better understand and explain the dynamics of peri-urbanization in Dongxihu District in Wuhan Municipality, China. Since Dongxihu is a representative Interior Region peri-urban zone reflecting the movement of Chinese manufacturing inland, driven by both market and policy forces, the output should lead to an increased understanding of peri-urbanization in Wuhan, and by extension, of peri-urbanization in China's Interior metropolitan areas. It is intended that this research will form the base for further studies on Interior Region peri-urbanization in China.

The second key objective of this research is to yield public policy implications, plus be of value to future investors in manufacturing and property developments. Considering the important role of peri-urbanization in the metropolitan urban development process, the policy implications are expected to provide new forward-looking, but practical, ideas as an input to the planning process in Wuhan at the district and municipal levels. Since Wuhan is a leader in urbanization in Interior China, implications of the research may extend to other Interior cities in China.

1.2 Study Relevance

A peri-urban zone is the place that is experiencing peri-urbanization which refers to a process in which "rural areas located on the outskirts of established cities become more urban in character" (Webster, 2002). This process is of great significance in rapidly developing East Asia, especially in China, which has undergone dramatic economic growth during the past thirty-five years.

Since peri-urban areas are almost invariably the fastest-changing areas of a municipality and the place where a city expands horizontally, peri-urbanization has a big impact on the

economy and society at different levels, thus shaping the future of a city. Over the last 35 years, manufacturing has been the prime driver of Chinese peri-urbanization, although driver of peri-urbanization in China, and particularly in the coastal areas, are becoming more diverse and complex. Peri-urbanization, associated with very rapid population growth on the areas of the metropolitan periphery puts great pressure on the local environment by transforming rural landscapes into urban landscapes in a short time period. At the same time, the intensive interactions between different stakeholders during the peri-urbanization process also often make it a place of conflict. Fortunately, in the Chinese case, there is less institutional fragmentation than in most other peri-urban areas of the world, because Chinese metropolitan areas are overbounded, i.e., the peri-urban area normally falls within the same jurisdictional area as the urban core. However, Chinese municipalities are composed of districts, thus the metropolitan periphery in China is multi-jurisdictional at that level of government. Districts within the municipality, and within the peri-urban area itself, are likely to compete resulting in less than the most efficient peri-urban landscapes and economies in Chinese metropolitan regions. Given the foregoing dynamics, if peri-urban areas are not fully understood and well managed, the outcome of peri-urbanization processes can present a serious challenge to Chinese metropolitan regions.

After witnessing the dramatic development of the eastern coastal Region, China recently changed its developmental focus to interior regions in order to create more spatial equity within the nation by adopting “Rise of central China” and “Go West” policies. Thus, China’s interior cities especially the key ones, are about to play a main role in terms of urban development. Wuhan, as the most populous city in central China, combined with its advantageous geographical location, is destined to experience significant change. Consequently, the peri-urban dynamic in Wuhan can serve as a pioneering example to other Chinese cities in the Interior in regard to best peri-urban practice under the current policy context. Such practice would recognize that there are economic and social differences between coastal and interior cities, and that the global and domestic economic and development practice contexts have changed since coastal Chinese peri-urbanization took off dramatically in the 1980s and 1990s. On the economic side, globalization

forces intensified while a Chinese middle-class has arisen that demands services for itself from peri-urban areas beyond jobs, e.g., recreation and fresh fruits and vegetables; on the development paradigm side, there has been growing concern with sustainability. Further understanding of peri-urbanization in Wuhan may yield learning with policy implications about how to direct the growth of China's interior cities in a sustainable manner, offering a better future for their residents.

1.3 Background

1.3.1 Manufacturing is Moving to Inland China

Manufacturing has prospered in the eastern coastal area. The development of China's east coast, primarily through manufacturing has made China the world's largest manufacturer in value added terms (accounting for more than 22% of global value added in manufacturing), ahead of the United States in second place, Japan in third, and Germany in fourth. However, driven by increasingly expensive labor and to a lesser degree, higher land prices in the East Coast Region, manufactures recently start to move to Interior cities on a large scale chasing lower factor prices there, supported by a series of national government policies aimed to stimulate the development of the central and western regions. Although East Coast China still dominates manufacturing output in China, the Region's relative share of industrial added value began to decline since early 2000s, while Central and Western China show an increasing share of value added. (Figure 1.3.1) At the same time, foreign investors are starting to show more interest in Interior China.

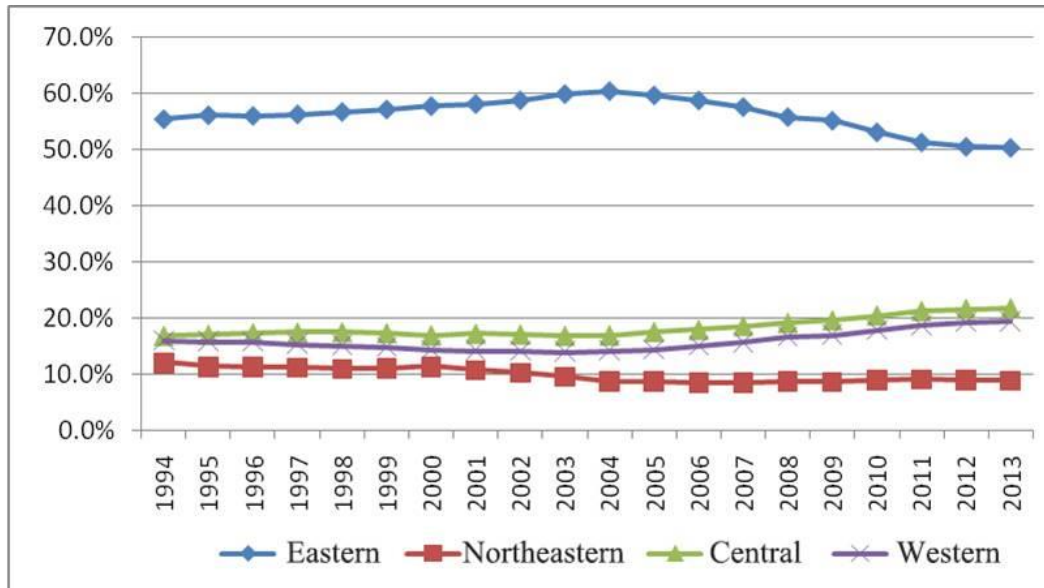


Figure 1.3.1: The Percentage of Industrial Added Value in China's Regions 1994-2013
(Source: China's Industrial Transfer Network)

1.3.2 Wuhan as a Fast-growing Interior Metropolitan Area

As the most important city in Interior China, Wuhan enjoys a geo-strategic location near the geographical center of mainland China's population. From Wuhan, one can travel to most major cities in China within two hours' flight. Wuhan is also the most significant hub of High Speed Rail (HSR) in China, which is usually the most effective way to move among China's cities within a five hours' travel radius. With this advantageous location, Wuhan now is one of the fastest growing cities in China. The GDP growth rate of Wuhan is among the top. Its total GDP is exceeded only by four major provincial level cities, yet Wuhan is only a sub-provincial level city¹. In fact, Wuhan is playing an ever increasing role in China's economy. Since 2007, there has been a huge growth in Wuhan's proportion of China's total GDP. (Figure 1.3.2) All these facts indicate Wuhan's indispensable status in current urban development in China. Therefore, the peri-urbanization in Wuhan is worth researching.

¹ Due to China's large population and area, the administrative divisions of China have consisted of several levels. These levels are: Provincial level (1st), Prefectural level (2nd), County level (3rd), Township level (4th) and village level (5th). Provincial level city is the highest level of city which is directly under the Chinese central government, with status equal to that of the provinces and large discretion with regard to economic policy. Sub-provincial level is a special case subdivision. Sub-provincial city is similar to prefecture-level city governed by a province, but is administered independently in regard to economy and law. Sub-provincial cities are mostly the capital of the provinces in which they are located.

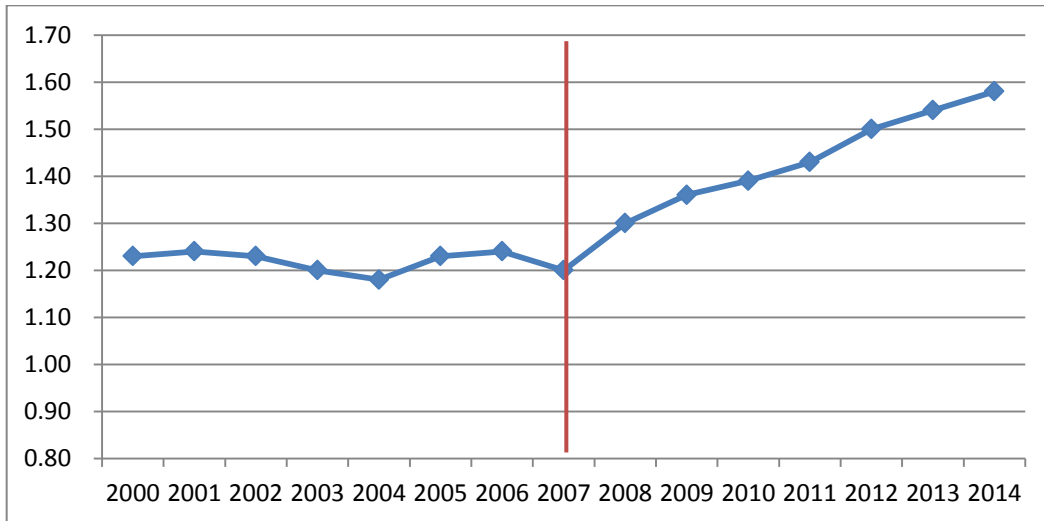


Figure 1.3.2: The Percentage of Wuhan Municipality's GDP to Whole China 2000-2014
(Unit: %)
(Source: *Wuhan Statistics Yearbook*, *China Statistics Yearbook*)

1.4 Dongxihu District

Since Wuhan is a huge metropolis with over 10 million people, it would be difficult to research the entirety of Wuhan's peri-urban area within the resource constraints of a Master's thesis research project. Related, it was deemed more important to achieve a deeper understanding of the interface of urban functions and spaces by focusing on one representative peri-urban area. Because data in China, as elsewhere is analyzed by jurisdictions, one representative peri-urban district was identified for the research, namely Dongxihu District. Districts are the spatial unit directly below the municipality.

Wuhan Municipality consists of thirteen districts, including seven inner districts in the urban core and six outer districts on the periphery (Figure 1.4.1). As in other big cities in China, major residential, commercial and service functions are concentrated in the core urban area, while manufacturing zones are located on the periphery. In the Wuhan case, the urban periphery is divided into four functional sectors with different designations (Figure 1.4.2). I considered all four peripheral functional areas as potential case study areas. Dongxihu, the district in the airport-

related functional sector on the north-western fringe of the Wuhan metropolis, is selected as the case study area for the following reasons: First, the size of its jurisdiction is appropriate in that Dongxihu District does not contain excessive purely rural land. Chinese cities always tend to be overbounded, including Wuhan. Thus many districts on the fringe of Wuhan cannot be considered as peri-urban zone because these jurisdictions reach too far into the undeveloped rural area. However, due to the moderate size of Dongxihu's jurisdiction (500 sq.km), the proportion of developed land and undeveloped land is relatively balanced, which makes it a typical peri-urban district. Second, Dongxihu is a very active outer district both economically and socially. Dongxihu's Gross Domestic production (GDP) was ¥497 million in 2013, which ranks second among Wuhan's outer districts. At the same time, it is the District with highest GDP growth rate (14%) in Wuhan between 2012 and 2013. Dongxihu's population in 2012 was 490,000, accounting for 5% of the total population of Wuhan Municipality. Its GDP per capita in 2012 (¥82824 million) ranks fourth among all districts, even better than most districts in urban core. All these indicators show that Dongxihu district is currently undergoing a rapid development process. Lastly, Dongxihu is a high profile district strongly supported by public policy. Since the whole district is designated as a national level economic and technological development zone (ETDZ), it enjoys competitive advantage relative to other districts, enabling it to offer a series of preferential locational incentives. Dongxihu District already has gained a reputation as one of the significant manufacturing centers in Wuhan. Besides, Dongxihu District constitutes the majority of the airport-based area, which is located in the northeast of Wuhan municipality. The center of Dongxihu District is only thirty minutes' drive from Wuhan Tianhe airport. In conclusion, Dongxihu District is an ideal sample case to study peri-urbanization in Wuhan due to its location on the urban fringe, appropriate mix of urban, urbanizing, and rural land, rapid economic development, as well as elevated political / administrative status as a manufacturing and airport-based ETDZ.

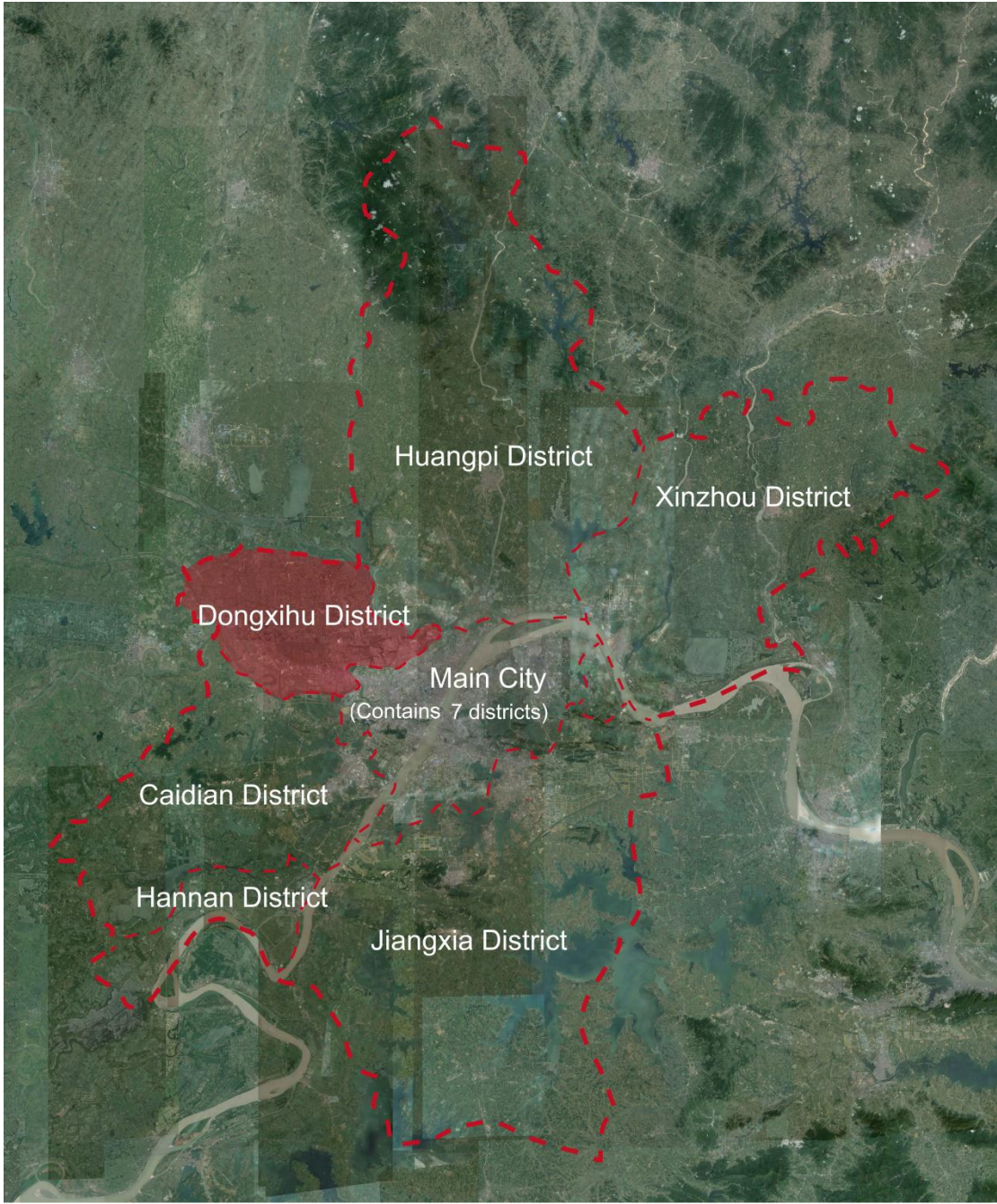


Figure 1.4.1: Districts of Wuhan Municipality
(Source: Drawn by the Author)

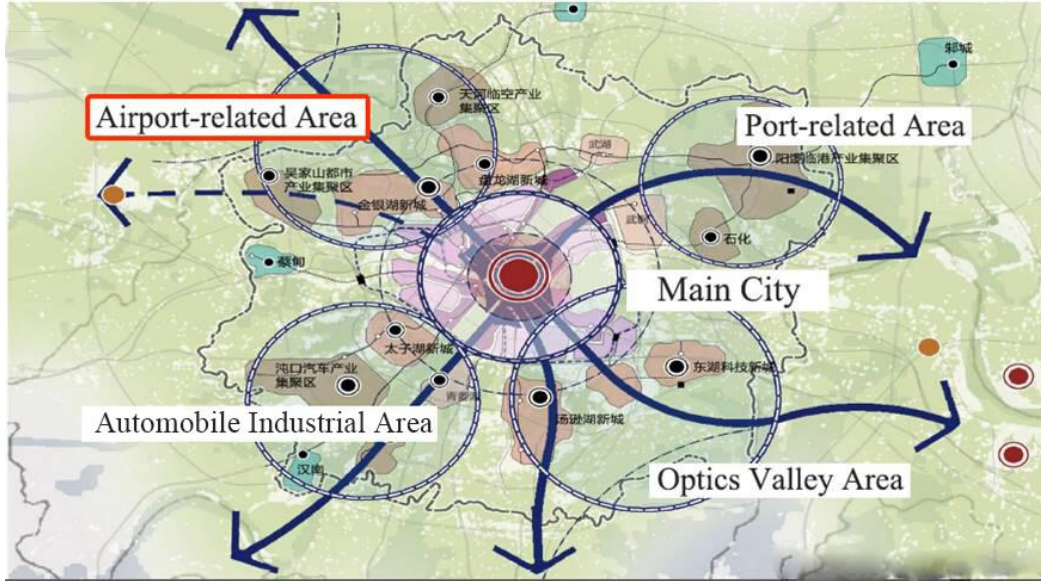


Figure 1.4.2: The Spatial Economic Structure of Wuhan's Periphery
 (Source: Wuhan Urban Planning and Land Resource Bureau)

Dongxihu District's history also justifies its suitability as this study's case study area. It used to be a collection of several large state-owned farms from the 1950s to early 90s. Dongxihu was a rural district mainly featured by agricultural activity at earlier time. Meanwhile, a few small state-owned enterprises (SOEs) and township and village enterprises (TVEs) for manufacturing have also emerged at state-owned farm stage. In the mid-90s, the District set up a Taiwan investment zone and facilitated a Taiwanese food firm called "Uni-President" acquiring a badly operated local food SOE. This pioneering action triggered the following large-scale inflow of FDI and the booming of manufacturing in the District. In 2000, a provincial-level ETDZ was established based on the previous Taiwan investment zone. In 2010, the whole district was designated as the national-level ETDZ named "Wujiashan Economic and Technological Development Zone". In 2013, its name was changed to "Wuhan Airport-based Economic and Technological Development Zone", aiming to take fully advantage of its proximity to Wuhan Tianhe International Airport to stimulate investment. Today, the source of manufacturing investment in District has become more diversified rather than being mainly from Taiwan. All these experiences indicate show that Dongxihu has undergone intensive and fast-paced transition from rural area into manufacturing zone over the last twenty years.

1.5 Thesis Outline

Chapter 1 of the thesis introduces the general background of this research, which sets the context to understand the following analysis of peri-urbanization in Dongxihu. In Chapter 2, related literatures on peri-urbanization are reviewed to identify the current state of knowledge on peri-urbanization as a concept, including definition, characteristics, and underlying drivers. As well, Chinese case studies of peri-urbanization are reviewed. Chapter 2 establishes the theoretical base for this study and identifies a research gap that this thesis to address. Chapter 3 discusses the thesis methodology, providing information about how relevant data are collected and assessed in order to move towards conclusion. Chapter 4 describes how the peri-urbanization process in Dongxihu is expressed in terms of land use, economic activities as well as demographic changes. Chapter 5 identifies underlying drivers of peri-urbanization in Dongxihu. Chapter 6 attempts to provide theoretical explanation for Dongxihu's peri-urbanization by putting this case study in the context of current understanding of interior China peri-urbanization, as well as identify policy implications which follow from the analysis, some of which are relevant to guide the peri-urbanization process in other interior cities in China.

CHAPTER 2

LITERATURE REVIEW

2.1 Definition and Characteristics of the Peri-urban

The term “Peri-urban” refers to the interface between city and countryside resulting from the process called peri-urbanization. “Peri-urbanization” is originally derived from French literature to describe the process during which the former rural areas influenced by urbanization process (Wikipedia, 2015). The most intuitive way to understand peri-urban zone is from spatial perspective. The well-known Burgess concentric ring model provides the initial idea that the peri-urban is the urban-rural fringe or the transitional zone between urban areas and more rural hinterlands (University of Nottingham and University of Liverpool, 1999). The early perception of the peri-urban is largely underlined by the conception of peri-urbanization as the extension of metropolitan urban growth on the fringes (Browder et al, 1995). The peri-urban, the urban core and suburbia, form the Extended Urban Region (EUR). Generally, the extent of peri-urban zone is 30-50km away from urban edge (Simon, McGregor, and Thompson, 2006), but this distance can up to as far as 150km or even 300km in the Chinese case (Webster, 2002).

However, this pure spatial modeling is not enough to have even an elemental understanding of the peri-urban (laquinta and Drescher, 2000). The drawbacks of a reductionist spatial modeling approach are over-simplification of the features of peri-urban areas and assigning definite boundaries around dynamic phenomena. The boundaries between urban and rural are getting blurred in many regions of developing world (Jone and Visaria, 1997).

The concept of peri-urban emerged from dissatisfaction with the dichotomous approach when considering rural and urban (laquinta and Drescher, 2000). Although activities in urban and rural can be described in a spatially separated way, there is always a continued and varied exchanged of resources between urban and rural areas (Adell 1999). And the peri-urban is the place of this interaction. Based on this ideology, some literatures have defined the peri-urban in

terms of urban-rural link. For instance, it is defined that “the peri-urban is a concept referring to a zone or area where urban and rural development processes meet, mix and inter-react on the periphery of the cities” (University of Nottingham and University of Liverpool, 1999, p.5). Besides, there is also a similar expression: “a peri-urban area, as a specific and non-neutral zone, refers to a transition or interaction zone where urban and rural activities are juxtaposed..... induced by human activities” (Douglas, 2006, p.18-29).

Another approach to understand the peri-urban is from its characteristics and functions. The peri-urban can be considered as the result of disorderly sprawl of urban areas (Blanco, 2012). Friedmann defined the peri-urban as “a zone of encounter, conflict, and transformation surrounding large cities”. He also argued the path during which urban penetrates into the heartlands of rural society is often marked by violence and pain (Friedmann, 2011, p.426). In other words, the peri-urban is the “area of social compression or intensification where the density of social forms, types and meanings increases, fomenting conflict and social evolution” (Iaquinta and Drescher, 2000, p.2). Spatially, peri-urban interface is characterized by mixed land uses and indeterminate inner and outer boundaries (Rakodi, 1998). More specifically, there is a constantly changing mosaic of both traditional and modern land use (Webster 2002). The Renewable Natural Resources Research Strategy (RNRS) of the UK’s Department for International Development gave a comprehensive definition in terms of peri-urban characteristics: “The peri-urban interface is featured by strong urban influences, easy access to markets, services and other inputs, ready supplies of labor, but relative shortage of land and risks from pollution and urban growth” (University of Nottingham and University of Liverpool, 1999, p.5). In addition, there are also scholars who define the peri-urban from its environmental performance in western cases. Peri-urban zone is not only the area experiencing direct impacts from urban growth and pollution, but is also a wider market-related zone of influence that is recognizable in terms of the handling of agricultural and natural resource projects (Simon, McGregor, and Thompson, 2006). Haase concluded that “peri-urban areas, which might include valuable protected areas, forested hills,

preserved woodlands, prime agricultural lands and important wetlands, can provide essential life support services for urban residents” (Haase, 2014, p.306).

What should be kept in mind is that peri-urban areas are the zones of changes instead of static status. The peri-urban is defined by its dynamic nature, wherein social forms and arrangements are created, modified and discarded (Iaquinta and Drescher, 2000). The land use patterns, labor markets and pressures on environments are all changing (Rakodi, 1998). Another important understanding in regards to the peri-urban’s changing nature is to think of peri-urban zone as the intermediate stage of the urbanization process during which rural areas become more urban. Thus the development of peri-urban areas can be considered as an inevitable consequence of urbanization (University of Nottingham and University of Liverpool, 1999). As cities grow continuously in rural areas, peri-urban zones simultaneously move outwards. This sort of understanding is mainly underpinned by ideology of “urban diffusion” rather than urban-rural interaction (Adell, 1999). Since peri-urban zones are often regarded as in a state of movement, peri-urban zones tend to experience a rapid development process especially in developing countries with a fast urbanization rate. The economic and social change in these areas is rapid (Rakodi, 1998). So it seems that peri-urban areas come and go, and mutate quickly through adaptation processes (Webster, Cai, Muller, 2014). Webster, in his early work assessing peri-urbanization in East Asia, puts the time-tested definition emphasizing both transitional process and characteristics: “peri-urbanization is a process in which rural areas located in the outskirts of established cities become more urban in character, in physical, economic, and social terms, often in piecemeal fashion” (Webster 2002, p.5). However, since the peri-urban is a place always evolving, there is a new peri-urban landscape with better planned developments with higher quality appearing in East Asia recently (Webster, Cai, Muller, 2014).

Efforts have been put into identifying a more comprehensive and detailed way to describe the concept of peri-urban as well as peri-urbanization. Following the ideology that the peri-urban is the intermediate stage of urban development, Iaquinta and Drescher (2000) focus their

attention to the concept of urban when defining peri-urban. They identified three components from the definition of “urban”: demographic component, economic sectoral component and social-psychological component. Assuming the peri-urban achieves certain degree of “urbaness”, some variations of those components help describe the peri-urban (Iaquinta and Drescher, 2000). The significance of this approach lies in its inclusion of social psychological reflection or response to urbanization (Fischer 1984). The economic, political and social impacts of rural-urban linkages are more likely to be on people rather than specific place (Rondinelli, 1983). But people’s behaviors, attitudes, tastes and values are always omitted when defining the peri-urban (Iaquinta and Drescher, 2000). While in China, the term “peri-urbanization” is associated with migrant workers (as drivers and impactees of peri-urbanization) living in cities without local registration, who cannot enjoy the same benefits and rights as registered residents.

Webster puts forward a very specific description of the peri-urbanization process in following terms of the following aspects: economic and employment structure changing from agriculturally-based to manufacturing-dominated; rapid population growth which often cannot be captured by official data; changing spatial patterns and rising land costs. (Webster 2002) This description aligns with most Chinese and East Asian cases. Nonetheless, modern production zones, leisure and tourism facilities and residential communities are important feature of second generation peri-urbanization on urban fringe of some East Asian cities (Webster, Cai, Muller, 2014).

When conducting empirical research on peri-urban areas, it is difficult to precisely define the specific peri-urban areas within a region and obtain data based solely on the identified area. In the research on peri-urbanization in Chengdu by Webster et al (2004), administrative delineation was used to define the peri-urban areas in a municipality for the convenience of obtaining data. In China, since a municipality can be divided into different districts or counties/county-level cities with clear boundaries, researchers put these districts and counties into categories of urban, peri-urban and rural according to their development status, so as to align the

study areas with specific data. It is a practical way to define the peri-urban especially in China where data is rare and hard to obtain.²

Last, it should be noted that peri-urbanization process and peri-urban zones, by their nature, are amorphous and uncertain. There is no single theory or model that can adequately explain what happens in the urban-rural fringe (University of Nottingham and University of Liverpool, 1999). Therefore, the definition of peri-urban areas and peri-urbanization should be examined case by case. It makes no sense to figure out exactly where a peri-urban zone is or what the specific boundary of peri-urbanization is. It is more important to understand the peri-urban area from the perspective of dynamic, characteristic and function. Besides, since there are obvious differences between peri-urbanization in developing countries and developed countries (Woltjer, 2012), the following review will predominately focus on developing countries in East Asia especially China, the subject matter of this thesis.

2.2 Drivers of Peri-urbanization

2.2.1 Foreign Direct Investment (FDI)

FDI is the most significant driver affecting peri-urbanization in most of East Asia. FDI, particularly in manufacturing, is often the trigger stimulating peri-urbanization around the fringe of large East Asian cities (Webster, 2002, also see Woltjer, 2012). And the investment of large global property developers may also significantly influence the magnitude of peri-urban development in major metropolitan regions (Winarso and Firman, 2002; Sajor, 2003). The importance of FDI lies in its ability to provide a capital base for peri-urbanization (Jessop, 2000). FDI introduces capital from outside for industrial, commercial and housing development, which is increasingly destined to newly opened industrial parks and development zone in the periphery of big cities (Hao, 2012). The Organization for Economic Cooperation and Development (OECD) argues that FDI is an increasingly important source of capital which generates jobs and upgraded

² With enough resources or access, in some cases people can obtain sub-district data, e.g. street level, in China; but this is not publicly published data.

skills (OECD 2000), thus it is not hard to figure out that FDI can help attract rural labor migrants from other places to peri-urban areas as it does to cities (Hao, 2012). In China, FDI is considered as the key agent of urban spatial transformation (Huang and Wei, 2014). A previous study based on time-series and cross-sectional analysis indicated China's urbanization from 1978 to 2000 had been mainly driven by the inflow of FDI rather than other factors such as changing policy or economic growth (Zhang, 2002). Other research also found that in the Pearl River Delta of China, urbanization, especially peri-urbanization was caused by external forces in the form of small and medium-scale, labor intensive manufacturing and trade-creative investment (Sit and Yang, 1997). Inflows of FDI were also identified as the major contributor to the inter-regional difference between interior and east-coast China urbanization rates (Zhang, 2002). Moreover, in the Chinese case, domestic investment can also play a propulsive role when combined with FDI to facilitate peri-urbanization, especially in some not very high-level development zones (Webster, 2002).

Global capital decisions, through FDI, greatly empowered the rapid changes on the fringe of large Asian cities (Woltjer, 2012). Wu and Radbone (2005) also see global capital as an influential factor for urban growth. So peri-urbanization in developing countries can be regarded as the consequence of globalization. According to Sassen and other scholars, the control function of capital is concentrated in a few "global cities", but production functions decentralize throughout the world (Sassen, 1991). So for less-developed areas, opening up to global markets can lead to the infusion of FDI by those who seek production place, thus facilitating urban development, including peri-urban development. China has already become the second largest recipient of FDI in the world due to three decades of economic reforms and open door policies (UNCTAD, 2013).

FDI comes to peri-urban areas for industry and the property market (Goldblum and Wong, 2000). In order to get profit, FDI manufacturing seeks for lower land prices and cheaper labor in peri-urban areas (Clark, 2006). Another factor attracting FDI is the closeness to established infrastructure. For instance, FDI tends to move towards new international airports in the Kuala

Lumpur case (Douglass, 2000). Based on quantitative evidence from 23 countries, Hsiao and Shen (2003, p.893) concluded that “economic growth, predictable behavior, trustworthiness, and commitment from government institutions, infrastructural development of sites, and lower tax rates are important factors in attracting FDI”. Development zones in peri-urban areas are such places with huge development potential accompanied by various preferential policies. Webster (2002) identified the main reason for FDI’s largely locating at peri-urban fringe rather than farther suburbs, namely the availability of large areas of land in peri-urban areas which meet modern manufacturing’s demand for large perimeter single-story production structures (associated with just-in-time production) and relatively easy access to major urban cores offering better high-level services. Foreign investors also agglomerate near government facilities in order to have better interaction with decision-makers (Sjoberg and Sjolholm, 2004). Besides, kinship or ancestral ties may also cause foreigner invest in certain areas, such as Chinese-American investors in Pearl River Delta (Johnson and Woon, 1997). Lastly, existing FDI would also reinforce an area’s attractiveness to more FDI, because foreign-owned firms tend to be more spatially concentrated (Sjoberg and Sjolholm, 2004). This is reflected in the fact that Chinese industrial zones often use existing foreign tenants to help them market sites to new foreign investors. Accordingly, in China, peri-urbanization tends to be concentrated in coastal areas with an already higher level of urbanization³, a higher level of previous FDI, and cumulated experiences that support industrial and economic developments in rural areas between developed cities (Hao, 2012). However, there is a new trend in China that FDI driven manufacturing is starting to jump to interior regions from coastal areas on a large scale (Webster, Cai, Muller, 2014). For example, Foxconn, the world’s largest peri-urban employer, is locating all its new factories in the peripheries of interior Chinese cities such as Zhengzhou and Wuhan (Cox, 2010). Webster (2014) argued the reason is that mature peri-urban areas in east coast China tend to spin off low-value manufacturing and then focus on a limited number of specialized clusters; at the same time, manufacturing moves

³ The exception is north-east China, with its very high levels of urbanization, partially associated with its role as the industrial core of China during the Mao era.

inland for even less expensive labor and land, while coasts become increasingly expensive in terms of land, labor and cost of living.

2.2.2 Public Policy

Public Policy is also a significant driver of peri-urbanization. Many scholars consider city fringe space as the product of the interaction between a government's intervention and local key stakeholders' action (Scheingart, 1989; Haumont and Marie, 1987). Based on the above discussion about FDI, it can be concluded further that investment in the peri-urban is actually the result of mutual selection. Not only do investors think that the peri-urban is a good place to locate/invest, governments also try to attract manufacturing firms to be clustered in industrial estates in peri-urban areas (Webster, 2002). The fierce competition for investment makes developing countries speed up urban place-making and urban place-promotion to capture the mobile capital (Jessop 2000). More loose land use regulation on peri-urban industrial land is a strong incentive for manufacturing. For instance, in many East Asian countries, national environmental laws do not apply to these industrial areas outside formal zones (Webster, 2002), so investors can have relatively more freedom in such areas. Public policy can also facilitate peri-urbanization by providing funding or collaborative opportunities (e.g., public-private-partnerships) to build key production support infrastructure such as highways, railroads, container handling facilities, or even airports and sea ports (Webster 2002).

The power of public policy on peri-urbanization outcomes can be also found when cities move administrative boundaries outwards. When the city's government intends to integrate surrounding areas (e.g., in China, by converting counties on the urban edge to urban districts that are more strongly integrated into the "city proper") to establish regional coordination, peri-urban zones can be strongly affected by the urban core in economic, social, demographic and environmental aspects (Simon et al, 2004). The most aggressive part of this process is the large-scale acquisition of agricultural lands by governments in some East Asian developing countries, especially China, but including other East Asian countries such as Thailand. This top-down

acquisition policy forces the rural areas to undergo passive peri-urbanization. As Narain (2009, p.501), in his research on peri-urban Gurgaon, India, claimed that the expansion of city leads to large-scale acquisition which has “altered patterns of rural natural resource use..... and bred resentment among many peri-urban residents against urban authorities”. In China, the situation is similar: the municipalities are always over bounded, facilitating municipalities controlling land far beyond the urban core. In China, most local governments have become reliant on rural land expropriation followed by land sales income (World Bank 2014). Typically, municipalities in China obtain approximately 25% of their fiscal revenue from land sales, with peri-urban areas playing a significant role because of the greater availability of land in peri-urban areas. This also explains the situation whereby inexpensive agriculture land (compensation to farmers is based on rural not urban uses of the land) in peri-urban areas is acquired for the sole purpose of speculation (Woltjer, 2012).

Public policy can influence peri-urban development from the perspective of resource allocation. At the municipal scale in China, most cities adopt policies that disperse manufacturing to the urban periphery for environmental and land availability reasons. Population is attracted by the jobs subsequently located plus lower priced market housing which reflects lower land prices on urban peripheries. This decentralizing dynamic from core cities is justified by its effects improving the livability of core cities through reduction of traffic, pollution and industrial accidents (Webster, 2002). Although peri-urban development involves huge capital spending and is politically sensitive, most of time it generates strong support from public polices because it generates economic growth, more tax revenues, employment creation as well as enhancement of regional competitiveness, all outcomes that are highly valued in China (Webster, 2002). At the national scale, public policy can also greatly influence the flow of investment, thus contributing to variation in peri-urbanization processes, characteristics and outcomes across regions. For instance, China’s reform and openness policies in the 1980s-90s greatly benefited the experimental development zones in east coast areas. However, around 2000, national policies including the “GO WEST”, “Northeast China Revitalization” and “The Rise of Central China”

started to bring resources to interior China (Huang and Wei, 2014). So in recent years, inland peri-urbanization seems to be more dynamic than east coasts. However, it is easy for national government to induce peri-urbanization in certain areas from a supply side perspective, but whether it can really succeed depends on local government's ability to constantly support the development (Webster, 2002).

The impact of public policy on peri-urbanization varies among different places and over time (Webster, 2002). The changes in China's policies between inland and coastal regions mentioned above serve as one example. Whether spatial governance is strong or weak is one of the main factors in urban expansion (Ravetz, Fertner and Nielsen, 2013). Internationally, while Thailand strongly promoted the development of Eastern Seaboard, the Philippines lacked policy commitment to peri-urbanization (Webster, 2002). However, public policy can also function as the counterforce against peri-urbanization. Policies like urban growth boundaries, compact develop rules or rural land protection regulations may prevent cities from spilling over into rural areas. At the same time, the practice of separating land use as urban, agriculture and water tends to contradict with the dynamic nature of many peri-urban areas (Woltjer, 2012).

2.2.3 Population Shift

Growing population and its consequences in peri-urban zones results in changing demand for housing, commercial areas and public facilities (Ravetz, Fertner and Nielsen, 2013), thus stimulating the peri-urbanization dynamics. There are two main sources of peri-urban population growth, the most significant of which is from rural migration. This major population shift from rural to peri-urban areas can be described as the process whereby surplus rural labors feeds the high demand for low costs workers by labor-intensive industries financed by foreign capitalists (Lin, 2006; Hao 2012). There are two stages of rural migration. Initially, wage differentials, relaxation of household registration regulations, rural labor surplus and more non-farm opportunities are the triggers for migration (Liang and White 1997; Johnson 2002). Then, social resources / networks of migrant networks play an important role in sustaining the self-

perpetuating migratory movements (Massey et al. 1993). Zhao (2003) also claimed that early migrants from villages have positive, significant effect on subsequent migration. Hao (2012) provided detail description for this social connection in migration. First, constant out-migration in a certain rural area gradually becomes part of the community's values, thus driving succeeding youth to follow in their predecessors' steps to look for opportunities in the peri-urban around large cities (Hao, 2012). Second, current migrants in destinations can bring market information and entrepreneurial opportunities to potential migrants in villages through networks of kinship, friendship or shared community origin (Burt, 1992), thus lowering the costs and risks for migratory movement and increasing the expected returns of migration (Hao, 2012). Social network based mechanisms are especially important in China where personal relations in social networks are known as "guanxi", which significantly affects job searching and hiring (Bian and Ang, 1997). As the result of factors mentioned above, huge numbers of rural migrant workers, particularly from poor regions in countries (Webster, 2002), keep moving to peri-urban work places far away from the origin village and often beyond crossing provincial borders (Hao, 2012). Although rural to urban migration is mainly concentrated in the eastern costal area (Fan, 2008), there is a new trend - rural migrant workers are becoming more likely to go to peri-urban areas in nearby urban areas instead of coastal areas (Webster, Cai, Muller, 2014; also see Chan, 2012). Workers' changing preference for shorter migration starts to benefit peri-urbanization process in interior cities such as Wuhan and Chengdu (Webster, Cai, Muller, 2014). Besides, local villagers in rural areas enveloped by peri-urbanization also constitute the workforce (Webster 2002), but this factor is relatively small when compared to huge migrant workers' flows.

Since rural migrant workers are usually poor, they tend to create a demand for cheap housing which allows them to live on lower wages and therefore bring down the cost of production (Wu, Zhang and Webster, 2012). The Land ownership and responsibility ambiguities in peri-urban areas caused by urban-rural dualism, weak administration and piecemeal land acquisition provide an environment for informal rental housing (Wu, Zhang and Webster, 2012). In China, rural collective land in peri-urban areas is often the source of inexpensive housing

(Webster, Cai, Muller, 2014). Households on local collective land which lacks clear property rights can convert their dwellings to rental housing or use land to build three or four stories structures with plenty of rooms to rent to industrial workers (Webster, 2002; Zhao 2012). As a result, there are widespread self-built, high-density and low-quality housing for rural migrants in such areas (Wu, Zhang and Webster, 2012). Webster et al (2014) also found evidence that in some places slums are near employment clusters. Besides, some firms provide onsite dormitories and service facilities for workers (Webster, Cai, Muller, 2014), which may lead to better living conditions than self-built informal rental housing.

Except rural migrants, there are also other factors driving increased population in peri-urban areas. Some people, especially lower-income groups, are pushed to the urban fringe by high housing prices in the urban core (Webster, Cai, Muller, 2014). For instance, China's housing price ranks as the second least affordable in the world (Cox, 2014), so it is relatively hard for the general public to afford houses in the urban core especially in large cities. However, according to location theory (rent-bid), housing prices decrease as one moves away from the magnet site (O'Flaherty, 2005). Empirical studies have proven that affordable housing is more likely to spatially cluster on urban fringe in cities like Beijing (Chen, Zhang, Lu, 2015; Huang 2015). So people with relatively low purchasing power chase low housing prices in peri-urban areas. This need for less expensive housing could be met by joint action by local urban governments and real-estate developers to promote many high-density types of development utilizing open spaces in peri-urban zone (Wei and Zhao, 2008). However, land developers chasing cheap land in the peri-urban would result in leapfrog patterns (Webster, Cai, Muller, 2014). In addition, the formal displacement of households by the government can also resettle people in peri-urban areas away from urban core, the Philippines is a prime example, but urban relocation in China generally results in outward relocation (Webster, Cai, Muller, 2014). In China's urban renewal projects, residents in old town or urban village might be relocated at housing around urban fringe, e.g., in Shanghai.

Not only lower-income people and rural migrants live in peri-urban areas, upper-middle class people may also choose to live in the peri-urban even they do not work there (Webster, 2002). As populations become older and richer, new options for residence with higher scenic value and better security are emerging in the peri-urban, including second-home, retirement communities and villas for rich people or celebrities (Webster, Cai, Muller, 2014). However, since people would still rather to be centrally located in most East Asian countries due to cultural preference, this driver for peri-urbanization residential housing is not so significant yet among upper income groups (Webster, Cai, Muller, 2014)..

2.2.4 Amenities

Demand for amenities is a new emerging driver for peri-urbanization in most developing Asian countries. Underpinned by improved transportation networks serving urban peripheries and raising middle and upper middle class, this new driver is creating a new generation peri-urban landscape (Webster, Cai, Muller, 2014). Increasing income leads to consumption culture which affects the identity and perception of peri-urban places through leisure and tourism (Ravetz, Fertner and Nielsen, 2013). As already discussed above, some rich and senior people are starting to move out of urban core to seek more livable environments. Besides, land-extensive tourists and leisure facilities catering to urban and international clientele are also concentrating in peri-urban zones in developing areas (Simon, McGregor, Thompson, 2006). Webster et al (2014) pointed out that leisure facilities such as Disneyland, F-1 racing tracks, stadium and large religious compounds are popping up in the urban periphery in East Asian countries. At the same time, peri-urban tourism has become a new trend of life among urban residents. Travelers from cities spend a day or weekend in peri-urban tourist spots. These sites are often characterized by informal or formal convenience hotels and restaurants opened by local villagers who want to seek opportunities after their villages are enveloped by urbanization process (Webster, Cai, Muller, 2014). The question in regard to inland peri-urban areas, such as Wuhan, is whether these more diversified peri-urban landscapes driven by factors such as amenities will increasingly

characterize peri-urban landscapes or whether this will occur later in the peri-urban trajectory in interior peri-urban areas.

Among the various tourism activities in the peri-urban, agro-tourism has attract the most intensive research. Visitors come to farms or rural areas for the purpose of enjoyment, education or active involvement in rural activities by combining agricultural production and tourism (Yang, Cai, Sliuzas, 2010). This trend is a reflection of a lifestyle based on ideas of what is rural and what is urban (Nilsson, 2002). With improvements in mobility and communications during urban development process, higher income and new technology can encourage tourism everywhere, particularly in peripheral urban areas (Townsend, 1992). Although agro-tourism is based on particular land uses in rural space, it is still closely linked to urbanization processes (Williams, Shaw, 1999). Peri-urban areas are ideal for the agro-tourism industry because they combine rural activities with urban access. Although agro-tourism is often viewed as recreation, not business (Page, Getz, 1997), it not only stems from small scale family-based development but increasingly is driven by large-scale and highly organized businesses operated by large enterprises (Yang et al, 2010). This kind of development is inevitably changing the rural landscape of inner peri-urban areas in Chinese cities such as Beijing, Tinian, Wuhan, Chengdu and Zhengzhou (Yang, Cai, Sliuzas, 2010). Lastly peri-urban agro-tourism has multiple benefits. It is able to stimulate the economy in peri-urban areas and create jobs for local villagers, at the same time provide high quality open spaces and recreation opportunities for urban people, plus offering environmental services, thus offering a means to promote integrated urban and rural development in a manner that can counteract some of the negative impacts of urbanization (Yang, Cai, Sliuzas, 2010).

2.3 Literature Review: Peri-urban China

Peri-urbanization is uncertain and there is much diversity across cases, so detailed empirical study on a specific site is needed to truly understand the peri-urban dynamic of a certain place. Since this thesis focuses on China, several Chinese peri-urban studies are reviewed so as to grasp what we know about peri-urbanization in different part of China.

2.3.1 North China

For north China, previous studies are predominately concentrated on Beijing – the national capital. Although temporary migrant residents have continued to grow, the structure of migrants in peri-urban Beijing has greatly changed towards the young and well-educated since 2000 (Zhao, 2012). However, the inequality between migrants and local people has also increased in aspects such as access to public services. Zhao (2010) also concluded sprawling development still dominates in peri-urban Beijing, but new economic clusters such as advanced business parks and high-tech R&D areas are rapidly emerging on Beijing's fringe. Liu, Wang and Chen (2010) observed that mass recreation market growth has led to the development of recreational business clusters in peri-urban Beijing, including commercial recreation areas with good accessibility and agricultural recreation areas near large-scale scenic sites. Besides, there are many ecological parks constructed in peri-urban Beijing to relieve the ecological pressure of high-speed urbanization, such as Beijing Olympic Forest Park (Zhang, Zhang, Hu, Liu and Li, 2012).

Apart from Beijing, researchers also paid attention to other places in north China. Sun (2012) pointed out there are three types of peri-urban residential settlement in Tianjin: rural resettlement projects; affordable housing compounds and suburban commercial housing estates. But lack of conception of sustainability among developers, decision makers and residents led to low level sustainability performance of these settlements (Sun, 2012). It was also identified that peri-urbanization could occur around middle size cities far away from major metropolitan areas, but located in regional transportation corridors. For example, the urban periphery of Zaozhuang city in Shandong province experiences peri-urbanization based on low-end TVEs (Zhu, Zhao, Jiang and Li, 2006). However, there is very limited literature on urbanization and peri-urbanization in Northeastern China where urban development is slowing down due to the decline of the old industrial base; in fact many northeast urban centers are experiencing population decline.

2.3.2 East Coast

As the Region first open to the global economy and most economically developed in China, the east coast has undergone dramatic urban development over the last few decades. It is also the Region that receives the most intensive research in terms of peri-urbanization. There are two major metropolitan areas on the east coast: the Yangtze River Delta and the Pearl River Delta.

When talking about peri-urbanization in Yangtze River Delta, Shanghai is always the first place to look at. Ge and Tian (2011) examined the evolution and characteristic in peri-urban Shanghai in terms of social-economic structure, population, employment and land use, then argued peri-urbanization in Shanghai is driven by both top-down and bottom-up forces. Specifically, development zones and the concentration of FDI led to dispersed growth and environmental degradation in peri-urban Shanghai (Wu, 2008). Sprawl associated with industrial uses, fragmented and low efficient land use as well as concentration of the urban poor is threatening the sustainable development of peri-urban Shanghai (Tian, Ge, Li, 2014; Ge and Tian, 2011).

Besides Shanghai, some cities in Zhejiang province also play important role in Yangtze River Delta. In their study regarding peri-urbanization in Hangzhou – Ningbo Corridor, Webster and Muller (2002) highlighted bottom-up development based on township and village enterprises (TVEs), flagship developments based on economic and technological development zone (ETDZ) as well as economic clusters of particular products as the key elements of peri-urbanization. They also identified self-adaption of local communities as complementary to official governance in shaping peri-urban areas and maintaining their viability. Liu and Zhang (2008) found that established peri-urban zones in the Hangzhou area are mainly driven by top-down forces such as FDI and expansion from urban core; at the same time, new emerging peri-urban zones are mainly driven by bottom-up forces such as small scale manufacturing. By studying Shaoxin county, Liu

et al (2005) concluded peri-urbanization will inevitably happen in densely populated areas in latecomer countries since peri-urban manufacturing can largely accommodate rural labor surplus. In addition, the south part of Jiangsu province is also highly developed and experienced intensive peri-urbanization. Cao and Zhang (2010) explained peri-urbanization in Changshu, a county-level city in Jiangsu province, is facilitated by the following factors: advantageous location and transportation network, major metropolitan areas' influence, firms' transition from state-owned to private-owned as well as foreign investment. However, sporadic distribution of TVEs, piecemeal land use and rapid expansion of industries all make a better planning administration necessary to guide the sustainable development of peri-urban Changshu (Cao and Zhang, 2010).

Many scholars have also done studies on peri-urbanization in the Pearl River Delta. Zheng, Liu and Cheng (2003) concluded specific anchor industries had evolved in peri-urban Dongguan after decades of rapid regional economic growth and urbanization. However, these industries based on inexpensive labor and land resources still constitute the low-end part of the global value-chain, thus lacking ability to innovate and develop sustainably. Nanhai, a peri-urban district in Guangzhou, is also identified as unsustainable due to a fragmented urbanizing landscape shaped by village-based land shareholding co-operatives and informally leased collective land (Zhu and Guo, 2013).

Because of the rapid urbanization process in the Pearl River Delta, residents and stakeholders have started to expand their influence throughout the Pearl River Delta, namely the provinces around, but outside the original Pearl River Delta. For instance, Fujian province has drawn much attention and investment. Peri-urbanization in Xiamen, the capital of Fujian province, was identified to be mainly driven by urban population growth, policies at different levels, economic structural change and infrastructure construction (Huang, Cui and Shi, 2012). A study on Quanzhou points out the peri-urban dynamic is driven by rural population surplus, development of domestic small-middle firms, foreign direct investment as well as government's policies. (Cheng, Wand and Li, 2010).

2.3.3 Western China

Peri-urban studies on western part of China mainly pay attention to two major cities: Chengdu and Chongqing. Although manufacturing is the main driver of urban growth in western China, the peri-urban in Chengdu show some different characteristics from east coast due to its deep inland location. Peri-urbanization in Chengdu is more driven by domestic investment rather than FDI when comparing to coastal cities such as Dongguan and Hangzhou (Cao, 2005). In terms of population, peri-urban Chengdu does not receive large-scale inter-province migration and largely relies on workers from nearby rural areas (Cao, 2005). Webster et al (2004) indicated this regional inexpensive labor resource is unlikely to run out of in near future. When it comes to public policy, decision-making power in Chengdu is highly centralized, but informal power relationships in different hierarchies are essential to securing agreement on development (Legates and Hudalah, 2014). Physically, peri-urban Chengdu is less dispersed and scattered than constellation-like coastal region cities. The core city plays indispensable role in regional development (Webster, Cai, Muller and Luo, 2004). In addition, Wang (2009) found agro-tourism and real estate development also play notable roles in the rural land conversion process in peri-urban Chengdu. In the long term, Webster et al postulate that peri-urbanization in Chengdu will increasingly resemble coastal areas but is still about ten years' behind coastal areas (Webster, Cai, Muller and Luo, 2004; also see Cao, 2005). Besides the drivers mentioned above, research on peri-urban Chongqing found that some people who have made money on the east coast are returning to the West and bring back capital to facilitate peri-urbanization process of their home town (Pan, 2009).

2.3.4 Summary

Already much literature discusses the definition and characteristics of peri-urban areas and peri-urban process. Spatially, the peri-urban is the space between urban and rural areas influenced by expansion from urban core. It can be considered as a rural-urban link space where rural and urban activities and developments mix. As a result, peri-urban areas can be a zone of

conflict and transformation when different factors fiercely interact with each other. The peri-urban is also a changing zone. As the intermediate stage of urbanization, the peri-urban evolves very quickly with mosaic land uses and indeterminate boundaries in fast developing metropolitan areas. Due to its amorphous and uncertain nature, no single theory can fully explain the peri-urban. So the definition of peri-urban can vary across cases. In terms of peri-urbanization in East Asia, Webster (2002, p.5) defined it is “a process in which rural areas located in the outskirts of established cities become more urban in character, in physical, economic, and social terms, often in piecemeal fashion”.

Peri-urbanization is driven by key factors; many scholars have discussed them. In East Asia, Foreign Direct Investment (FDI) is often the trigger of peri-urban development (Webster, 2002, also see Woltjer, 2012). Migrants, both rural workers who come for non-farm job opportunities and residents driven out of urban core by economic factors, are the source of vitality in peri-urban areas. Public policy also strongly supports peri-urbanization by expanding jurisdictions of municipalities, designating development zones, as well as investing in infrastructure. Increasingly, with increased affluence and the rise of a large middle class, people’s demand for amenities is the emerging driver of peri-urbanization in East Asia, accounting for high-end villa development, agro-tourism and leisure facilities, and second home development (including for retirees) emerging on the urban fringe.

Previous empirical studies of China’s peri-urban area largely confirmed the definitions and drivers mentioned above. In the Beijing – Tianjin area, peri-urbanization is mainly and increasingly driven by residential spillover and recreational development. The East Coast, mainly fueled by FDI, has experienced large-scale manufacturing driven peri-urbanization driven by both bottom-up (TVEs) and top-down forces (ETDZ), thus attracting massive numbers of inter-province rural labors into peri-urban areas. However, extensive growth of low-end manufacturing also causes piecemeal land use and concentration of low-income workers, which raise questions concerning the sustainability first generation east coast peri-urban areas. The peri-urban in the

West, although also mainly driven by manufacturing, are different from those of the East Coast. Firstly, they have generally developed later than East Coast peri-urban areas, perhaps learning from that experience. West Region peri-urban areas rely more on domestic capital and labor; peri-urbanization in west is not that large-scale. As a result, the landscape in western peri-urban areas is more orderly than constellation-like peri-urban areas of the Coastal Region.

The theoretical base for peri-urban research has been well established and many scholars have started to do empirical studies to examine specific peri-urbanization processes in particular places. As the most significant country in fast-developing East Asia, there is already a large-scale literature assessing peri-urban areas in Chinese cities. Surprisingly, in contrast to the North, East Coast and West Regions, another important region – Central China has not received much attention in terms of peri-urban study. It seems that there is still no researcher systematically investigating the peri-urban dynamics of Central Interior China, which represent a huge gap in planning and geography research in China. Many questions remain to be answered: Do identified drivers of peri-urbanization equally apply to Central China? Do Central China's peri-urban areas resemble its western neighbors such as Chengdu and Chongqing; do they replicate what the East Coast has gone through before? Is there anything new about peri-urban zone in central China due its unique location? Is Central China leap-frogging into the “New peri-urbanization”, i.e., second generation peri-urbanization? A comprehensive and detailed case study about peri-urbanization based on one representative zone in central China is definitely needed to address these questions and fill this gap. On a modest scale, this is the objective of this research.

CHAPTER 3

METHODOLOGY

3.1 Methodological Approach

To explore the peri-urban dynamic in Dongxihu, this study aims to find out what is changing in the District, and then explain these changes in terms of different drivers. The study region is the whole Dongxihu district, also known as the Wuhan Airport-based Economic and Technological Development Zone. Firstly, relevant data are collected to identify and analyze the changes spatially, economically and socially:

(i) To identify spatial change in Dongxihu, time series of land use data (2003-2014) and land-use license data (2010-2014) are assessed. Analyzing land use data shows how physical development has expanded into rural areas during the last decades. Land-use license issuance data can be used to identify the spatial pattern of developments in terms of different land-use types.

(ii) In terms of economic activities, the magnitude and structure of GDP and fixed investment data (2002-2014) are assessed to show the general trend of economic development in Dongxihu. An even more detailed GDP dataset (2009-2012) is utilized to provide a deeper insight into economic development in different sectors in the study area. Output value data broken down by firm origin (2005-2014) indicates the relative significance of contribution to economic development between domestic and foreign capital. In addition, a detailed firm-level analysis is also conducted to identify the current types and distribution of all industrial firms in Dongxihu.

(iii) To assess social change, this study examines time series residential population data (2002-2014) to illustrate the trend of population growth in Dongxihu. Spatial distribution of population (2010-2014) is also analyzed to reveal spatial pattern of population growth. The

source of migration is assessed to figure out where these people come from. In addition to population data re residents, I obtained employment data for different industries, enabling the development of a more comprehensive social profile of Dongxihu.

After identifying what is happening and changing in Dongxihu District, then this study tries to explain outcomes in terms of different drivers. Based on the discussions in previous peri-urban literature and the context of Wuhan, this study focuses mainly on the following specific drivers: manufacturing investment stimulated by policy and market forces, Infrastructure construction, land use policy, people's changing lifestyles, population growth/spillover as well as housing affordability. At the same time, the challenges of key drivers will also be analyzed. Finally, based on all analyses above, the characteristics and prospects of peri-urbanization in Dongxihu is summarized and assessed as a basis for policy implications to better guide the development of peri-urban zone in this area.

3.2 Data Collection

This study mainly relies on secondary data from official sources. Textual material released by Dongxihu District government is one of the major data sources. Every year, Dongxihu Statistics Bureau publishes an Annual Economic and Social Development Statistics Bulletin on the government website. GDP, industrial output value, fixed investment as well as population data can be found. This study uses this annual bulletin for the year from 2002 to 2014. Besides, the district almanac published later in each year confirm the data from the statistics bulletin and provide even more detailed data such as share of GDP. Since the district's almanac was only started in 2007, this research can only use almanac data for 2007-2013. All this information is numerical data. The time series of these numbers were manually transcribed into Microsoft Excel and then processed to reveal changing trends.

Besides traditional materials, spatial referenced data is also used. Due to the support from Wuhan Land Resource and Urban Planning Information Center, I was able to gain access to

the official planning database and identify useful spatial data. Since it is the responsibility for the local planning bureau to issue land use license and monitor land use change, there are comprehensive and detailed land use data and land-use license issuance data available for each year stored in this database. The information center also maintains socioeconomic data by collaborating with other municipal departments. In this database, there is spatial referenced population data for each community in Wuhan, which is derived from the regular population census. Moreover, the data from latest economic census in 2014 was just imported into the database. It is a large scale census that identifies the basic information including type, location and employment of all individual firms in Wuhan city, thus allowing a detailed firm-level analysis in this research. All these data are in the scope of whole Municipality, this study only use the part of them belongs to Dongxihu. Spatial referenced data are transferred, processed and visualized within ArcGIS environment.

3.3 Research Questions

Specifically, five main questions are addressed to explore the peri-urban dynamic in Dongxihu. For each main question, there are also several sub-questions to help build a comprehensive understanding of each aspect.

What Is changing In Dongxihu District?

- Economic activities
- Spatial Land use change
- Population change & distribution

What is driving this change? Possible drivers to be examined include following:

- Manufacturing investment: policy/ Market
- Infrastructure construction
- People's changing lifestyles
- Population growth/spillover
- Housing affordability
- Land use policy

What are the challenges for key drivers?

- Manufacturing investment
- Airport
- Public policies to attract firms to come
- Population change/ spillover effects

How can Dongxihu's peri-urbanization best be characterized?

- Can Dongxihu's peri-urbanization best be characterized as traditional manufacturing led, or is it representative of a diverse (second generation) mixed peri-urban process?
- Is Dongxihu's growth self-limiting?

What policy implication can be drawn from Dongxihu's peri-urbanization?

- How should the peri-urbanization be guided in Dongxihu?
- Are there lesson for other Interior cities that can be learned from the Dongxihu case?

CHAPTER 4

DEVELOPMENT DYNAMICS: PERI-URBAN DONGXIHU

4.1 Land Use

4.1.1 Spatial Structure

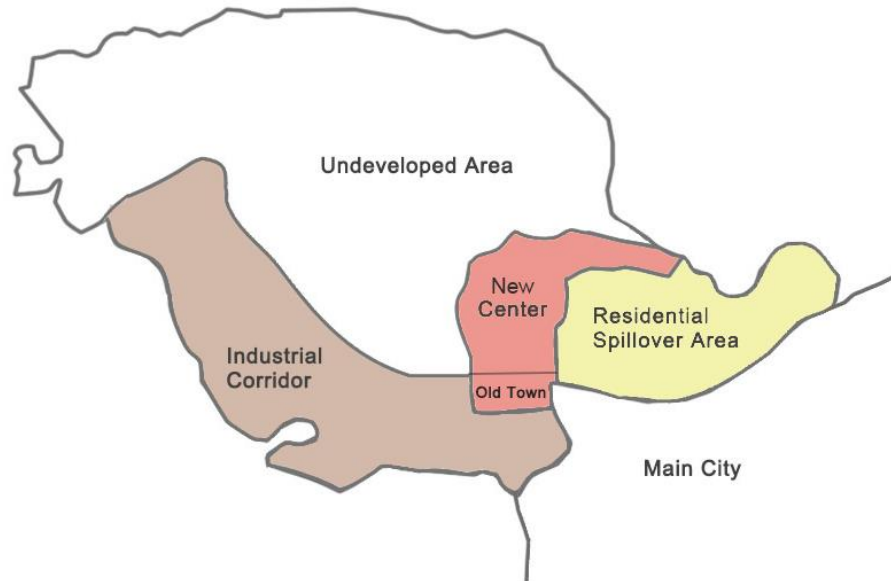


Figure 4.1.1: Peri-urban Structure of Dongxihu District
(Source: Drawn by the author)

In order to better understand land use changes in Dongxihu, it is necessary to first identify the basic spatial structure of Dongxihu's peri-urbanized area. Based on satellite image, field observations and related plans, most of the district remains undeveloped, the area under development can be considered to have three parts (Figure 4.1.1). Each part has different functions and unique place identity.

To the east, is the Residential Spillover Area characterized by numerous apartment complexes. This area is where Dongxihu primarily borders the main city (the urban area of Wuhan Municipality). Therefore, it is the area that receives most intensive influence from urban expansion into district. Previously, the area was mainly filled by a wetland lake called "Jinyin Lake", surrounded by farm lands. Around late 1990s, some real estate developers started to

target this area to build villas and low-rise dwelling (Figure 4.1.2) around the lake due to its high scenic value as well as comfortable and quiet environment. Development in this area resembled American suburbanization. However, an unexpected rapid urbanization process started in mid-2000s changed the development trajectory of this area. The dramatic increase in urban population in Wuhan led to high demands for housing, thus causing large-scale land development on the urban fringe. The Spillover Area in Dongxihu District is on one of the main vectors of urban expansion in Wuhan, so rural land in that area has been quickly acquired and filled by mid-high rise apartment complexes (Figure 4.1.3). Since then, this area is no longer the place a few people choose to live for enjoyment, but has become just another conventional living place for people relocating from the urban core. Today, the Residential Spillover Area has been developed as a suburban community. Walking on its streets which are much emptier than that of urban area, one can only see one residential project after another as well as a few commercial complexes.

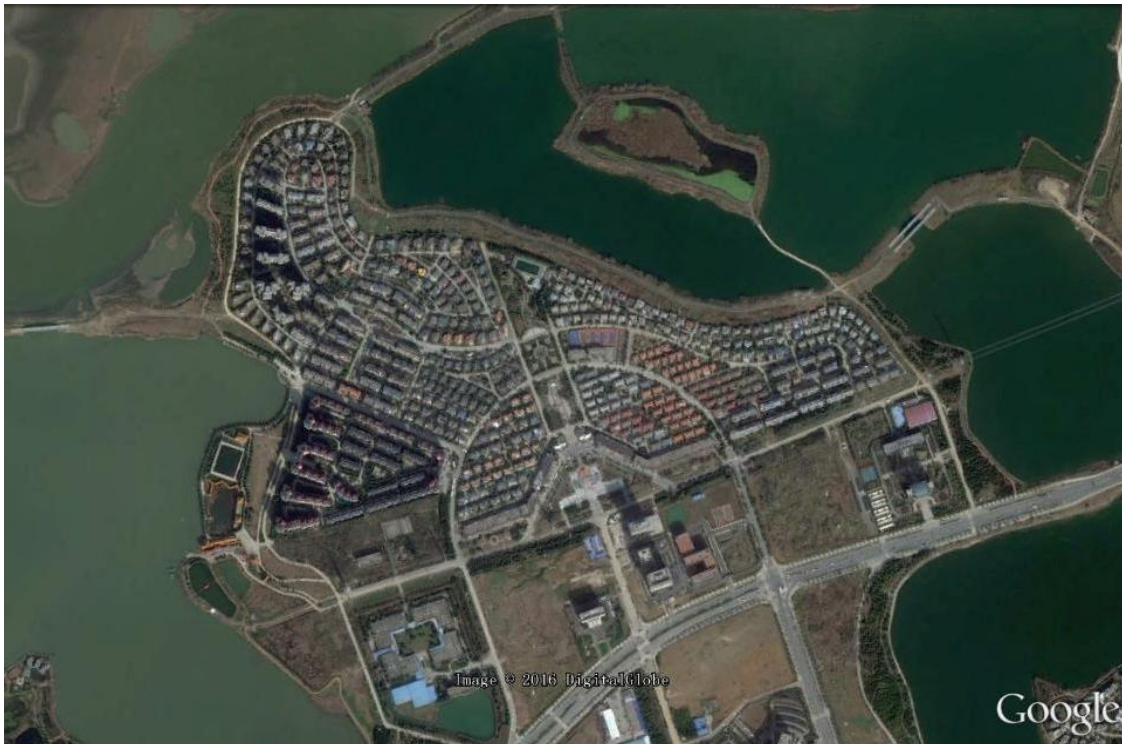


Figure 4.1.2: Villas and Low-rise Dwelling in Dongxihu's Spillover Area
(Source: Google Earth, image date: 2016)

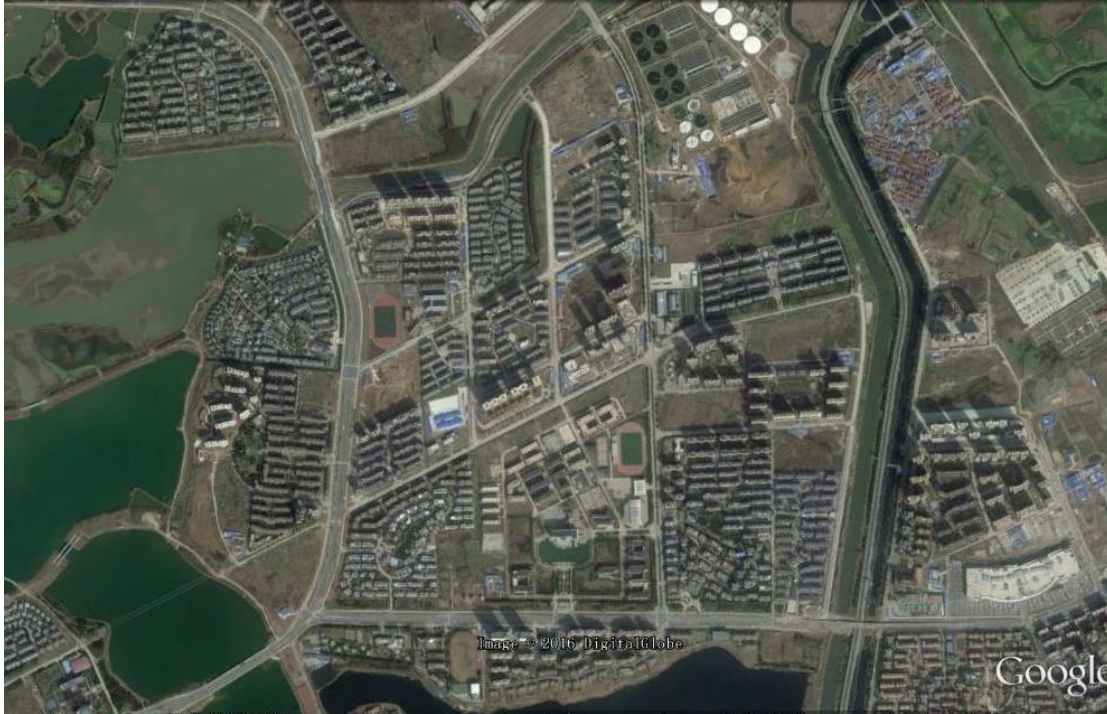


Figure 4.1.3: Mid-high Rise Apartment Complexes in Dongxihu's Spillover Area
(Source: Google Earth, image date: 2016)

While the Residential Spillover Area can be considered as an extension of the main city, the center of the District is more independent in terms of function and identity. The south part of the center is the old town where Dongxihu District originally started. It has long been district's central place where most public services, government agencies and commercial sites are located. Back to the time when Dongxihu was a collection of various state-owned farms, major administrative offices were set in this area. There is also considerable and plenty of housing and population concentrated in the southern center. However, since most of building in this area occurred before the 21st century, the south part of the center has an image of being deteriorated and dense (Figure 4.1.4), which is totally different from the new residential areas in the Spillover Area. Therefore, some of District government agencies are starting to move northwards which is relatively empty and undeveloped, aiming to lead the development of a new town with better environment so as to replace the function of old town in southern center.



Figure 4.1.4: The Old Town of Dongxihu District
(Source: Google Earth, image date: 2016)

The third major area is the Industrial Corridor characterized by a string of blue roofs (Figure 4.1.5). In China, manufacturing factories and warehouses tend to have blue color roofs which make it easy to distinguish them from other buildings. The corridor shape of the factories and warehouses is explained by the fact that they are generally located along the “G107”– an important national rapid road connecting Wuhan with other cities and regions. The industrial corridor is a typical peri-urban landscape: chessboard-like land use - a mix of blue roofs, vacant land waiting to be developed and green undeveloped rural land. The development of this industrial corridor started in the mid-1990s when the District first opened the Taiwan investment zone and introduced foreign investment. Since then, as more manufacturing investment comes to the District from increasingly diversified sources, industrial land has rapidly extended by occupying rural land along G107. In order to adapt to this expansion, the government has been trying to designate specific zones with different industries and functions along the corridor to better direct its development.



Figure 4.1.5: Blue Roof Environment in Dongxihu's Industrial Corridor
 (Source: Google Earth, image date: 2016)

4.1.2 Land Use Changes

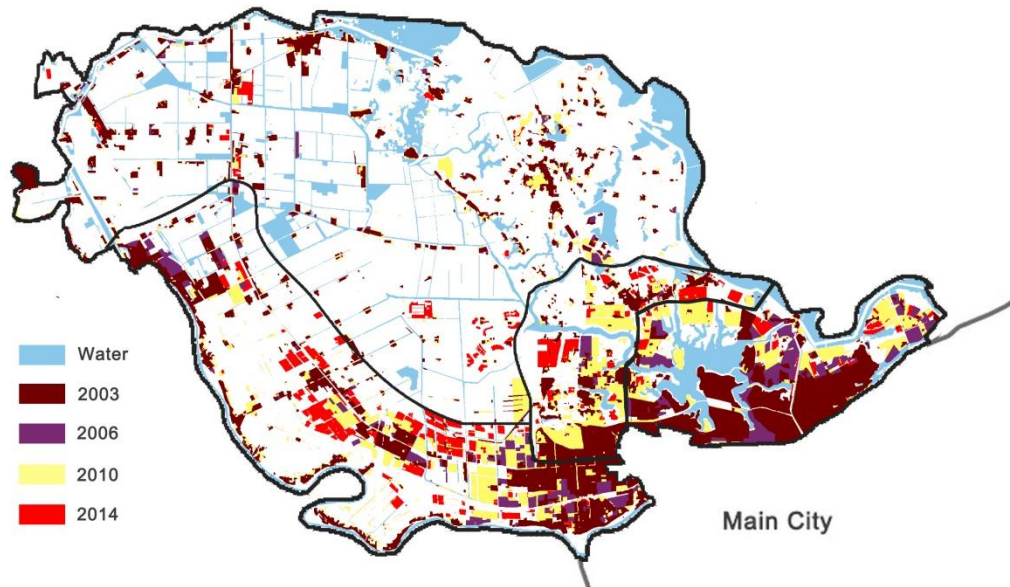


Figure 4.1.6: Changes of Built-up Area in Dongxihu (2003-2014)
 (Source: Wuhan Land Resource and Urban Planning Information Center)

Figure 4.1.6 above shows how built-up area in Dongxihu has expanded during the last decade. Dispersed constructed lands in the middle and north part of District are actually villages in rural undeveloped areas, thus essentially not peri-urban in character, which is the focus of the thesis. This study focuses on change in the built-up area in the three peri-urban areas, namely Spillover Area, The Center as well as Industrial Corridor. Generally, it can be seen that land use change in Dongxihu is occurring in typical peri-urban fashion. First, the extension of the constructed (built-up) area is very quick. In 2003, built-up lands of Dongxihu were mainly concentrated in a small area along the fringe of the main city. But only one decade later, the built up area already covers most of the southeastern part of the District and even penetrates along the Industrial corridor into the deep rural hinterland in the west of the District. Second, constructed land has expanded in a piecemeal way. It seems that development did not happen in an integrated fashion. Constructions occurred piece by piece, and leaving plenty of blanks between developments for potential in-fill development, - thus resulting in a chessboard landscape in Dongxihu's peri-urban zone.

Particularly, in the Residential Spillover Area, where most of the lands closely adjacent to the main city were developed before 2003, construction projects have mainly expanded in a circle around the lake between 2006 and 2010. The District Center has gradually developed towards the north from the original settlement in the south where district's old town is. The District Center's development also shows a trend to merge with the Spillover Area. In terms of the Industrial Corridor, its initial development was mainly concentrated near the old town. Then, it displayed leapfrog development dynamics when expanding northwest before 2010. During 2010 to 2014, development in the Industrial Corridor started to fill the gaps caused by leapfrog development and continued to penetrate into the rural hinterland.

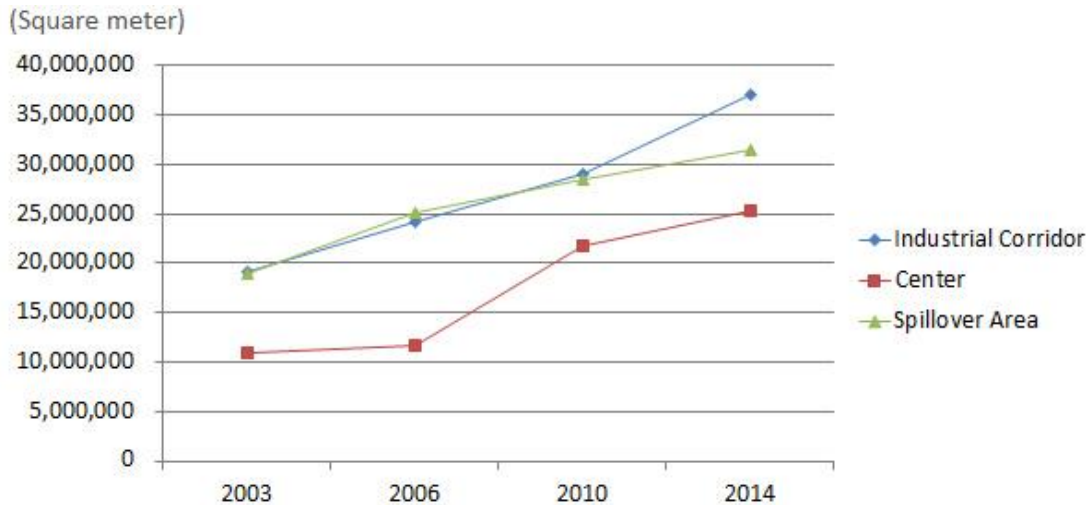


Figure 4.1.7: Amount of Built-up Area in Dongxihu (2003-2014)
 (Source: Wuhan Land Resource and Urban Planning Information Center)

In order to better understand land use change in Dongxihu, the amount of built-up land from 2003- 2014 for each area is quantitatively measured as indicated in figure 4.1.7. The Industrial Corridor has been increasing steadily in terms of built up area. This suggests that the Industrial Corridor part is experiencing high speed peri-urbanization, and that this trend is strengthening. This bold increase is enabled by adequate available land on the both sides of the long G107 rapid road which is the spine of the Industrial Corridor. The very significant land use change in the Industrial Corridor also reflects the strong development of industry and its increasingly significant role in peri-urbanization of Dongxihu. In terms of the Residential Spillover Area, its land use change rate is obviously slower than that of Industrial Corridor and slowing. Based on the trend shown in figure 4.1.7, it may be concluded that the land use change rate in Spillover Area could be even slower in the future. This weak growth can be explained by the fact that most of land around the lake has been developed and vacant land in Spillover Area is becoming increasingly scarce. The Spillover Area also cannot continue to expand northwest since it is blocked by the center part of district. Due to the constraint of land resource, residential spillover from main city is likely to be less significant in the future of Dongxihu's peri-urbanization. For the Central part of district, after a slow change from 2003 to 2006, it experienced a dramatic increase in built-up land between 2006 and 2010. Spatially, as shown in figure 4.1.6, this dramatic growth mainly

happened to the north from the Old Town, which is consistent with government's intent to move development northward. Therefore, the dramatic land use changes in such a short time appear to be significantly shaped by the government's will, thus showing the impacts of public policy on peri-urbanization in Dongxihu. Since the growth rate of built-up land in the District Center has greatly fluctuated, the future trend of land use change in this area is not clear yet.

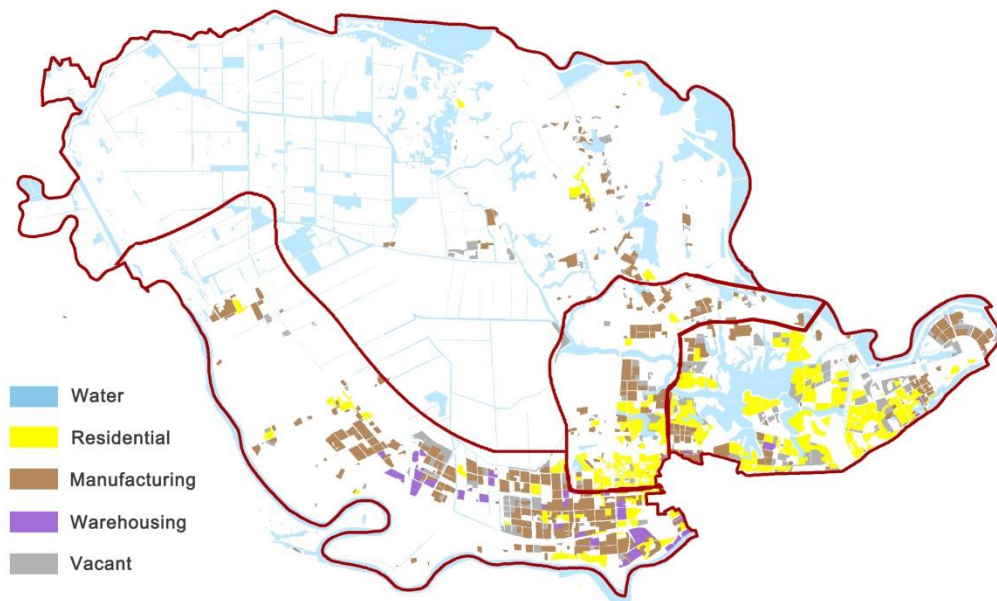


Figure 4.1.8: Land Use Map of Dongxihu (2014)
(Source: Wuhan Land Resource and Urban Planning Information Center)

Figure 4.1.8 shows the land use situation of Dongxihu in the year 2014, which can help better understand the results of the land use change process discussed above. In the Industrial Corridor, manufacturing land is no doubt the major land use type. Besides, a small amount of supportive residential land and vacant land waits to be built. Warehousing land also covers a certain proportion of land in the Industrial Corridor. So it can be concluded that the development of the Industrial Corridor is not only driven by manufacturing but also warehousing. Within the District Center, the Old Town in the south has developed northward, resulting in some new residential land development in the mid-south area. However, many manufacturing facilities have

been built in middle and north of the District Center, creating a mix of manufacturing and residential land in the middle area. Although the government wants to reallocate the functions of the Old Town to the north, manufacturing is starting to appear in the mid-north part of district center and is rapidly developing. The manufacturing is even extending into the spaces around the major lake in the Spillover Area. Therefore, manufacturing land is dispersed in pockets in the Residential Spillover Area beside massive residential land use around the Lake. Overall, the result of land use change in Dongxihu's peri-urbanization highlights the overwhelming power of manufacturing investment in shaping land use in the District, even as the District also receives primarily residential spillover effects from main city. In addition, warehousing also plays an important role in the development of the Industrial Corridor, complementing to manufacturing.

4.1.3 Land-use License Issuance

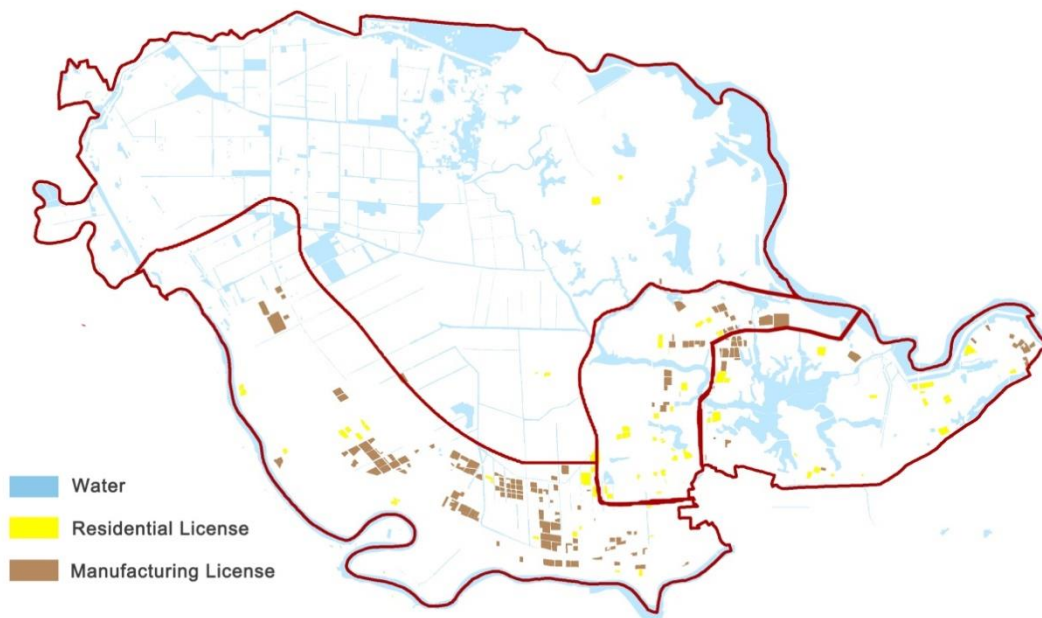


Figure 4.1.9: Land-use Permit Issuance Map of Dongxihu (2010-2014)
(Source: Wuhan Land Resource and Urban Planning Information Center)

In China, it generally takes approximately five years for a development project to reach completion, measured from the date that the land-use permit was issued (Manufacturing projects are slightly quicker than it). Therefore, by assessing the land-use permit issued in the last five

years, expected land use changes in near future can be foreseen to some extent (warehouse license data is not available). According to figure 4.1.9, residential projects in the near future are scattered and evenly distributed across the Industrial Corridor, the District Center and the Spillover Area. There is no special concentration of residential projects in the Spillover Area, which shows that the Spillover Area might no longer be experiencing a rapid development process - a trend consistent with the assessment above. Manufacturing land use permit issued are obviously more than that of residential. They are mainly distributed in the Industrial Corridor and north of the District Center. Therefore, in the near future, more manufacturing land use will appear in the north areas of the District Center, near the border with the Spillover Area. In the Industrial Corridor, land-use permit data indicates manufacturing land will not expand further toward the northwest but development will be characterized by in-filling, enabled by the previous piecemeal development. However, Figure 4.1.9 shows there will be considerable continued development of manufacturing lands in the Industrial Corridor.

4.2 Economic Activities

4.2.1 Basic Indices

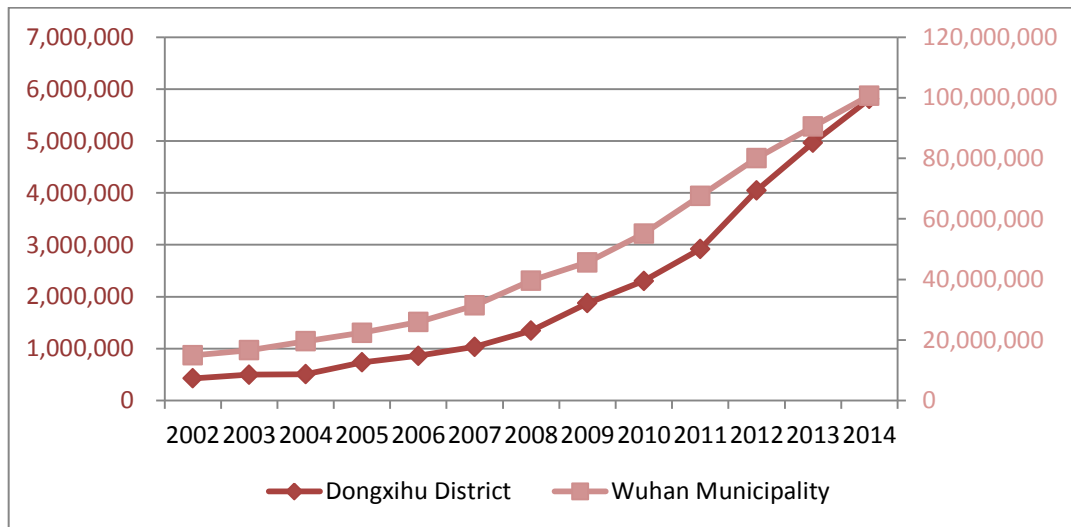


Figure 4.2.1: Annual GDP of Dongxihu and Wuhan (2002-2014) (Unit: ¥ 10,000)
(Source: *Dongxihu District Statistic Yearbook*)`

Figure 4.2.1 shows the trend of GDP growth each year for Dongxihu district and whole Wuhan as comparison. The GDP of Dongxihu has risen dramatically in absolute value and its growth rate has been increasing during the last decade, which indicates the strong economic growth in this area. So the GDP data expresses the dynamic nature of peri-urban Dongxihu. Moreover, by comparing the GDP growth rate between Dongxihu and Whole Wuhan, one can better understand Dongxihu's role in the Wuhan's development. In the first half of the 2000s, Dongxihu's GDP growth rate is slightly slower than the average of the Municipality. Then, the GDP growth rate of Dongxihu is almost equivalent to the Municipal average during the second half of 2000s. After 2010, Dongxihu's GDP increases quicker than the whole Municipality. From this comparative trend, it can be concluded that the peri-urbanization process in Dongxihu has increasingly taken off, and is driving economic growth in the District.

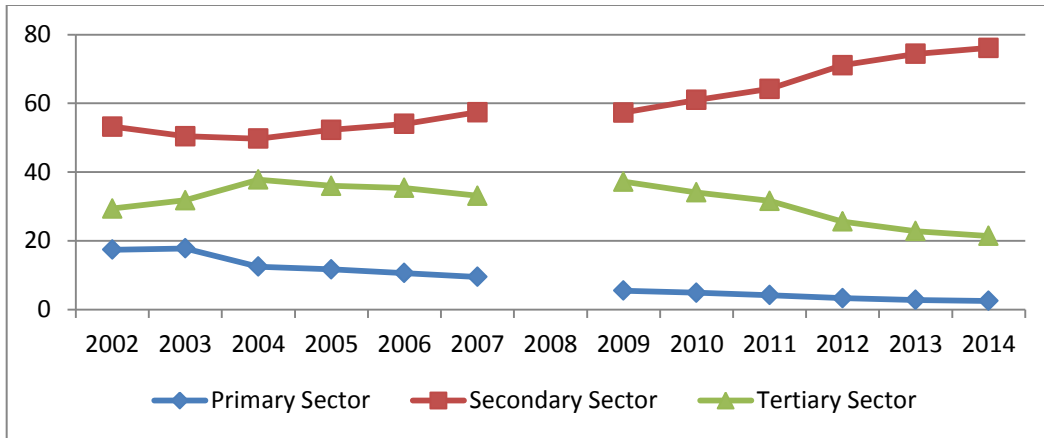


Figure 4.2.2: Economic Structure of Dongxihu District 2002-2014 (Unit: %)
 (Source: Dongxihu District Statistic Yearbook)

Generally, the change of economic structure (Figure 4.2.2) shows that the increase in the secondary sector (manufacturing and construction) is the main reason for the incredible economic growth of Dongxihu discussed above. The dramatic growth in the secondary sector, combined with the significant decrease in the primary sector (agriculture), imply that Dongxihu district has experienced typical and intensive secondary sector driven peri-urbanization: considerable farm lands has been converted into manufacturing use. In addition, although the share of the primary sector has decreased to a very low, it does not mean there is no agricultural activity anymore since the amount of farm land in Dongxihu is still considerable. It is just because the absolute value of secondary sector's output is so huge that the share of the primary sector seems so small.

Peri-urbanization in Dongxihu started around the mid-1990s when the District first introduced foreign investment for manufacturing, the secondary sector-led economy already had a foothold by 2002. However, from 2002 to 2004, the growth of the tertiary sector was much higher than the secondary sector, this can be explained by the development of a major wholesale market – Duoluokou Market in the district; it is the biggest comprehensive wholesale market in central China. Duoluokou Market is advantageously located at the eastern end of the Industrial Corridor where Wuhan's 3rd ring and national highway G107 intersect. Wholesale activity is categorized as tertiary, so the prosperity of this market greatly contributes to the growth of the tertiary sector. During that time, it looked like the tertiary sector was about to become the main

driver of Dongxihu’s economy. However, since manufacturing was able to freely expand along the Industrial Corridor to the west but Duoluokou wholesale market is spatially constrained in the eastern end of the Corridor, the share of secondary sector launched its robust growth, while the tertiary sector kept losing its relative position after 2004. The gap between these two sectors has been widening to the degree that the secondary sector now dominates the District’s economy: its output value accounts for 76.1 percent of the District’s GDP in 2014, 26.4 percentage base point higher than its lowest point in 2004. At the same time, the share of tertiary sector decreases 16.4 percentage base points from its highest point to only 21.4 percent in 2014.

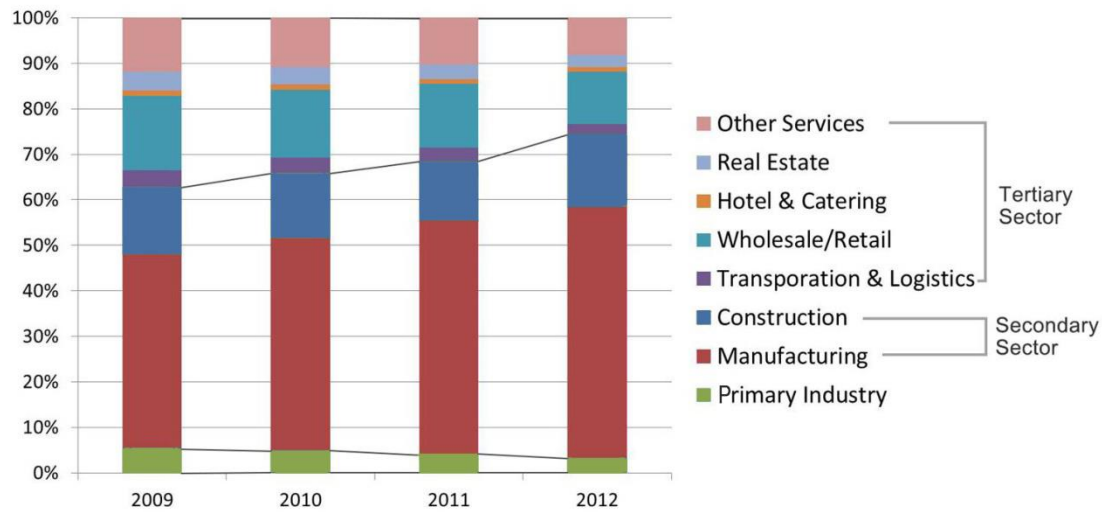


Figure 4.2.3: Annual Detailed Economic Structure of Dongxihu District 2009-2012 (Unit: %) (Source: Dongxihu District Almanac)

A more detailed assessment of GDP provides more information about the recent economic development of peri-urban Dongxihu (Figure 4.2.3). Figure 4.2.3 illustrates that manufacturing is the main component of secondary sector and produces the largest proportion of GDP in whole district. Moreover, the share of manufacturing in GDP is still growing. From 2009 to 2012, the share of manufacturing in GDP has increased from 42 percent to 55 percent. This high share of manufacturing is a key indicator of peri-urbanization, and echoes similar high rates of manufacturing share in coastal Chinese peri-urban areas during its earlier manufacturing boom.

As a comparison indicator, for the whole of Wuhan Municipality, manufacturing only accounts for around 40 percent of the Municipality's economy. According to this data, Dongxihu is experiencing typical manufacturing-driven peri-urbanization which is common in developing East Asian.

Along with the high share of manufacturing, another unique characteristic of Dongxihu is the relatively large share of construction industry in the economy. From 2009 to 2012, the share of construction is stable around 15 percent of the GDP. In comparison, construction activity only accounts for 8 percent of the whole Wuhan GDP. Figure 4.2.3 provides evidence that construction activity is heavily concentrated in peri-urban Dongxihu. There are three reasons behind this phenomenon. First, in place like Dongxihu which is experiencing rapid development, a lot of buildings need to be built, causing huge demand for the construction firms. Secondly, given the emergence of a self-reinforcing cluster of construction firms in peri-urban Dongxihu, these construction firms can also reach out to projects in nearby urban areas, even other cities. Thirdly construction firms prefer to co-locate where building materials are produced, i.e., in Dongxihu District. Many products closely related to construction are produced in manufacturing factories in Dongxihu's Industrial Corridor, such as processed wood, metal materials, plastic products, as well as specific equipment and tools. Being close to these factories can give construction firms more purchasing options and save them costs. By and large, the strong demand for construction services caused by rapid spatial development and associated building material demand from manufacturing factories in peri-urban Dongxihu has led to a self-reinforcing virtuous cycle of manufacturing and construction..

Although the share of Dongxihu's economy in the wholesale/retail component of the tertiary sector keeps decreasing, it still accounts for a considerable percentage of the District's economy. Part of the reason for this is the existence of Duoluokou wholesale market at eastern end of industrial corridor. However, by about 2010, Duoluokou market's growth had peaked. This appears to be the result of strong competitors in other parts of the District. First, based on the

location of the building materials manufacturing and construction industry, there are several major furniture & decoration material retailers in the old town area of Dongxihu, forming a retailing cluster of furniture and decoration material products serving Wuhan metropolis. Second, various specialized wholesales markets for different sort of products are dispersed along the Industrial Corridor. These markets are located right next door to related factories so that manufacturers can sell their products to distributors on-site immediately. Therefore, the Industrial Corridor in Dongxihu becomes not only a place of producing but also wholesaling. Besides, the sale of manufacturing products can be facilitated by the large number of logistics firms in the Industrial Corridor. The land use map in Section 4.1 already illustrated the considerable land devoted to logistics functions in the District. But due to the logistics industry's nature of low absolute output value (they just deliver instead of producing), this industry is not significant in terms of share of the economy, but may play a significant role in enhancing the competitiveness of the District.

In conclusion, Dongxihu's strong peri-urbanization is not simplistically manufacturing driven, although that is the main story that the statistics tell; rather it is the product of a robust self-reinforcing combination of manufacturing, construction, and logistics.

4.2.2 Manufacturing: Domestic vs Foreign

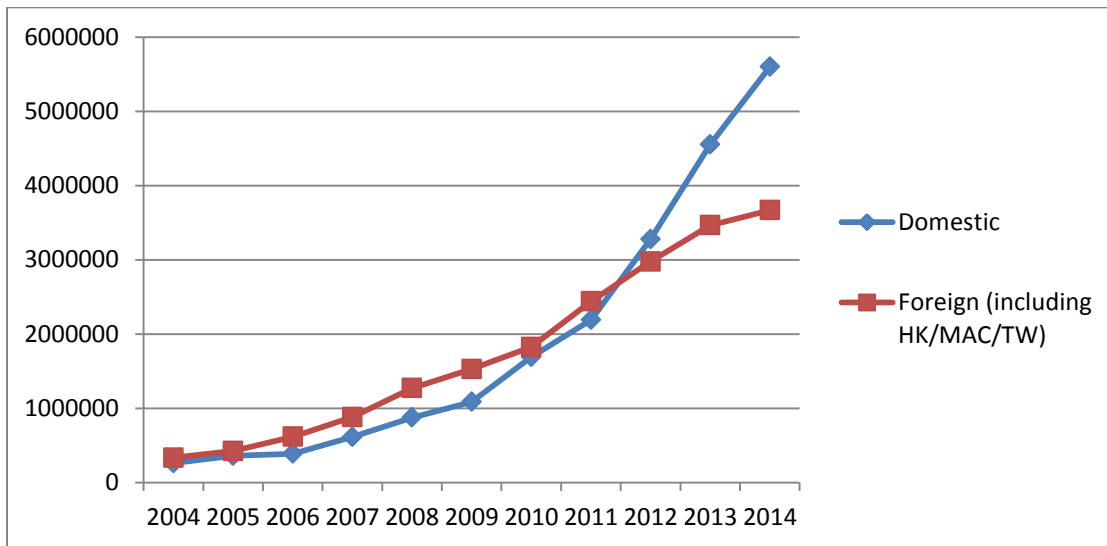


Figure 4.2.4: Accumulated Output Value of Manufacturing, 2004-2014 (Unit: ¥10,000)
(Source: Dongxihu District Statistic Yearbook)

The assessment above indicates that manufacturing is the main factor driving economic development in peri-urban Dongxihu. In this sense, Dongxihu has (and is) experienced/ing a typical manufacturing-driven peri-urbanization process which is common in metropolitan developing areas at East Asia. Moreover, previous literatures emphasize the foreign direct investment (FDI) as the primary source of manufacturing development in East Asian peri-urban processes. This assertion is consistent with Dongxihu's early history when investment from Taiwan in the mid 1990s first triggered the rapid manufacturing development in the District. However, the role of foreign investment in the District's subsequent development process is still needed to be examined. According to Figure 4.2.4, by the early 2000s, domestic investment in manufacturing had almost caught up with foreign investment terms of accumulated output value. Domestic manufacturing investment has boomed since 2011, surpassing foreign ones. Overall, the relevance of foreign investment in driving manufacturing activity in Dongxihu has been decreasing as domestic investment becomes more important. Now, domestic firms constitute the majority output value in manufacturing.

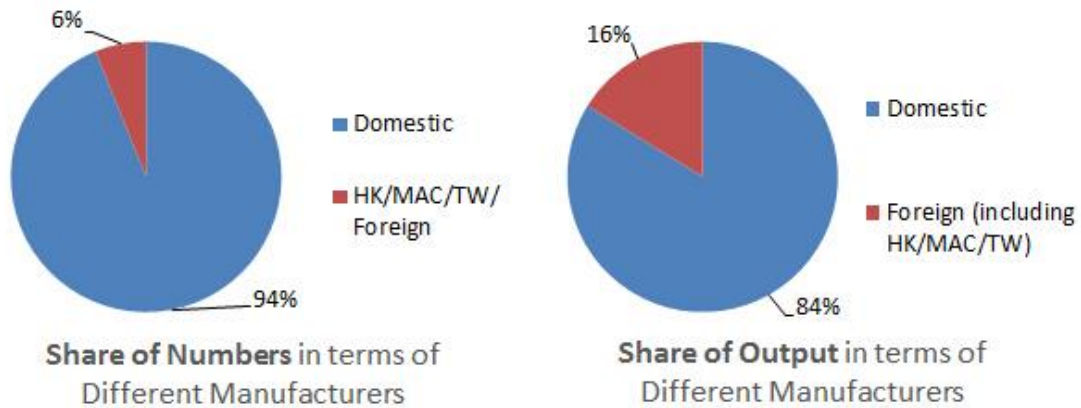


Figure 1.2.5: Share of Domestic and Foreign manufacturers in Dongxihu, 2014
 (Source: Dongxihu District Almanac, Wuhan Land Resource and Urban Planning Bureau)

The foregoing does not mean manufacturing based on foreign investment is not important anymore. In fact, foreign investment still plays a crucial role in manufacturing at Dongxihu. While only 6 percent of firms are foreign, they produce 16 percent of output value among all manufacturers (Figure 4.2.5),.

Taiwan investment is especially important among foreign investors in Dongxihu, and contributes considerably to the economic development of the District. Taiwan investment played a key role in “kicking off” development of the Industrial Corridor, consistent with District policy. Accordingly, there are two specific industrial parks designated for Taiwanese firms. Today, about half of the foreign firms are from Taiwan, forming the backbone of foreign invested manufacturing firms in Dongxihu. Given the strong rise in domestic investment, Taiwanese firms are less important in driving the District economy. But there are still some key Taiwanese firms which can contribute a lot to GDP such as Uni-President.

	Average Scale of Employment	Major Manufacturing Industries
Domestic Firms	38	Metal Products, Food/ Agricultural Products Processing Electrical Equipment Print/Record Medium Products Apparel
HK/MAC/TW Firms	243	Beverage
Foreign Firms (besides HK/MAC/TW)	292	Automobile Beverage,

Table 4.2.1: Scale of Different manufacturing Firms (2014)
(Source: Wuhan Land Resource and Urban Planning Bureau)

Table 4.2.1 may help explain the higher productivity of foreign firms. Domestic manufacturing firms are small scale in terms of employees and usually specialize in relatively low-end industries. Domestic firms are primarily found in industries such as metal products and print/record medium products which only require elementary processing, and are low value-added. Besides, economies of scale are hard to achieve for domestic firms due to its small size. So, the production efficiency of individual domestic firms is low. The magnitude of domestic manufacturing firm numbers and absolute output is explained by the quantity instead of quality of firms. On the other hand, the average scale of firms owned by investors from Hong Kong, Macao and Taiwan regions (actually most are from Taiwan), and foreign sources, is obviously larger – generally around seven times that of domestic firms. Higher-profit industries, combined with large scale, make the production efficiency of foreign manufacturing firms much higher. Although foreign invested manufacturers are a minority, they are generally found in high-end activities.

Even within the foreign invested firms, there are certain differences. For Taiwanese firms, apart from big anchor beverage firms “Uni-President” and “Pepsi”⁴, the rest of them are mainly middle size firms in industries like medicine and rubber products. Different from exported-oriented

⁴ In 2011, Pepsi (China) was acquired by Tingyi Holding Corp which is the subdivision of Ting Hsin International Group based in Taiwan. So now in China, Pepsi is considered as a Taiwanese firm.

Taiwanese firms in the East Region, Dongxihu's Taiwanese firms particularly target local market within Hubei Province. In terms of manufacturing from other countries, they also primarily deal with auto parts production in addition to beverage. Most of auto parts manufacturers in Dongxihu are from Japan. Since these Japanese auto parts firms are the suppliers for some world-renowned automakers such as Honda and Toyota, they are actually the part of global automobile manufacturing supply chain.

4.2.3 Spatial Distribution of Firms

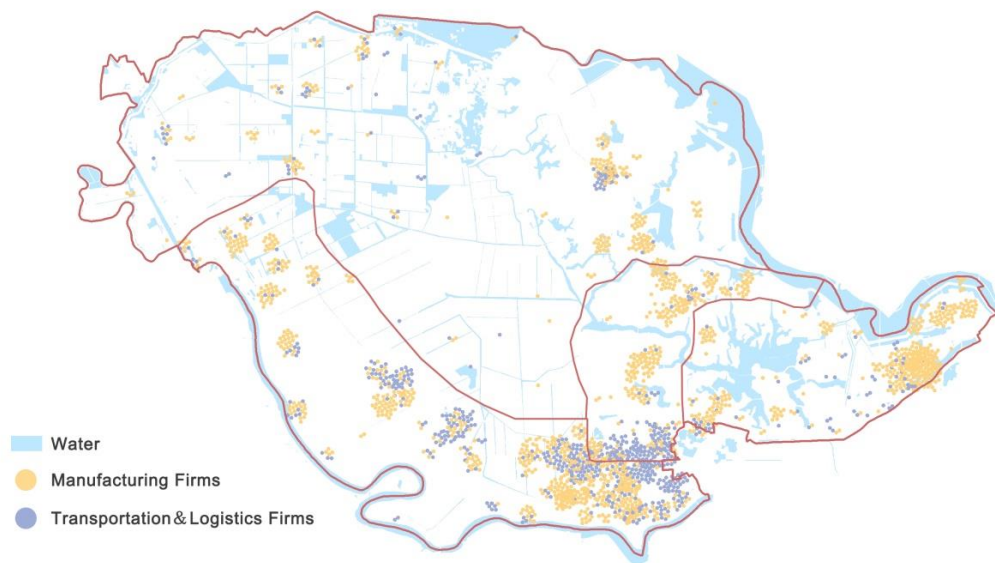


Figure 4.2.6: Distribution of Manufacturing and transportation & Logistics Firms (2014)
(Source: Wuhan Land Resource and Urban Planning Bureau)

Since manufacturing investment is the primary driver of economic development in peri-urban Dongxihu, the spatial distribution of manufacturing firms facilitates explanation of how economic development occurs across space. Since logistics, linked to manufacturing, are also an important aspect of the District's development from a spatial perspective, logistic firms are included to better explain industrial development in peri-urban Dongxihu. The distribution of firms has following characteristics.

Manufacturing firms are dispersed all around the District, they are not only concentrated in the Industrial Corridor. Although the land use map in Section 4.1 already shows a certain amount of industrial land in the Spillover Area, it is still surprising to see manufacturing firms are heavily clustered, forming nodes, in the Spillover Area. This suggests that the east part of the District is not a pure residential spillover area, but also plays an important manufacturing function. These manufacturing clusters in the Spillover Area may exert a significant negative influence on nearby residents, especially considering the expectation of residential locaters living relatively close to the core city. In addition, many manufacturing firms are also distributed in the middle and north of the District's central part, and even spill further north into rural area. In addition, a few speck-like manufacturing enterprises, usually TVEs can be still found in the rural areas in the northwestern of the District.

Within the Industrial Corridor where manufacturing is mostly concentrated, firms are not distributed as planned. They are not evenly distributed along the corridor and are excessively concentrated in the east, neighboring the old town of the District. To the northwest, where the corridor is expanding, firms do not spread continuously, but exhibit a scattered leapfrog pattern of development.

In terms of logistics firms, they mainly scatter within and around the Old Town area, and also leapfrog along the Industrial Corridor. Logistics firms do not scatter widely, especially to the more remote areas of the District, as do some manufacturing firms. Most of the logistics firms are located in the south of the District where transportation infrastructure is relatively developed, enabling access to the expressway system, airport, etc. Within the Industrial Corridor, manufacturing and logistics firms co-locate, even leapfrogging together. By taking advantage of the location along major transportation corridors, linkages between manufacturing and logistics firms are supported and facilitated.

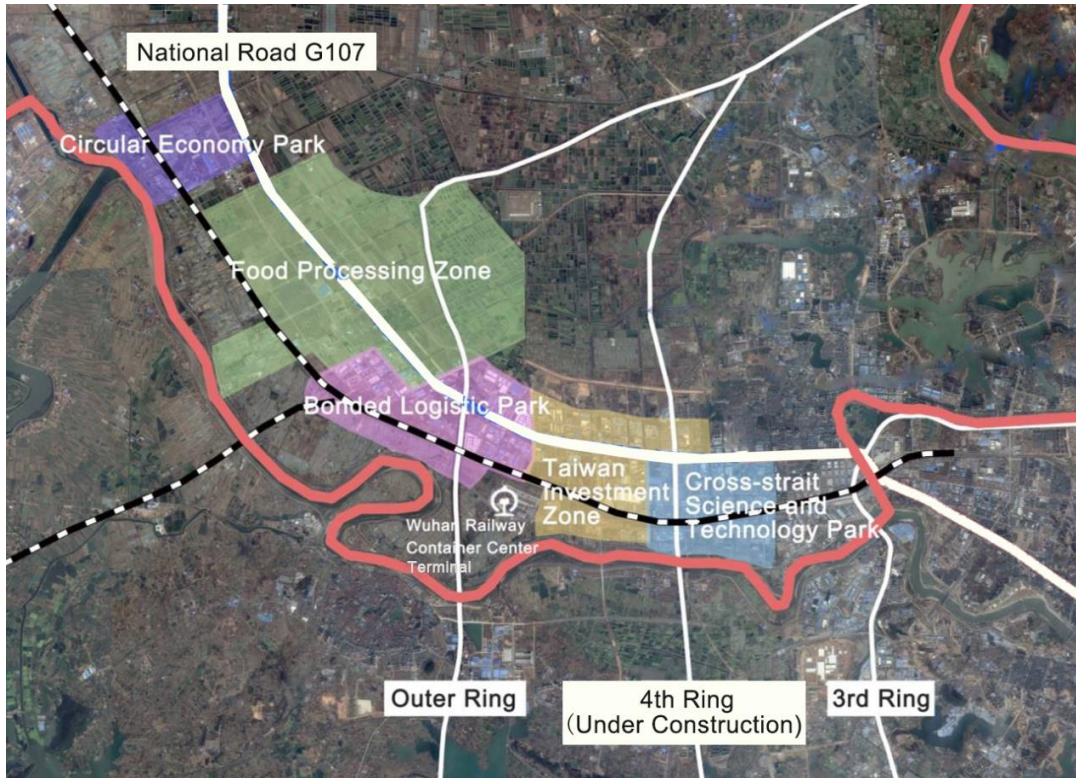


Figure 4.2.7: Officially Designated Specialized Parks/Zones along the Industrial Corridor in Dongxihu
 (Source: Drawn by the author)

Dongxihu's Industrial Corridor is the place that the District government emphasizes in terms of location of manufacturing and logistics in peri-urban Dongxihu. This area is a highly advantageous place for locators, facilitated by unique and developed transportation infrastructure. As shown in Figure 4.2.7, National Rapid Road G107 and a freight railroad form the spine of industrial corridor. G107 also reinforces the transportation advantage by intersecting with the outer ring and the 4th ring (under construction) in Wuhan. More importantly, the Wuhan Railway Container Center Terminal, one of eighteen railway container center terminals in China, makes its surrounding area a perfect place to develop logistics and exported-oriented manufacturing. In order to take full use of these advantages and decentralize the excessively dense distribution of firms near the Old Town, District Government is constructing a string of industrial parks/zones to attract new investment and motivate some existing firms concentrated near the Old Town to relocate towards the northwest.

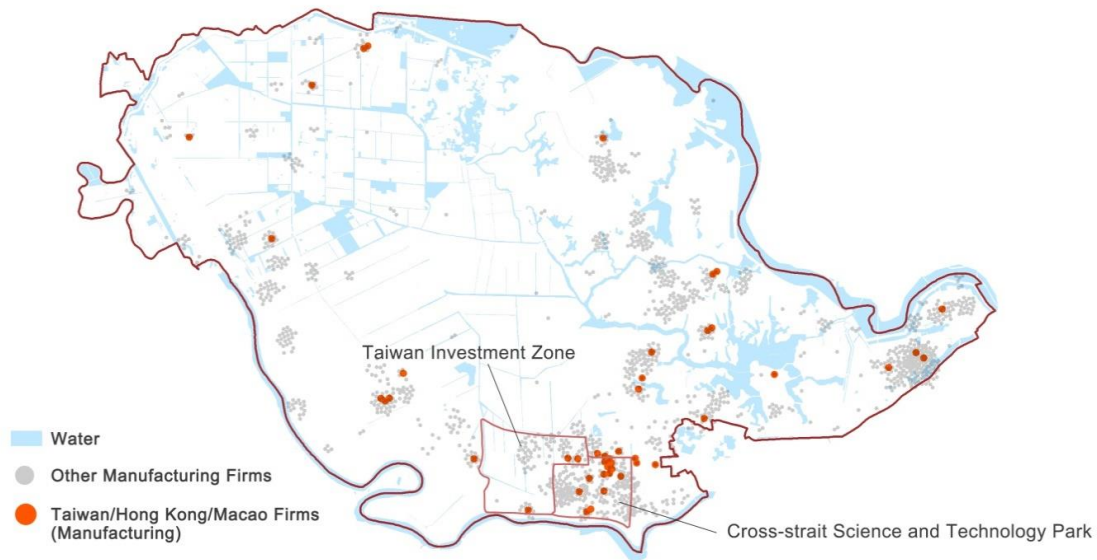


Figure 4.2.8: Distribution of Manufacturing Firms (2014)
 (Source: Wuhan Land Resource and Urban Planning Bureau)

Dongxihu's close relationship with Taiwanese investors has long been established. The Special Zone for Taiwan investment can be traced back to the mid-90s. Taiwan investors mainly focus on manufacturing, about 70 percent of Taiwanese investment is in manufacturing and logistics. Today, there are two zones closely related to Taiwan investment: the Taiwan Investment Zone as well as the Cross-Straits Science and Technology Park. Located adjacent to old town, they are the Industrial Corridor's major manufacturing zones, where most manufacturing firms in the District are still located. However, today the relationship between these two zones and Taiwan investment is less formal. Although it played an important role in the early times, Taiwanese investment already has become a minority factor in present due to the overwhelming rise of domestic investment. As shown in Figure 4.2.8, Taiwan/Hong Kong/Macao firms (actually most from Taiwan) currently only cover a small proportion of land in these two zones. The Taiwan Investment Zone and the Cross-Straits Science and Technology Park are no longer specialized zones just for Taiwan firms, and already are places where various manufacturing firms mix and agglomerate together due to closeness to the prosperous old Town area.

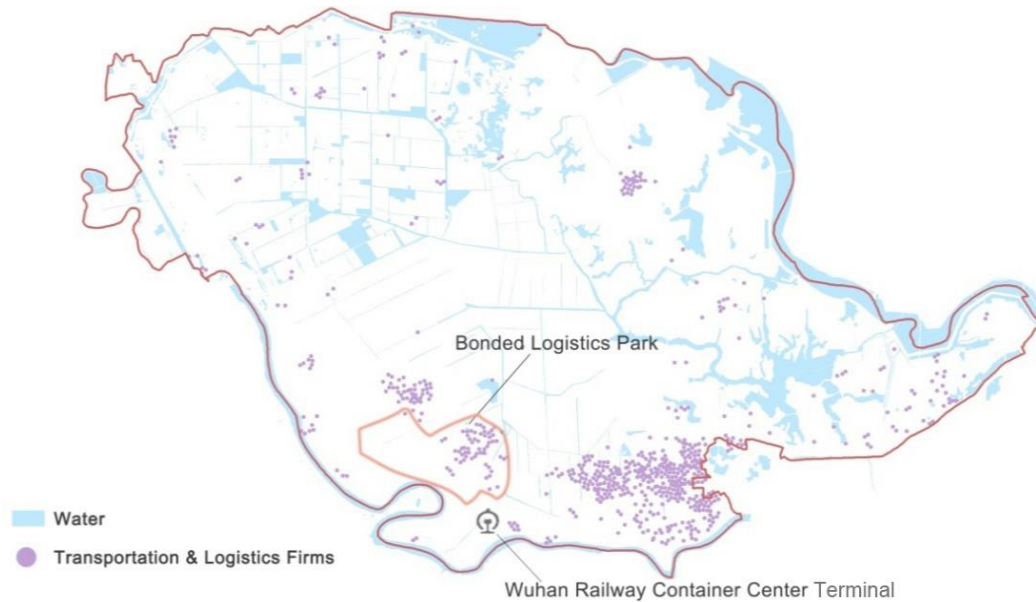


Figure 4.2.9: Distribution of Logistics Firms (2014)
 (Source: Wuhan Land Resource and Urban Planning Bureau)

Along with the foundation of the Wuhan Railway Container Center Terminal (Figure 4.2.10), the Bonded Logistics Park, established in 2008, is an important transit area for international freight. It is one of the five bonded logistics centers in China, which gives Dongxihu a good opportunity to develop and upgrade its logistics industry. Despite the existence of such an important element, logistics firms are still mainly concentrated near the Old Town. Because only large logistics enterprises can deal with international freight; only they operate in the Bonded Logistics Park. Thus ordinary logistics firms tend to remain near the Old Town and rely on business from local manufactures. However, there are still some logistics firms to the northwest of the Bonded Logistics Park but not many, since it makes no sense for logistics firms to expand in isolation while manufacturing does not expand along corridor continuously.



Figure 4.2.10: Wuhan Railway Container Center Terminal
 (Source: Photo by the Author)

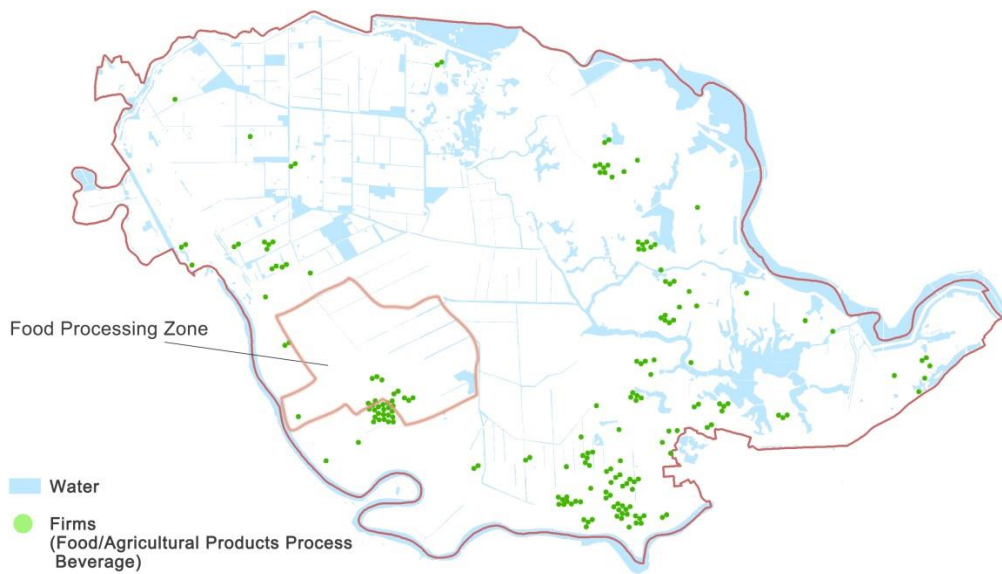


Figure 4.2.11: Distribution of Food Firms (2014)
 (Source: Wuhan Land Resource and Urban Planning Bureau)

Dongxihu is known for production of food and agricultural products, which is the result of Dongxihu's early history as the site of several state-owned farms. Even though Dongxihu has experienced intensive manufacturing-led peri-urbanization during the last twenty years, most of the land area in Dongxihu is used for agriculture. Until now, Dongxihu is the main food-growing area in Wuhan Municipality and also known as "the food basket of Wuhan" or "Wuhan's backyard garden". Based on this bold agricultural production, food-related manufacturing is well developed. The first batch of foreign investment found an opportunity in Dongxihu by acquiring badly operated state-owned food factories. Today, more and more famous food enterprises locate their production facilities in Dongxihu. In order to carry forward this agricultural role and facilitate the development of the Industrial Corridor, the District set up a food processing zone in 2002 as shown in Figure 4.2.11. However, although there is a small cluster of food firms near the food processing zone, it is clear from the Map that food firms are mainly located in mid-eastern Dongxihu. It is the government's intention to relocate some key food firms from the dense east part of industrial corridor to the newly established food processing zone, but most of them remain unmoved. Although established for more than ten years, the official food processing zone is not able to attract enough food firms to its location, which represents an extension of the Industrial Corridor; if the food firms did relocate en masse, it would be an impetus to consolidating and furthering the Industrial Corridor's extension. In contrast, most of the food firms are scattered in the eastern part of the District.

Generally, an intensive manufacturing investment boom in Dongxihu's economy and introduced a lot of manufacturing firms into the district. But the distribution of these firms is somewhat chaotic and disordered. Within the Industrial Corridor which is supposed to be the main area of manufacturing development, firms are overly concentrated at the east end of corridor and cannot fully expand towards northwest despite a string of officially designated zones/parks along the corridor. However, the Industrial Corridor is not only the place manufacturing concentrated. Surprisingly, there are also considerable manufacturing firm clusters dispersed in Residential Spillover Area, district center and even north rural hinterland. Overall,

manufacturing firms are largely distributed at the east half of Dongxihu district, and they seem to don't have strong impetus to move towards west even though the Industrial Corridor is well-planned and facilitated by strong infrastructure. Besides, since Dongxihu is in Wuhan which is the geographical center in China and enjoys advantageous transportation connection, logistics firms also prosper and are in linkage development to manufacturing in this peri-urban district. But different from manufacturing, logistics firms are bound to support from transportation infrastructure. So, most of them are located within industrial corridor with developed infrastructure.

4.3 Population Change

4.3.1 Population growth

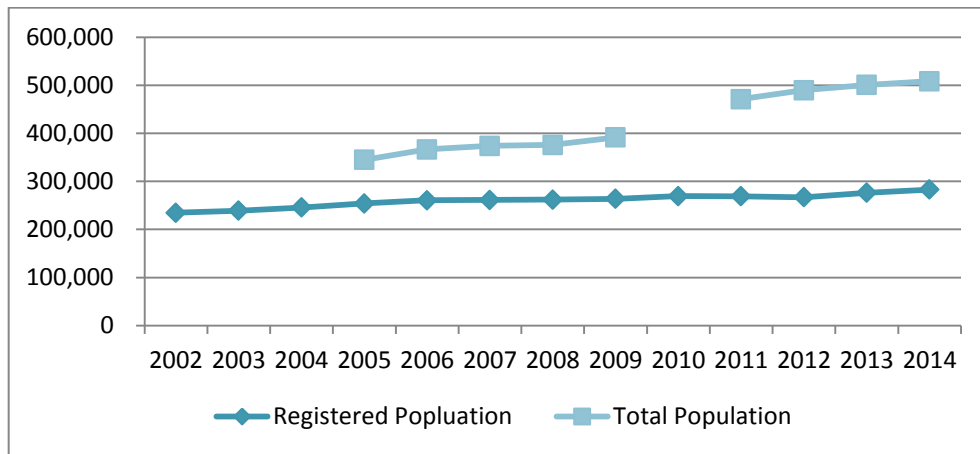


Figure 4.3.1: The Population of Dongxihu District 2002-2014
(Source: *Dongxihu District Statistic Yearbook*)

Figure 4.3.1 shows Dongxihu's population growth trend in terms of both total and registered population. (In China, there is a resident registration system called "hukou". Only local people with this kind of registration can fully benefit from public services and civil rights, while migrant people without registration are only able to live as second-class citizens, not able to access certain services such as pensions and schooling.) So in undertaking demographics analysis of Chinese cities, the total population consists of the locally registered population plus the migrant population. Based on Figure 4.3.1, the registered population in Dongxihu has been increasing slowly. As the urban core of Wuhan becomes more expensive to live in, there is an incentive for more people to buy less expensive housing in adjacent peri-urban areas. In order to meet this demand, many residential complexes have been built in the Spillover Area in Dongxihu. This dynamic explains Dongxihu's slow registered population growth.

Despite the slow growth of the registered population, total population in Dongxihu has increased dramatically. This is because the total population growth in Dongxihu is mainly caused by the inflow of migrants without local registration status. Surplus rural laborers from poorer places who do not meet the qualifications for local registration keep coming to Wuhan

Municipality and Dongxihu District in particular to look for non-farm job opportunities, thus meeting the high demand for low-cost workers by labor-intensive firms in Wuhan’s peri-urban area. In the Dongxihu case, as mentioned in Sections 4.1 and 4.2, traditional manufacturing is the anchor of the District’s economy. Employment opportunities in manufacturing can attract a lot rural migrants. However, manufacturing factory is not the only employment destination for migrant workers. Male workers, in particular, are attracted to / hired in the construction industry; as noted above, in fast-developing peri-urban areas, demand for construction worker is an indispensable component of the development system. On the other hand, firms in many manufacturing firms involved in activities that require less heavy work, such as food processing, clothing/shoes favor female workers. In the past, most of the population in Dongxihu consisted of local people with registration (hukou) status. But after more than a decade’s industrial development, migrants already account for almost 45 percent of the people in the District, which reinforces the assertion that the peri-urbanization in Dongxihu is mainly driven by the secondary sector (manufacturing and construction).

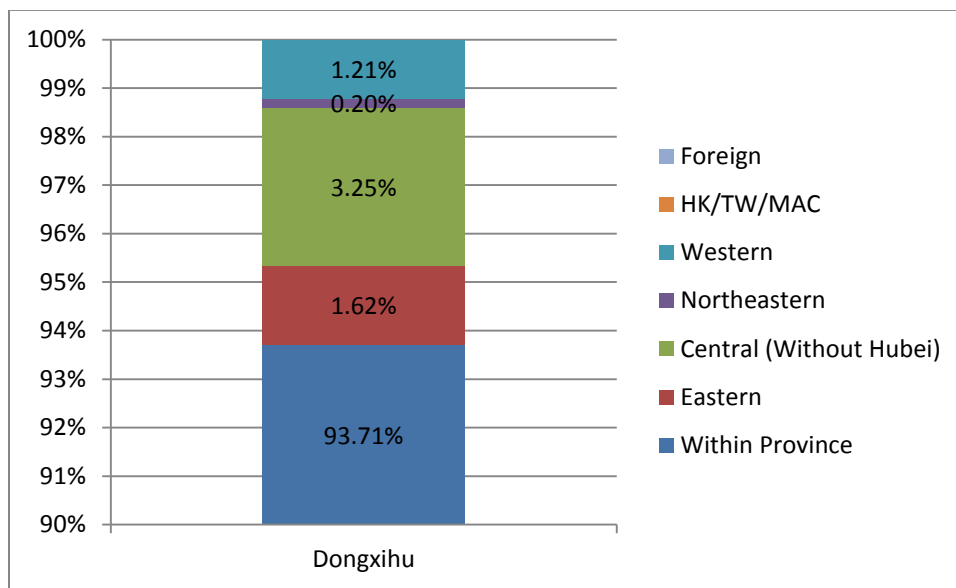


Figure 4.3.2: Dongxihu Residents’ Location Five Years Earlier, 2010
 (Source: 6th China Population Census)

Given most population growth in peri-urban Dongxihu is caused by the inflow of migrant workers, it is important to answer the next question: Where do these people come from? Figure 4.3.2 from the 2010 China Population Census provides valuable information (respondents in the census identify their living location five years before). Most migrants are from the Municipality's hinterland within Hubei Province or from Central China, the Region where Wuhan is located. (Due to data constraints, although we know that over 90 percent of people in Dongxihu have been living within the Province for the last five years, the data does not directly indicate what percentage of people comes from other areas beyond Wuhan Municipality but within Hubei Province. However, since it is known that about half of the population in Dongxihu has local registration, it can be roughly estimated that about 40 percent of Dongxihu residents are migrants from other areas within the Province.) This finding is consistent with a trend in China in this century for shorter migration, discussed in more detail below, especially in the case of female migrants: i.e., in the past, many of the Dongxihu migrants may have traveled much further to the booming coast (Chan, 2012).

Given the small percentage of migrants from regions out of Hubei Province, it can be concluded that peri-urban Dongxihu mainly attracts migrant workers from other areas within the Province, which is similar to other metropolitan peri-urban areas in western China. Peri-urban areas in the highly developed East Coast can attract migrant workers all over the country, while interior peri-urban zones mainly rely on human resources within province. However, as noted above, the coast is experiencing increased competition by Interior Cities, both in the Central and West Regions, for migrants. Recently, as manufacturing, especially lower value added activities keep moving from the East Coast to inland China on a large scale, inland rural labor is more likely to work in nearby metropolitan areas instead of traveling all the way to east coast. So the viability of industries / firms in peri-urban Dongxihu is increasingly facilitated by the availability of a labor force from nearby areas. Nonetheless, Figure 4.3.2 shows that although the percentage of migrants from central China (beyond Hubei) is higher than from other Chinese regions, it is still

very small compared to that of intra-province migrants. This phenomenon tells us that the attraction of peri-urban Dongxihu to labor is currently confined to a relatively small hinterland.

Although considerable numbers of manufacturing firms are invested by foreign investors (including those from Hong Kong, Macao and Taiwan), very few nationals from these jurisdictions come to live in Dongxihu. Foreign investors generally only provide capital support to operate manufacturing firms. They rarely settle down for long stays in Dongxihu (or Wuhan), but do visit their invested firms on short trips to hire domestic contractors and management workers, and to monitor and evaluate activities to keep factories working and progressing. Peri-urban Dongxihu is largely a pure production space with limited associated business and professional services, with the exception of logistics, discussed above.

4.3.2 Spatial Distribution of population Change

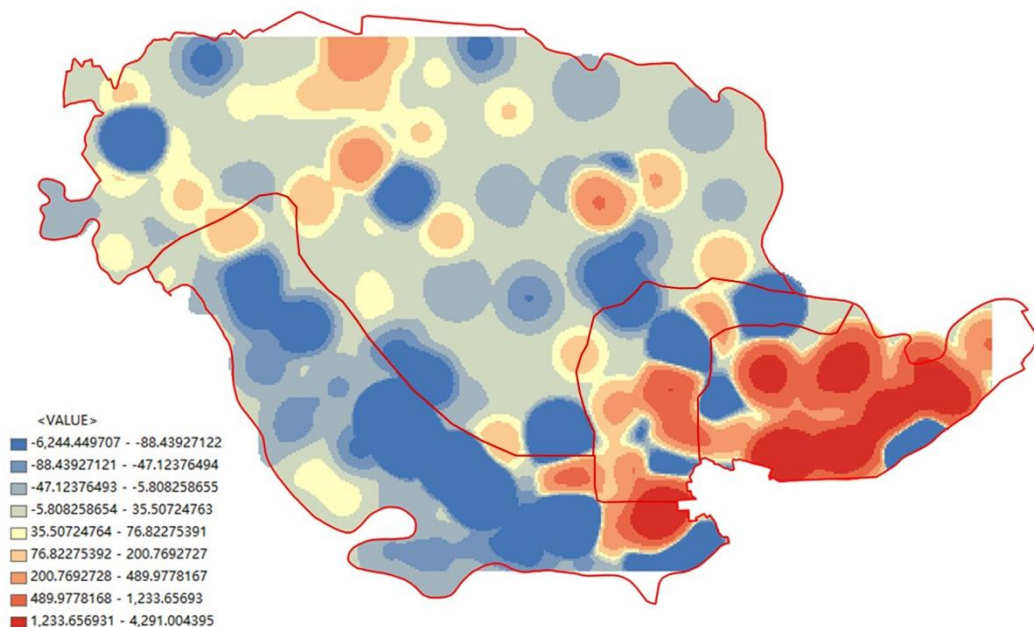


Figure 4.3.3: Spatial Change of Population in Dongxihu, 2010-2014⁵
(Source: Wuhan Land Resource and Urban Planning Bureau)

⁵ This map measures the kernel density based on the absolute change of population number between 2010 and 2014 in every spatial unit (community) within the Dongxihu District. On the map, more warm (red) color means larger population growth in a certain area, while more cold (blue) color means that the population is shrinking.

Figure 4.3.3 indicates how Dongxihu's population has changed spatially for the last five years. First, the map indicates that population increased in the Spillover Area and around the Old Town. This observation is consistent with the land use dynamic, previously discussed. As noted, many people who are pushed out of the urban core by high housing prices move to the Spillover Area and live in newly built residential complexes (Figure 4.3.4). At the same time, there are manufacturing and construction firms in and around the Spillover Area. So the Spillover Area is also inhabited by migrant workers who live in relatively old housing there. The Old Town area's remarkable population growth is explained by the inflow of migrant workers who work in the Industrial Corridor. Since factories in the Industrial Corridor do not provide dormitories, workers tend to live in low-end rental housing (Figure 4.3.5) in the Old Town. Many manufacturing firms provide shuttle buses to help their workers commute between their factories and popular housing areas, such as the Old Town. Besides, since retail and personal services are concentrated in and around the Old Town area, it is more convenient for workers to live in the Old Town.



Figure 4.3.4: Newly Built Residential Complex in Dongxihu's Spillover Area
(Source: Photo by the Author)



Figure 4.3.5: Low-end Rental Housing in Dongxihu's Old Town
(Source: Tencent)

There are several other places in the District experiencing noticeable population growth. Due to the District government's intention to move many of the Old Town's functions northward, effectively creating a "new town", new dwelling construction in the middle of the central part of Dongxihu is driving significant population growth. In the future, this "new" District's Center part is expected to experience even more rapid population growth as more buildings are constructed and additional functions are moved to the new center, which will reinforce the increasing pace of residential construction. Surprisingly, several locales in the District's rural area also show the notable population increase. This is usually driven by the TVEs (Township and Village Enterprises) in selected villages (Figure 4.3.6). Collectively owned or private invested by farmers, manufacturing TVEs are typically small in scale and low in efficiency but are more flexible in terms of organization and production. TVEs absorb surplus rural labor and significantly improve local rural people's income. In the highly developed East Coast, large numbers of TVEs can even agglomerate into competitive clusters, with successful firms sometimes relocating closer to the metropolitan core. However, TVEs in Dongxihu's rural area are scattered, based on individual

villages. These scattered TVEs can attract labor from surrounding rural areas thus resulting in limited population growth in the actual villages where these TVEs are located.



Figure 4.3.6: A Village with TVEs in Dongxihu's Rural Area
(Source: Google Earth, image date: 2016)

Third, population in the Industrial Corridor has significantly decreased. Since a series of industrial parks were designated along the Industrial Corridor, long-standing villages and their farmlands in this area keep being demolished and redeveloped for industrial use. During this process, indigenous farmers are relocated while new coming workers choose to live in or near the Old Town instead of along the Industrial Corridor. As a result, the Industrial Corridor area has been losing population as more factories are set up. The Industrial Corridor is more like a pure production space without living functions such as residential, commercial and recreational.

In sum, there are two major sources of population growth in Dongxihu and each of them projects unique spatial pattern. First, migrant workers in industrial parks generally choose to live in and around the Old Town area instead of along the industrial corridor. The abundant affordable rental housing and low-end services make the Old Town area a suitable place for migrants to live. Second, people moving out of urban core mainly live in apartment complexes in the Spillover Area which is more suburban-like. As noted above, with the new residential development in north-central Dongxihu, that area will also play an important role in housing those moving from the core city for affordability reasons. Lastly, TVEs in Dongxihu's rural hinterland attract surplus rural labor from nearby villages thus resulting in scattered population growth in the undeveloped rural areas of Dongxihu District.

4.3.3 Employment

	Percentage	Employment
Construction (<i>Secondary</i>)	38.0%	114,802
Manufacturing (<i>Secondary</i>)	26.4%	79,570
Retail & Whole Sale (<i>Tertiary</i>)	10.1%	30,334
Transportation & Logistics (<i>Tertiary</i>)	5.5%	16,687
Real Estate (<i>Tertiary</i>)	3.6%	10,768

Table 4.3.1: Employment by Major Industries in Dongxihu, 2014
(Source: Wuhan Land Resource and Urban Planning Bureau)

Table 4.3.1 lists five major industries in Dongxihu in terms of employment. Although manufacturing industry is dominant in terms of output value, it is the construction industry that generates the most employment. In Dongxihu, 114,802 employees work in construction, 38 percent of all workers in the District. By comparison, there are only 79,570 employees in manufacturing, 26.4 percent of all workers. The direct reason for such massive employment in construction is the existence of the anchor firm “The First Construction Engineering Limited Company of China Construction Third Engineering Bureau”. This large SOE (Stated-owned

Enterprise) employs 48,587 and is a subsidiary of “China State Construction” which is a Fortune Global 500 company. This anchor construction firm greatly stimulates the manufacturing and trading of building material and equipment as well as the agglomeration of other middle and small size construction firms in this area.

The huge number of employees in the construction industry indicates its significant contribution to the population growth of Dongxihu. However, although employment in construction is about 1.4 times that of manufacturing, construction output value is only one-third of manufacturing. From this perspective, it can be concluded that construction generates much less value-added and is more labor-intensive than manufacturing. Development of the construction industry attracts many people to the District, but it is much less efficient than manufacturing in stimulating the economic growth.

In addition, Retail and Wholesale, and Transportation & Logistics are also listed as leading industries in terms of employment. Since many manufactured products need to be stored, traded and transported, these two industries are stimulated by the prosperity of manufacturing in Dongxihu.

CHAPTER 5

DRIVERS OF PERI-URBANIZATION IN DONGXIHU

5.1 Drivers

5.1.1 Manufacturing Investment: Policy and Market

Manufacturing investment is no doubt the primary driver of peri-urban development in Dongxihu. Several indicators collaborate this. Of the cumulative total fixed investment over the last ten years in Dongxihu, 71 percent is in manufacturing. Of the land-use permits issued during the last five years, 55 percent are for industrial use. The manufacturing share of total GDP in Dongxihu has risen from 35 percent to 59 percent over the last ten years. In terms of employment, manufacturing is the second largest sector, and just behind construction which is more labor-intensive and delivers less value added. All these metrics indicate the significant status of manufacturing investment. This large scale manufacturing investment is stimulated by both policy and market forces.

In terms of policy forces, they operate at different levels including the national, municipal and local (district) levels. At the national level, the “Rise of Central China” policy was proposed in the early 2000s and aims to ameliorate the huge economic imbalance between central and eastern China caused by years of overwhelming development of the Yangtze and Pearl River Delta areas. The “Rise of Central China” policy encourages infrastructure construction in Central China as well as industrial relocation from Eastern to Central China, thus greatly facilitating Central China’s economic development. In addition, in 2010, the State Council designated the whole Dongxihu District as a national ETDZ (Economic and Technological Development Zone). This designation makes Dongxihu eligible for a series of national level policy preferences and gives Dongxihu a higher administrative status than other ordinary outer districts, so as to let Dongxihu be more competitive when attracting manufacturing investment and other resources.

At the municipal level, there are also many policies that make Dongxihu an ideal place for manufacturing investment. According to both the “Wuhan General Plan (2010)”, “Wuhan Key Functional Area Plan (2012)” and “Wuhan 2049 Long-term Plan (2013)”, while major residential, commercial and service functions are concentrated in the main urban area, manufacturing functions are to be located on the urban periphery where Dongxihu District is situated. At the municipal planning level, Dongxihu is included in the airport-based development area which is supposed to rapidly develop manufacturing and logistics functions based on proximity to Wuhan Tianhe International Airport. In addition, in 2012, the Wuhan Municipal Government launched the “Double the Industry” plan which emphasizes manufacturing as the key to Wuhan’s economic growth. This municipal policy better incorporates Dongxihu’ manufacturing development into the municipal vision and greatly supports the enhancement of infrastructure and service for manufacturing investment.

However, it is the district level policy that directly affects Dongxihu’s attractiveness to manufacturing investment. In the early 90s, Dongxihu District Government first established the Taiwanese Investment Zone to connect the District to the outside world and join the global market. At that time when most of areas in Central China remained unopened, it was a very pioneering and progressive move to particularly target Taiwanese investors especially considering the special political relationship between mainland China and Taiwan. However, this policy successfully triggered the inflow of manufacturing investment and identified manufacturing as the major feasible driver of Dongxihu’s future development. The Taiwanese Investment Zone serves as a good example for subsequent industrial zones and parks within the District. In the mid-90s, the District launched a reform of SOEs (state-owned enterprises) by letting foreign capital acquire them to form joint ventures. This move shows the District’s determination to say goodbye to the Soviet Union style planned economy and embrace market forces. At the same time, this policy was successful in attracting big players due to the solid foundation laid by the SOEs. Some anchor firms such as “Uni-president Enterprises Corporation” from Taiwan and “Groupe Danone” from France were attracted to Dongxihu given this context. After this initial stage, as more

manufacturers came to Dongxihu, the District Government became more selective when introducing investors. In the mid-2000s, a policy named “Moon project” was introduced. By saying “we want the moon instead of stars”, the District government showed its strong preference for big players rather than trivial ones. It was at this time that the Government realized that the sustainable growth of manufacturing depends on the quality, not just the number of manufacturers.

The specific instruments to enact the policies mentioned above are incentives to attract manufacturing investment. Manufacturers can benefit from a 30 to 50 percent land rent subsidy, and various tax credits when investing in Dongxihu. Besides the subsidy from the district level, local government also assists firms to obtain subsidies from other sources such as from the municipal or provincial governments. In order to encourage production, government will even give bonuses to firms if they achieve certain output goals. To help manufacturing firms settle in Dongxihu quickly, there is a service center providing one-stop services for investors to efficiently handle all the application and registration procedures. In some industrial parks, infrastructure such as electrical and water/sewage connections for individual parcels are built in advance so as to create a “plug in” environment for factories.

In addition to policies which attract manufacturing investment, there are also many market factors that encourage manufacturers to move to Dongxihu, Wuhan. One of the most important market forces is the high cost of doing business and living on the East Coast. Due to the dramatic economic boom since the early 1980s, the East Coast is already highly developed and in many places densely developed. As a result, land rent, labor cost and commodity prices in East Coast locations are super high compared to Dongxihu. This is a difficult situation for industries with wafer thin profits such as much of the manufacturing sector in China. Therefore manufacturers have strong incentives to move towards Central China where costs are lower. Secondly, in terms of market forces, very large amounts of rural surplus labor remain underused in China’s Central Region. Besides, as discussed previously, migrant workers now prefer to work

in nearby metropolitan areas instead of traveling all the way to east coast due to the convenience issue and the unaffordable living costs in East Coast areas. So the large supply of low cost labor in surrounding areas makes Wuhan a good place for manufacturing. Third, China's economy is turning from export-oriented to domestic demand-oriented. Previously, the prosperity of manufacturing in the East Coast largely reflects its role as "the factory of world". The location of the East Coast is convenient for export, with its numerous world-class marine ports. However, as foreign demand has slowed dramatically since the global financial crisis of 07-08, manufacturers can no longer rely on export demand. On the other hand, Central China is a large area with a large population, which means there is a huge potential regional market. For many manufacturers, moving to Central Region cities such as Wuhan is a good strategy to reduce dependency on the stagnant export market and target prospective domestic demand, thus achieving more sustainable development. Last, near the geographical center of China, Wuhan enjoys huge advantages in terms of location. Since Wuhan is said to be "the nine provinces' leading thoroughfare", it is an important transportation hub for freight, rail, aviation as well as water shipment. From Wuhan, one can travel to most major cities in China within two hours' flight time. This two hours' flying range covers 85 percent of population and 90 percent of GDP in China. Besides, Wuhan is at the center of the HSR (high speed rail) network, most of major Chinese cities can be reached within five hours by HSR.

In conclusion, market factors constitute fundamental drivers in attracting manufacturing investment to Dongxihu. Local level policy actually provides guidance and often triggers the inflow of investment at initial stage. Then, after firms or clusters have developed to a certain degree and show good prospects, upper level policy comes into play and supports its continuous development at an even larger scale.

5.1.2 Infrastructure Construction

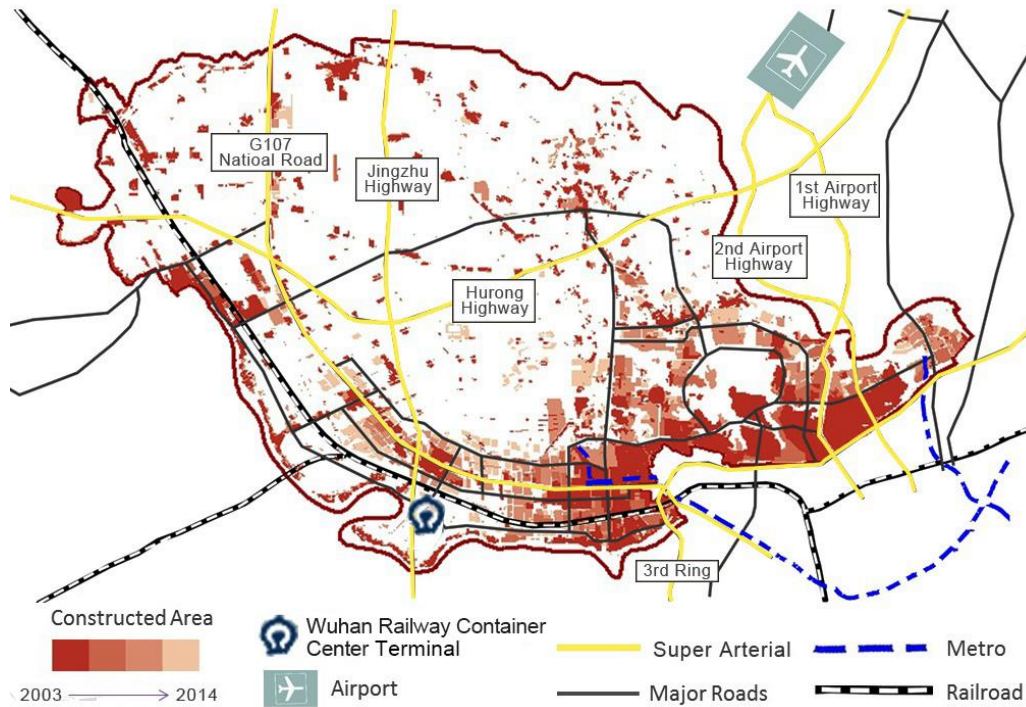


Figure 5.1.1: Key Existing Infrastructures in Dongxihu
(Drawn by the Author)

Figure 5.1.1 shows the relationship between change in the built up area over time and key infrastructure in Dongxihu. Generally speaking, infrastructure construction is a critical driver of Dongxihu's peri-urban development. Due to the need to handle massive inbound raw material flows and send out products, manufacturing is very sensitive to transportation infrastructure. The expansion of the constructed (built-up) area in the Industrial Corridor has been, and is rapid. It is spatially elongated, which can be explained by the complicated road system along the corridor: in addition to the main spine – national road G107, there are also three long major roads running parallel to G107, as well as several connecting roads running perpendicular to the G107; in addition to roads, there is also a freight railway line running through the Corridor. During the ongoing expansion process to the northeast, the Industrial Corridor's development exhibits certain leapfrogging. Previously this leapfrogging jumped to the junction of the Jingzhu and Hurong highways due to the locational advantage create by the intersection of these two

important super arterials. Later, around 2010, the construction of the Wuhan Railway Container Center Terminal reinforced the leapfrog development around this area and gave the Industrial Corridor a stronger base from which to expand contiguously. To be specific, based on this national container terminal, Dongxihu set up a Bonded Logistics Park which is a milestone in Dongxihu's development due to its ability to support possibilities beyond manufacturing and fully realize the District's potential in terms of location and transportation.

Although the airport is actually not within the administrative boundary of Dongxihu District, it is still close enough to greatly influence Dongxihu's development. Each part of Dongxihu is closely connected to the airport by highway system; it is only ten minutes' drive between the airport and Dongxihu's core area. The Spillover Area's and Old Town's tendencies to develop towards the north are largely the result of the airport's draw. Besides the airport, the metro system also plays an important role in Dongxihu's development. As shown in Figure 5.1.1, the Old Town and Spillover Area in Dongxihu are connected to the main city by metro lines, so people living in these areas can conveniently go to main city for high-level commercial, business, and personal services. The metro connection has made the Old Town and Spillover Areas much more accessible, thus greatly facilitating residential development in these areas and attracting more people to live in Dongxihu.

5.1.3 People's Changing Lifestyle

As China's economy keeps growing quickly, people's income has been increasing substantially. As a result, the rapidly expanding middle and upper-middle classes drive demand for amenity (attractive environments), which had already becomes an important driver of the peri-urbanization process in China, initially through such as demand by the elite for peri-urban villas. In developed cities like Beijing and Shanghai, high-end villas and leisure facilities are popping up in the urban periphery. At the same time, driving for agro-tourism in peri-urban areas also has becomes a common way for urban families to relax on weekends. However, in the Dongxihu case, amenity demand played a selective role in Dongxihu's earlier development, but its significance is fading away due to Wuhan's rapid urban expansion and overwhelming development of manufacturing in Dongxihu, which appears to be crowing out amenity specific development.



Figure 5.1.2: Villas in Dongxihu's Spillover Area
(Source: Google Earth, image date: 2015)

Figure 5.1.2 shows a typical villa community in the Spillover Area of Dongxihu. It can be seen that these villas are largely detached single family houses and enmeshed in gorgeous natural scenery of green space and water, like that of a high-end American suburb. Most of this

type of high-end villa in Dongxihu's Spillover Area was built in the early 2000s. For Wuhan, the early 2000s were an interesting time when the upper-middle class started to emerge, but the urban built-up area had not yet extensively expanded. So, at that time, Dongxihu's Spillover Area was a tranquil zone on the outskirts of the city without much construction underway. Given this context, high-end villas popped up in the Spillover Area to meet the demands of the newly emerging upper-middle class who have high mobility and want distinguished living environments. However, Wuhan's urbanization process has boomed since the mid-2000s and the urban built-up area quickly invaded Dongxihu's Spillover Area. In order to accommodate fast-growing urban population, a large number of ordinary apartment complexes were built in the Spillover Area. So middle class high rise housing started to become the residential norm there. Reinforcing this change, the Municipal Government forbade the construction of villas due to their extremely low land use efficiency; nearly no more high-end villas were built after mid-2000s. As a result, although Dongxihu's Spillover Area started as an upper-middle class neighborhood characterized by villas, it was quickly transformed into a dense residential area considered an affordable living choice for the middle class wishing to move from the main city.



Figure 5.1.3: Leisure Facilities in Dongxihu, 2010
(Source: *Dongxihu District Almanac*)

As shown in Figure 5.1.3, three modern leisure facilities in Dongxihu are all located in the Spillover Area, very close to the main city. “Oriental Lucky Horse”, which opened in 2003, is the only international standard racecourse in Central China. “Gold-Silver Lake International Golf Course” is a large golf themed resort consisting of a golf course, club house, hotel and villas. It was opened in the late 90s and has held several national-level golf competitions. “Wuhan Polar Ocean World” is an aquarium which was opened around 2010. In fact, the racecourse and golf course served as anchors when Dongxihu’s Spillover Area was first developed as an upper-middle neighborhood. However, as the Spillover Area was transformed into a more affordable higher-density residential area due to the rapid urban expansion process, these two leisure facilities were enveloped by urban expansion and became more fabric of the urban area instead of being spatial anchors within a peri-urban setting. Although the aquarium is relatively newly built, it is located at the east end corner of Dongxihu’s peri-urban area and is very near the border with the main city, so it has almost no connection with Dongxihu’s peri-urbanization process. No more leisure facilities have been built in peri-urban Dongxihu since manufacturing has become the leading driver of the District’s peri-urbanization process. Overall, it can be concluded that the construction of leisure facilities only affected the development of the Spillover Area at an early stage, and the leisure facility function faded as a peri-urban driver after southern Dongxihu was enveloped by urban expansion and manufacturing led development. This is opposite to the coastal peri-urban trajectory, whereby leisure and amenity developments are becoming more important as drivers of peri-urbanization, and shapers of the peri-urban landscape.

In addition, due to Dongxihu’s early history as essentially a huge state-owned farm, there is still considerable farm land in the District’s rural undeveloped area, which supports many modern agricultural parks. Accordingly, Dongxihu has significant potential for agro-tourism. In fact, Dongxihu has developed several rural-tourism sites and some of them have already become famous. In 2012, rural-tourism in Dongxihu attracted about 2 million visits and led to income of 145 million Yuan. The District is even considering developing industrial tourism based on its

prosperous manufacturing economy. However, Dongxihu's tourism economy is only small-scale when compared to the importance of the manufacturing and residential economies in the District.

5.1.4 Population Growth/Spillover

As the capital city of Hubei Province and the key center of China's Central Region, Wuhan has exerts centripetal forces on surrounding areas. Population from nearby areas, other cities within Hubei province and neighboring provinces in Central China, are attracted to Wuhan as migrants, shoppers, etc. From 2000 to 2014, population in Wuhan Municipality has increased from 8.3 million to 10.3 million, a gain of nearly 2 million people. And the main source of such huge population increase is migration. According to the 6th National Population Census, the number of migrants living in Wuhan Municipality had increased by 1.6 million from 2000 to 2010. As of 2010, there were already 3.8 million migrants in Wuhan, which accounts for 39.2 percent of the total municipal population. Previous research also found migrants in Wuhan are more likely to live at the urban fringe (Wuhan Land Use and Planning Bureau, 2015), either due to more suitable job opportunities or lower living costs. So the rapid population growth in Wuhan is spatially concentrated around the urban fringe, thus further driving peri-urbanization.

In addition, more people are being added to the peri-urban area due to the fact that Wuhan's main city is severely overloaded. According to the Wuhan general plan, the forecast population of the main city for 2020 is 5.02 million, but that number was already reached in 2013 when the population was about 6.3 million. In order to prevent environmental deterioration and congestion caused by excessive high-density in the main city, peri-urban areas are deemed to have a role to play in accommodating more population to reduce main city pressure.

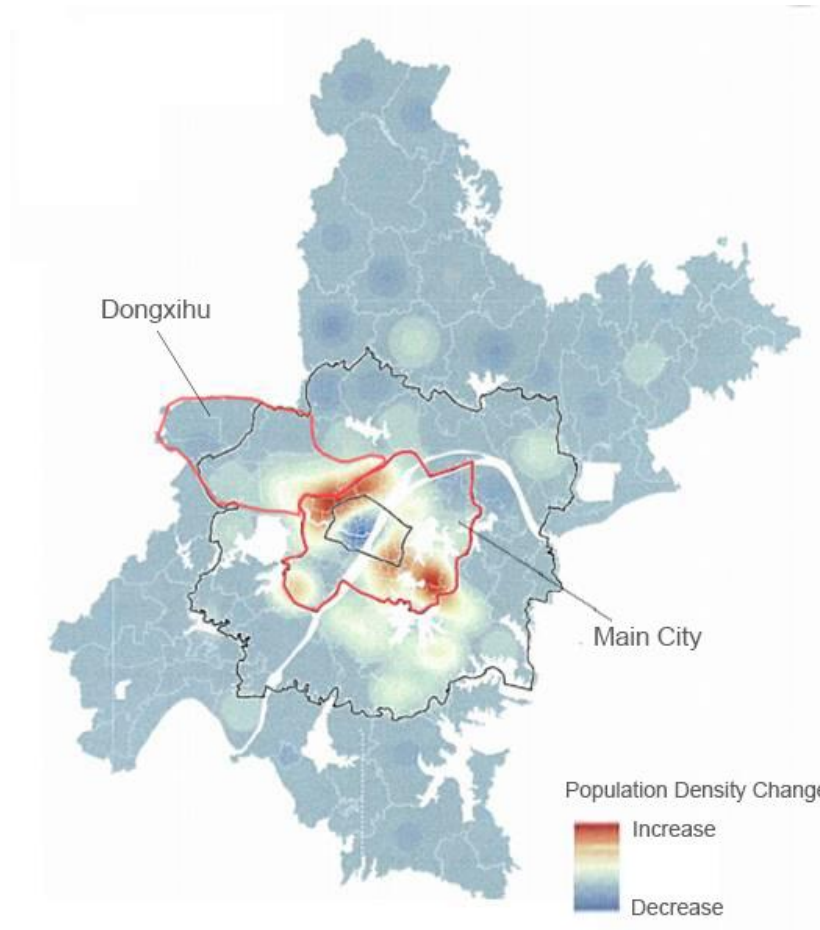


Figure 5.1.4: Population Density Change in Wuhan Municipality, 2000-2010
 (Source: Wuhan Land Resource and Urban Planning Bureau)

Figure 5.1.4 indicates how population density has changed spatially across Wuhan Municipality between the 2000 and 2010 censuses. Red areas are the spaces where major population density increase happened between 2000 and 2010. Since the population density growth mainly happened around the fringe of main city, it can be seen that population spillover did occur, which reinforces the discussion above. The border area between Dongxihu District and the main city experienced substantial population density growth, so Dongxihu is in the main direction of population spillover.

5.1.5 Housing Market

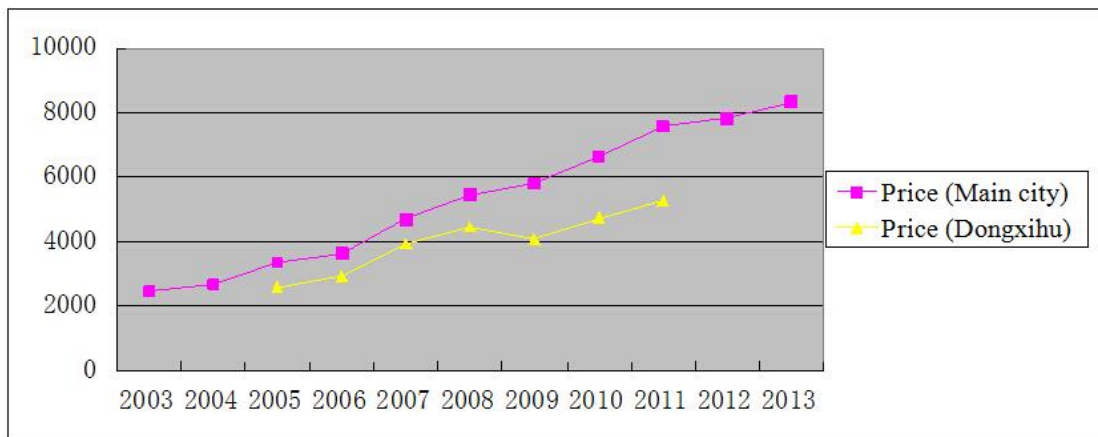


Figure 5.1.5: Average Housing Price in Wuhan's Main City and Dongxihu, 2003-2013
(Unit: ¥/ sqm)
(Source: Baidu)

The housing market is another important driver, lower prices in the peri-urban area signal people to live in the nearby peri-urban area rather than the main city. In China, housing prices in major cities have grown substantially, so housing has become less affordable over the last decades. In fact, housing affordability constitutes a major social crisis in big cities. In Wuhan, the average housing price in the whole municipality has increased 257% from 2003 to 2013. In the year 2013, the average annual salary is 48,942 Yuan per capita, but the average cost of a 100 sqm housing unit reached 721,000 Yuan. So the housing cost is a big burden on families; accordingly, people are very sensitive to housing price. Figure 5.1.5 compares the trend of housing prices between Wuhan's main city and Dongxihu. It can be seen that Dongxihu's housing price is lower than main city and the price difference keeps increasing over time. So housing in Dongxihu has become increasingly affordable relative to main city, thus attracting more people to live in Dongxihu.



Figure 5.1.6: Trend of Average Prices of Used and New Housing in Wuhan (Unit: ¥/ sqm)
(Source: Sina)

Figure 5.1.6 shows an interesting fact regarding housing prices in Wuhan. The price of used housing is higher than that of new housing – a very unusual situation in urban China and East Asia. The answer can be found in the urbanization process. After years of development, the main city is more or less filled up by previous construction while new construction is mainly occurring in the surrounding peri-urban area. Thus if someone wants to buy an apartment in main city, he/she is more or less “forced” to buy a used unit. At the same time, people who buy apartments around the urban fringe are more likely to buy new ones since that area is more newly built. Therefore, most used housing transactions happen in the main city where the price is high as consumers chase a central core city location, and most new housing trades are made on urban periphery where the price is relatively low.

5.1.6 Land Use Policy

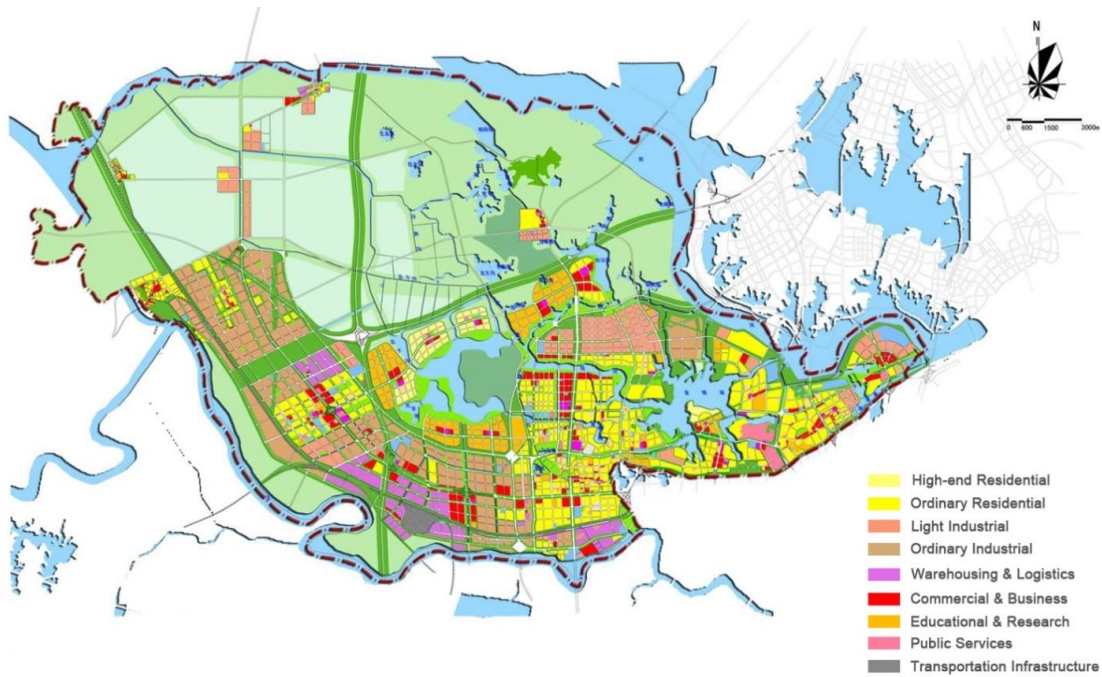


Figure 5.1.7: Dongxihu General Plan (2012-2030)
(Source: Wuhan Land Resource and Urban Planning Bureau)

Different from policies attracting investments, land use policy directly influences the spatial form and land functions of Dongxihu District. However, since urban development in China is very fast and full of uncertainty, it is a common phenomenon that land use planning does not foresee future development trends, thus losing its significance as a control tool and instrument of development guidance. The Wuhan Master Plan (1996-2020), made in 1995, completely failed to anticipate the rapid urban expansion and peri-urbanization in Wuhan Municipality that subsequently occurred, so its value in shaping Dongxihu District is very limited. However, after years of growth, peri-urban Dongxihu developed through market and policy forces separate from the land use plan, and a general pattern started to emerge. Three functional areas – the Industrial Corridor, the District Center and the Spillover Area clearly formed, as has been explained above. This relatively obvious sorting of land use in Dongxihu made the situation simpler to understand and the District Government was able to develop a clearer vision for the future. According to the Dongxihu General Plan 2012-2030 (Figure 5.1.7), the District Government intends to fully expand the Industrial Corridor. Within the Corridor, there will be a warehousing area aligned with major

railway infrastructure. Since the Industrial Corridor appears to be too long, a residential area is planned in the middle of the Corridor to help balance jobs and housing, so as to prevent spatial mismatch. The District Government even plans zoning of land for educational and research functions along the upper edge of the Corridor to facilitate innovation and support upgrade of manufacturing. It is also the District Government's intention to develop the District's Old Town Center northward and connect this zone to the Spillover Area to form an integrated New Town for living. In addition, a group of light industrial lands are planned north of the integrated New Town in order to take advantage of this area's proximity to the airport which is located near the northeast edge of Dongxihu's boundary. All these arrangements are rational and can be considered as good strategy. In fact, the situation in manufacturing-led peri-urban areas such as the Dongxihu are much simpler and easier to grasp than more sophisticated areas such as the urban core and Optics Valley.

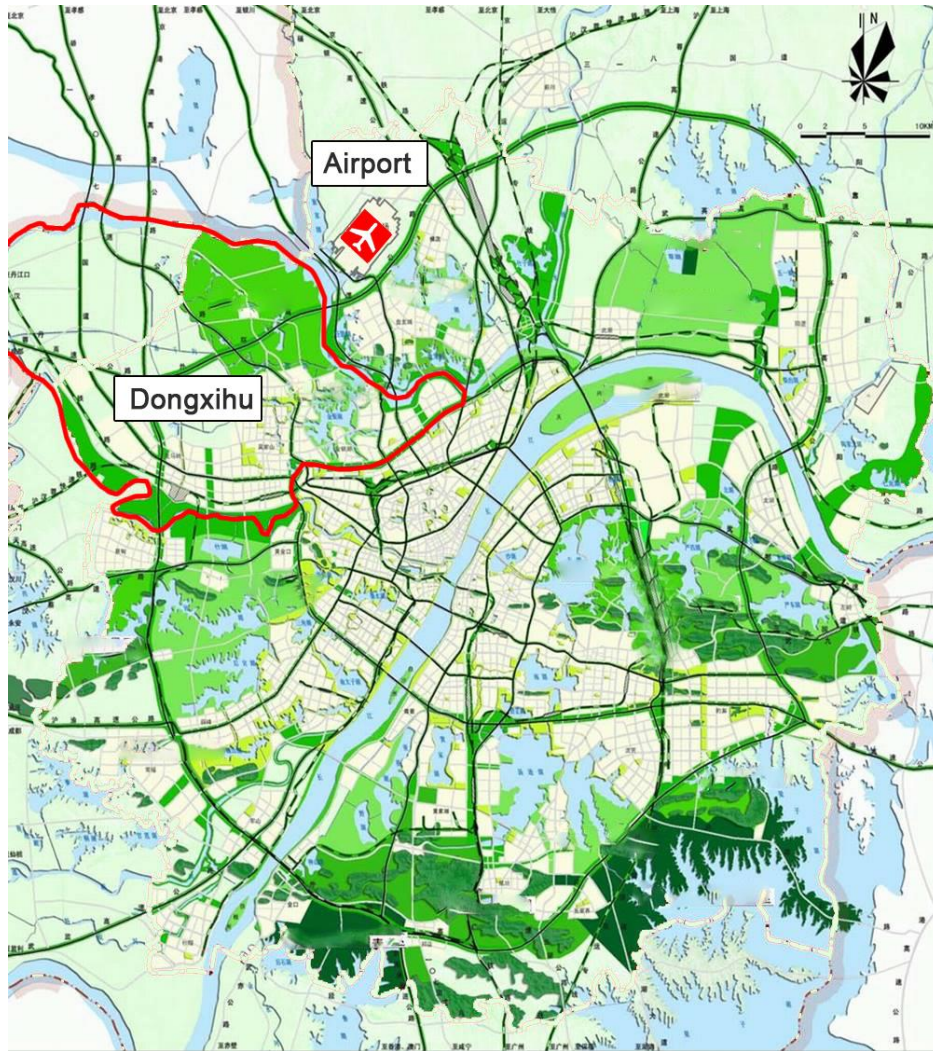


Figure 5.1.8: Green Wedge Plan in Wuhan (2010-2020)
 (Source: Wuhan Land Resource and Urban Planning Bureau)

Green wedge policy was first proposed in the Wuhan General Plan (2010-2020) in order to preserve green open space, ecological infrastructure, and ecological services in the face of rapid urbanization. Developments in green wedges will be strictly controlled. It is a much wiser environmental protection strategy than a green belt strategy since it also allows space for urban expansion (along non-green wedges) while protecting green areas at the same time. So the Industrial Corridor is able to continue to expand northwest in the space between wedges. Besides, control of land in green wedges does not mean no development. There are several agro-tourism sites in the control area along the south edge of Dongxihu. A major green wedge is planned in the

northeast of the District which will create a green buffer space between the airport and Dongxihu's core area. Since the airport is a very important factor affecting the future development of Dongxihu, the implementation of this green wedge will greatly reduce the economic value of this area and weaken Dongxihu's future potential. It might be the reason why Dongxihu General Plan 2012-2030 (Figure 5.1.7) does not plan development further north. In this case, there is a huge conflict between Municipal level land use policy and the District's interest.

5.2 Challenges for Key Drivers

5.2.1 Manufacturing Investment

Manufacturing investment is the primary driver of peri-urbanization in Dongxihu as well as a significant explanatory of China's unprecedented economic growth over the last thirty-five years. However, manufacturing in China is facing a series of challenges caused by international market change and China's own issues. China has long been relying on wafer thin profit labor-intensive manufacturing. But, as the World Bank has pointed out, rapid labor cost growth in China will drive less productive manufacturing move out, thus causing about 85 million jobs to be lost (World Bank, 2011). Currently, there is a trend for low-end manufacturing to move to Southeast Asian countries such as Philippines, Indonesia, Vietnam and Malaysia, and to Southeast Asian countries such as Bangladesh where the labor cost is even lower than in Interior China. In addition, there appears to be a trend toward some relatively high-end manufacturing returning to developed countries. For instance, the United States has adopted policies to stimulate reindustrialization in order to relieve the high unemployment rate and stimulate the economy after the financial crisis. Probably more important, reducing transportation costs as well as better incorporating the latest technology into production are other factors at play in this attempt at reindustrialization in the United States.

When it comes to China itself, there are many factors beyond higher labor cost that negatively influence the manufacturing industry. Now in China, people's attitude towards career choice has changed. In the second half of the twentieth century, being a manufacturing worker was considered as an honorable job according to socialist ideology. But given the rapid socio-economic development after reform and opening, and globalization forces (particularly affecting the millennial generation), manufacturing jobs are now the last choice for people to pursue due to the low wages and the sector's lower status. Especially for the Chinese young generation, they are greatly influenced by modern urban lifestyles and materialism, thus becoming much more ambitious and impetuous than their parents' generation. So they are more interested in getting evolved in the businesses which have potential to make big money instead of just being a

manufacturing worker. As a result, only the least qualified and ambitious cohort of the workforce is filtering into the manufacturing job market, and the quality of worker is getting lower over time. Employees in manufacturing factories are excessively mobile which makes learning within firms difficult. It should be also noticed that Chinese manufacturing lacks innovation (partly the result of ineffective government policies ostensibly designed to stimulate innovation) and still largely relies on low-end products even fake products which violate other's intellectual property. All these phenomena are detrimental to the sustainable development of manufacturing industry. Last, from the perspective of investors, investing in Chinese manufacturing is no longer their top choice. Recently, investors have achieved higher returns by putting their money into real estate due to the dramatic rise in price in the housing market in China, or investing in Internet entrepreneurship programs which are strongly supported by government. So the capital sources for manufacturing are likely to shrink. The bottom line is that the main driver of the District's economy is under considerable stress.

5.2.2 Airport

Among infrastructure factors, airports are an important demographic and land use driver of peri-urbanization. (Marine ports are key to peri-urbanization, in terms of support to actual product production and distribution.) A major airport can add 500,000 to 2,000,000 people to its surroundings over about 20 years, such as happened in Bangkok, Jakarta and other cities (Webster, Cai, Muller, 2014). So airports in advantageously located Wuhan should be able to greatly stimulate surrounding development. However, since 1995 when Wuhan Tianhe Airport was first put into use, there is almost no development in the airport area. Signs of development started to show only after 2010, and development in the airport's environs are still at the very beginning stage. In other words, the significance of airport as a driver for urban development has long been ignored. For the last twenty years, Wuhan's major airport was left alone in the outskirts and was only connected to the city by a single highway.

As rapid development around the urban fringe has occurred over recent years, the potential driving power of the airport keeps attracting more attention. In 2013, Dongxihu District was designated as “Wuhan Airport-based ETDZ”, which shows the District’s objective to fully take advantage of its proximity to the airport (previously Dongxihu district was also known as “Wujiashan ETDZ”). After the redesignation of the District’s ETDZ, the connection between the core area of the District and the airport was immediately enhanced, and the District Government functions started to move north (The airport is to the northwest of Dongxihu). However, as mentioned in Section 5.1.6, a major green wedge was planned in the space between airport and district center, thus eliminating Dongxihu’s possibility to develop land adjacent to the airport in a large scale. As a result, neither the District-level land use plan nor the municipal general plan acknowledges the airport’s potential and the need to develop Dongxihu District as part of an airport district, essentially as part of an aerotropolis (Kasarda, 2011). Even though the District Government has expressed its intention to develop the “green wedge designated” area into an airport-based high-tech industrial zone in its latest concept plan, it is very hard to truly implement this strategy due to the conflict with upper-level planning guidelines. Although the convenient connection to the airport by a rapid travel road system can still greatly facilitate the development of Dongxihu, it cannot compensate for the loss of access to land for aerotropolis type development right next to airport. If Municipal environmental regulation and the District’s demand for development cannot be appropriately balanced, Dongxihu will lose much of its potential as Wuhan’s airport becomes an ever more important driver of the Municipality’s economy.

5.2.3 Public Policies to Attract Firms



Figure 5.2.1: Forces to attract Firms

(Source: Drawn by the Author)

The inflow and expansion of manufacturing firms is the direct explanation for the rising economy in Dongxihu. Policies to attract firms have contributed a lot in supporting this process. The Dongxihu Government shows a strong preference for big firms. For instance, Dongxihu has proposed the “moon project” which has as its main objective, attracting major players instead of ordinary ones to locate in Dongxihu. In addition, the District Government has set up a specialized team to oversee the attraction of powerful firms. Officers in this team act as sales people to do everything possible to promote Dongxihu to potential investors. The District will reward successes in attracting famous firms in terms of career advancement of team members. On the other hand, for small firms, they are more likely to be only affected by basic and generic policies which are common in many other places. The inflow of small firms seems to be more related to market forces. It can be concluded that among the forces driving firms to locate in Dongxihu, the bigger the firm is, the more important policy forces are; at the same time, the smaller the firm is, the more important the market forces are (as shown in Figure 5.2.1).

In fact, Dongxihu's strategy to emphasize attraction of large firms is rational and has already proven to be successful. First, large firms can function as anchors, with extensive and deep supply chains (some to nearby firms, creating geographic clusters) which can directly contribute substantially to local economic development. Powerful large firms are often more stable so as to guarantee continued prosperity. Some big players such as Uni-President and Groupe Danone who came to Dongxihu during the initial industrial development of the District are still playing a leading role in driving the District's economy. Although Wuhan is the geographical center of China, it is still only a second tier city (or a 1,5 tier city according to some analyst such as CBRE) and has no overwhelming advantages over peer competitors in inland China such as Chengdu and Zhengzhou. So, for powerful large firms, it actually does not make much difference for them which major city they locate in central China. Even within Wuhan Municipality, Dongxihu faces competition from other national-level ETDZs: “Wuhan Economic & Technological Development Zone” and “Wuhan East Lake High-tech Development Zone”. So Dongxihu must

show its determination and sincerity by putting distinguished preferential policy forward in order to attract big players.

However, there are also certain concerns associated with Dongxihu's policy of emphasizing large firms and partly ignoring small scale firms. First, it puts Dongxihu in a passive position by largely relying on "begging" big firms to locate from outside. Not all attempts to attract big players are successful. The decision-making power is in the potential locator firms' hands and external changes can significantly influence the firm's decision to move to Dongxihu. Second, ignoring small firms may result in Dongxihu losing the opportunity to incubate local firms into future big players. Some small firms with great potential, e.g., in terms of technology or entrepreneurship, have the possibility to develop into large firms, especially if fully facilitated by supportive policies. In order to achieve sustainable manufacturing development in the future, it would be a better choice for Dongxihu to create a suitable environment for the development of start-up firms rather than simply try to attract existing big names from outside. Currently, although invested by many large firms, Dongxihu is actually a pure production space for them to put factories. If the District can take advantage of its manufacturing foundation to foster an original big name producer, it can really empower Dongxihu's development by contributing to the development of a true headquarters economy. This incubation conception is also in accordance with State Council's recent emphasis on entrepreneurship and innovation. Not paying attentions to small-scale firms might mean that Dongxihu loses a significant chance to upgrade its local development model. Last, public policy's neglect of small firms might lead to inadequate supervision on the inflow of low-end firms. As a result, some small low-quality firms with high pollution and low efficiency could sneak in, causing negative environmental impact on Dongxihu.

5.2.4 Population Spillover

Residential spillover is a major driver of Dongxihu's development, especially from a spatial perspective. However, its significance in terms of driving peri-urbanization in Dongxihu is declining. As noted in Section 4.1.2, the rate of increase in built-up area in the District's Spillover

Area is slowing down. This is largely because the current Spillover Area is already more or less built up. Other factors also have negative impact on spillover effect on Dongxihu. First is the competition from other districts. Dongxihu's north neighborhood – Huangpi District which is famous for its beautiful scenery, is attracting many residents through the large scale of construction of residential communities around the urban fringe. Since the airport is within Huangpi District, these dwellings and communities are even more attractive to residential consumers than those in Dongxihu's Spillover Area due to being closer to the airport and higher amenity. At the same time, owing to rapid manufacturing development, Dongxihu's reputation is increasingly that of a manufacturing district, which is likely to deter residential buyers, especially higher-end residential buyers. Exacerbating this situation is the fact that there are still many manufacturing firms dispersed in Dongxihu's Spillover Area, a negative to many potential residential purchasers. Second, due to the cultural preferences, Chinese people still prefer to live in urban center; and Wuhan's major cultural, education, government, and business elements are concentrated in urban core. So the strong centripetal force of the city's center also impedes the magnitude of spillover effects on Dongxihu.

CHAPTER 6

ASSESSMENT

6.1 Characterizing Dongxihu Peri-urbanization Dynamics

6.1.1 Dongxihu as a manufacturing-led Peri-urban Area

Dongxihu District in Wuhan Municipality is a typical peri-urban area due to its location linking the urban and rural areas, landscape of construction and farm land, plus rapid expansion of its built up area, population and economy. The peri-urbanization process in Dongxihu has been driven by both manufacturing investment and residential spillover, thus resulting in two different peri-urban landscapes within the district: the Industrial Corridor and the Spillover Area. However, manufacturing development seems to be increasingly important while spillover residential development is becoming less significant. Overall, peri-urban development in Dongxihu is best characterized as a traditional manufacturing-led peri-urbanization.

Where Dongxihu directly borders Wuhan's main city, its modern era development first started with the construction of a few high-end villas and leisure facilities for upper-middle amenity seekers. Then, with the rapid population growth and urban expansion in Wuhan, this area was quickly transformed into a spillover area mainly filled by affordable middle-class residential communities. However, with build out of land near the contiguous edge of Wuhan's development, spillover effects as a driver of peri-urbanization is becoming less important.

The inflow of manufacturing investment results from both policy and market forces. Manufacturing development in Dongxihu was first triggered by foreign direct investment especially from Taiwan. Then, domestic investment gradually caught up and became the dominant mode of investment. However, foreign investment, in general, leads to a higher quality manufacturing mix; domestic investment is more associated with the quantity of firms. Manufacturing development has mainly happened along the national highway passing through Dongxihu, thus forming an Industrial Corridor. At the same time, there is also much

manufacturing development dispersed throughout other areas in peri-urban Dongxihu. Moreover, manufacturing contributes to Dongxihu's peri-urbanization not only by itself, but also through stimulating retail/wholesale, logistics, and construction industries thus forming a full manufacturing driven cluster, with chains extending from production to distribution.. As a result, manufacturing development has a great impact on Dongxihu spatially, economically and demographically. During the peri-urbanization process, built up area in the Industrial Corridor and the amount of industrial land in Dongxihu has been steadily increasing and this trend continues. Manufacturing is the fundamental driver of, and dynamic of, economic growth in Dongxihu since it constitutes the largest share of the District's economy and its share is still growing. Labor-intensive manufacturing, together with the construction industry, which is even more labor-intensive, attracts large flows of rural surplus labor mainly from within the Province, constituting the main source of population growth in Dongxihu.

6.1.2 Challenges Facing Dongxihu as a manufacturing-led Peri-urban Area

Since the peri-urbanization process in Dongxihu is becoming increasingly manufacturing-led, the future of Dongxihu largely depends on the state of its manufacturing economy and external factors affecting it. In my opinion, there are concerns re the future. Firms are overly concentrated around their original location and are generally not expanding to new locations along the Corridor despite a string of officially designated industrial parks. However, land is scarce for industrial expansion in area where the original modern era manufacturing firms located. Many firms even choose to locate to the north of the expanding District Center rather than further west area along the Corridor.



Figure 6.1.1: Hangzhou-Ningbo Peri-urban Corridor
(Source: Drawn by the Author)

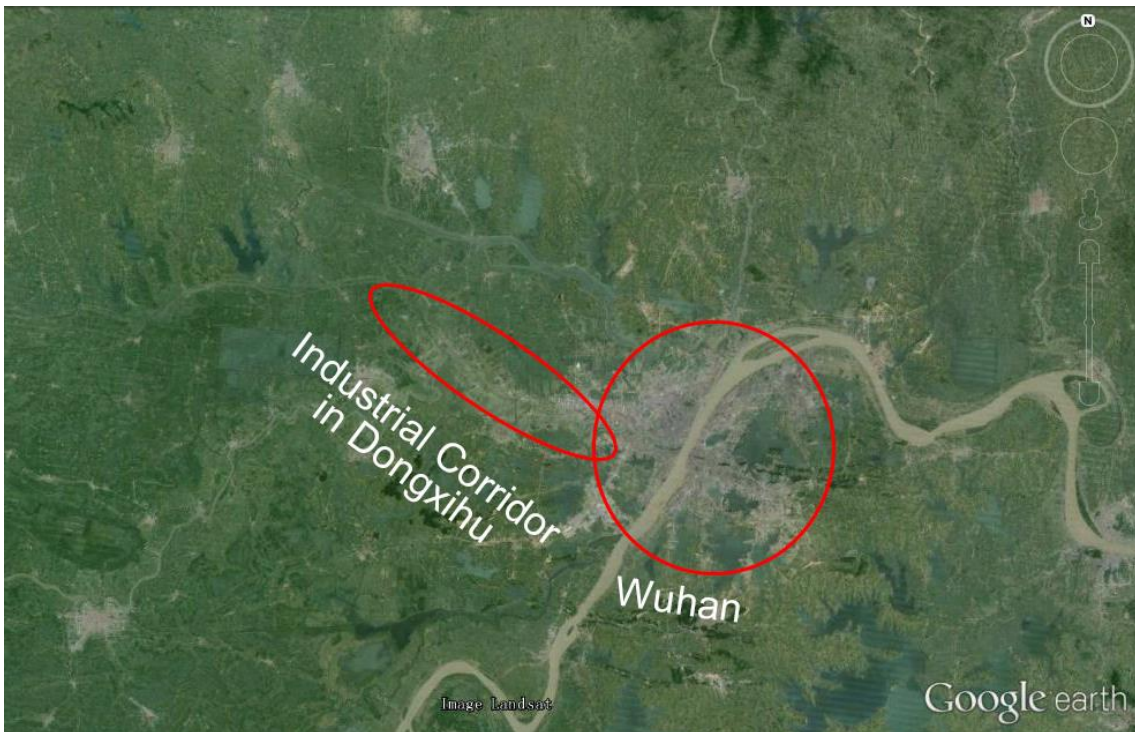


Figure 6.1.2: Industrial Corridor of Dongxihu
(Source: Drawn by the Author)

Figure 6.1.1 shows the peri-urban corridor between Hangzhou and Ningbo in China's East Coast Region. This corridor is about 130 km long, but still dynamic and self-perpetuating due to the balance between two ends. In the highly urbanized East Coast, the urban development difference and size between cities is not huge. Hangzhou is a sub-provincial level city and Ningbo is only a prefecture level city, they are similar in terms of magnitude; although Hangzhou's competitive advantage is in management and innovation, while Ningbo's is in production (Webster, Cai, Muller and Luo, 2004). So the centripetal force from each of them is strong, grounded in complementary competitive advantage thus resulting in a balanced corridor. However, in Interior China, where the urbanization level is relatively lower, the difference between regional central cities and ordinary cities is huge. In essence, Wuhan, as a metropolis, dominates a very large hinterland, with no competing large cities. From Figure 6.1.2, it can be seen that Wuhan holds an "urban monopoly" in its surrounding area and other cities are just too small in comparison. As a result, Wuhan's centripetal force in the Industrial Corridor is too overwhelming and there is no strong enough force to drag the Corridor away from the city. For firms, locating further west along the Corridor means less advantage since they are further from the urban core of Wuhan. That's why many firms prefer to locate around the east end of corridor, or even to the north of the District Center. So the Industrial Corridor is not able to expand rapidly westward even though it is only about 20km long. Finally, the agglomeration effect caused by firms' concentration around one end reinforces the unbalanced development along the Corridor.

6.2 Dongxihu as Prototype Central China Peri-urbanization Paradigm in the Context of China's Peri-urbanization Trajectory

Webster, Cai and Muller (2014) categorized the peri-urbanization trajectory in East Asia into two generations: the first generation is mainly facilitated by globally linked manufacturing and while second generation peri-urbanization is more consumer and amenity driven, i.e., the drivers and dynamic are more diverse and complex. It is the trajectory East Region has experienced as the forerunner in terms of peri-urbanization in China. However, based on my research on Dongxihu which is a representative peri-urban area in Central China, it can be found that Central

China, as the latecomer, is neither simply replicating what has previously occurred in the East, when the East experienced first generation peri-urbanization, nor does the Central China peri-urban case, represented by Dongxihu, directly jump into second generation peri-urbanization. The Central China case shows a different mix; although manufacturing-led, it exhibits some unique characteristics.

First, manufacturing investment is the fundamental driver of peri-urbanization in Central China, reflecting what previously occurred in the East Region. However, Central China's peri-urbanization relies more on domestic investment while foreign investment is the main capital source for East Region manufacturing. This is partly explained by the fact that manufacturing in the East Region is mainly export-oriented while Central China's manufacturing is more targeted to domestic demand. Second, different from the landscape of sprawling factories (literally stretching for hundreds of kilometers in the Pearl River Delta Region), manufacturing development is less spatially dispersed in Central China. This is partly because of the strong centripetal force from the only core city which enjoys an "urban monopoly"; but also, physical development / land use in the Central region is better managed because of Central China's latecomer advantage. Third, manufacturing industry in Central China mainly makes use of nearby rural labor surplus (dominantly from within the province) instead of attracting migrant workers from all over the country, as in the East Region. Fourth, peri-urbanization in central China is not purely driven by manufacturing and shows some mix of drivers. Mainly occurring in the 21st Century, Central China's peri-urbanization area is more influenced by consumer and amenity economies than was the case in first generation East Region peri-urbanization. However, since Central China has a lower degree of socio-economic development than the East, the impact of consumer and amenity economy drivers on Central Region is more limited than in the East. Aside from less consumer purchasing power, there are scale issues, so we do not (yet) see Disneyland and Formula 1 race tracks in Wuhan's peri-urban area. Fifth, spillover residential effects may be stronger in the Wuhan case because East Coast industrial areas tend to be further away from the main city in many cases. In sum, peri-urbanization in Central China can be largely categorized as the

manufacturing-led type even though it shows certain features of second generation peri-urbanization. Last, peri-urbanization in the Central Region is highly similar to its inland peer - Western Region cities (e.g., Chongqing, Xi'an) in terms of investment and labor sources as well as the mix of firms. But what makes the Central Region unique is the rise of a non-ocean port logistics/warehousing industry – because of their “land locked” position, logistics services are critical to enable Interior cities (Central and Western Region) to support manufacturing. (In fact, in the Mid-Twentieth Century, many analysts argued that the Interior Chinese cities could not support manufacturing because of their “land locked” geographical locations – they have been proved wrong.) Due to its advantageous geographical location and advanced transportation infrastructure, Central China has a huge potential to develop its logistics/warehousing industry as another important driver of peri-urbanization.

6.3 Policy Implications

Learning from Dongxihu's peri-urbanization experience can inform Chinese policy makers as they attempt to better manage and guide the development of peri-urban area in Interior China.

Policy makers should regard attracting manufacturing investment as the main strategy for economic development in interior peri-urban areas. As a latecomer, Interior China is relatively undeveloped in terms of economy and urbanization, thus it has a favorable cost structure for low to mid-level manufacturing. The impact of consumer and amenity drivers on the economy of interior peri-urban areas is limited – migrant workers have modest wages. Thus the economic development of interior peri-urban areas will still largely depend on manufacturing investment for the foreseeable future. A very strong driver of manufacturing-led interior peri-urbanization is the major spatial trend of manufacturing moving from Coastal China to Interior China. In sum, manufacturing development is the most effective and reliable way to stimulate the economic growth in peri-urban areas in Interior China.

Planners should be cautious when adopting corridors as the spatial form for manufacturing development in interior peri-urban areas. Corridors are most effective when the centripetal forces at both ends of the corridor are strong. However, in interior China, regional core cities are always much larger than surrounding cities. So, in the case of peri-urban corridors stretching out from a major core city, the forces from the core city are too overwhelming, thus making the development of the corridor self-limiting.

Besides just targeting large firms, governments responsible for development of peri-urban areas should also pay attention to small firms in their promotion and incentive activities. It puts peri-urban governments in a very passive position if they keep attempting to persuade only big players to invest. It would be a more proactive approach if peri-urban governments can create a suitable environment which can foster middle-small firms to develop into big firms.

Policy makers should have better coordination between different level policies. Currently, district governments in Chinese cities, especially in Wuhan Municipality have huge power, including to make development plans by themselves. As a result, it is common that the district's interests and plans are in conflict with the municipal plan. This disagreement can greatly reduce the efficiency of development. So it is important for district level planners and managers to incorporate their objectives into higher level vision set by Municipality

Manufacturing development can be further facilitated by forming economic clusters, with deep and extended supply chains. In Dongxihu, there is a complete industrial chain for building materials and equipment from production to sale to utilization. It is not only good for manufacturing itself but also for the development of other industries. Accordingly, economic cluster formation should be encouraged and facilitated to the extent possible.

Last, policy makers should consider the possibility of supporting the logistics/warehousing industry as another significant driver of peri-urbanization. In China, modern logistics/warehousing

is an emerging productive service industry with huge potential. Recently, specialized third party logistics firms began popping up on a sizeable scale. The quality transportation infrastructure, sufficient land resources, and plenty of manufacturing factories in the peri-urban area make it an ideal place for logistics/warehousing industry. The manufacturing and logistics/warehousing industry can reinforce each other thus achieving a linkage development. Unfortunately, in China, logistics firms are often discouraged from locating by local government because revenue and tax revenues are often less per land unit than other activities such as high-value added manufacturing. However, local governments should understand that there are considerable external benefits to logistics services, especially in Interior China, given that it is land locked. Accordingly, to gain competitive advantage in manufacturing, Dongxihu, and similar peri-urban jurisdictions in China should support location of state-of-the-art logistics facilities in their jurisdictions.

6.4 Conclusion

Dongxihu District in Wuhan, as a representative peri-urban area in the Central Region of Interior China, is experiencing a diverse but increasingly manufacturing-led peri-urbanization process. This process neither simply replicates first-generation manufacturing-led peri-urbanization, nor directly jumps into second generation peri-urbanization driven by consumer and amenity drivers. Dongxihu's peri-urbanization started somewhere between first and second generation peri-urbanization, but actually appears to be stepping back to the first generation type as spillover effects become less, and the District's increasingly manufacturing dominated economy, land use and reputation may actually be crowding out amenity land uses. Although mainly driven by manufacturing, what Dongxihu is experiencing now is very different from what the Eastern Region experienced previously. Dongxihu, together with other peri-urban areas in Interior China, is facing brand new opportunities and challenges.

REFERENCES

- Adell, G. (1999). *Theories and models of the peri-urban interface: a changing conceptual landscape*. UK: University College London, Development Planning Unit.
- Browder, J.O., Borland, J.R. and Scarpadi, J.L. (1995) Patterns of development on the metropolitan fringe – urban fringe expansion in Bangkok, Jakarta and Santiago. *Journal of the American Planning Association*, 61(3): 310-327.
- Burt, Ronald S. (1992). *Structural Holes*. Cambridge, MA: Harvard University Press.
- Bian, Yanjie; Soon, Ang. (1997). Guanxi Networks and Job Mobility in China and Singapore. *Social Forces*. 75:981–1006
- Clark, J. (2006) *Peri-Urban Agglomerations in Southeast Asia*. Exurban Change Project White Paper.
- Cox, W. (2010). China: Two modernizations (decentralization and living away from the job). *New Geography* [blog post].
- Chen, M., Zhang, W., & Lu, D. (2014). Examining spatial pattern and location choice of affordable housing in Beijing, China: Developing a workable assessment framework. *Urban Studies*, 52(10), 1846-1863.
- Chan, Kam Wing, 2012. "Internal Labor Migration in China: Trends, Geography and Policies" in United Nations Population Division, *Population Distribution, Urbanization, Internal Migration and Development: An International Perspective*, New York: United Nations, pp.81-102.
- Douglas, I., (2006). Peri-urban ecosystems and societies transitional zones and contrasting values. In *Peri-Urban Interface: Approaches to Sustainable Natural and Human Resource Use*, edited by D. McGregor, D. Simon, and D. Thompson, pp. 18-29. London, UK: Earthscan Publications Ltd.
- Douglass, M. (2000). Mega-urban Regions and World City Formation: Globalisation, the Economic Crisis and Urban Policy Issues in Pacific Asia. *Urban Studies* 37(12): 2315-2335
- Friedmann, J. (2011). Becoming Urban: Periurban Dynamics in Vietnam and China — Introduction. *Pacific Affairs*, 84(3), 425-434.
- Fischer, C. (1984). *The urban experience*, Second edition. San Diego: Harcourt Brace.
- Fan, C. C. (2008). *China on the Move: Migration, the State, and the Household*. Abingdon: Routledge
- Goldblum, C., T.C. Wong (2000) Growth, Crisis and Spatial Change: A Study of Haphazard Urbanisation in Jakarta, Indonesia. *Land Use Policy* 17, 29-37.
- Ge, B., & Tian, L. (2011). Characteristics and driving forces of peri-urban areas: The case of shanghai, china. 2011 5th International Association for China Planning Conference.
- Hao, L. (2012). Cumulative Causation of Rural Migration and Initial Peri-Urbanization in China. *Chinese Sociological Review*, 44(3), 6-33.
- Haase, D. (2014). How is Urban Land Use Unique. *Rethinking Global Land Use in an Urban Era*. Edited by Seto, K.C., and Reenberg, A. Cambridge, MA: MIT Press.

- Huang, H., and Wei, Y. D. (2014). Intra-metropolitan location of foreign direct investment in Wuhan, China: Institution, urban structure, and accessibility. *Applied Geography*, 47, 78-88.
- Hsiao, C and Shen, Y. Foreign Direct Investment and Economic Growth: The Importance of Institutions and Urbanization. *Economic Development and Cultural Change*. 2003; 51(4):883–896
- Haumont, Nicole and A. Marie, Alain (eds.). (1987). *Politiques et pratiques urbaines dans les pays en voie de développement*, L'Harmattan, Paris.
- Huang, Y. (2015). Bolstering Inclusionary Housing in Chinese Cities. *Paulson Policy Memorandum*. The Paulson Institute.
- Iaquinta, D.L. and Drescher, A.E. (2000). *Defining peri-urban: understanding rural-urban linkages and their connection to institutional contexts*. Rio de Janeiro: Tenth World Congress of the International Rural Sociology Association.
- Jones, G.W. and Visaria, P. (1997). *Urbanisation in Large Developing Countries: China, Indonesia, Brazil, and India*. Oxford: Clarendon Press.
- Jessop, B. (2000). The Crisis of the national spatio-temporal fix and the tendential ecological dominance of globalizing capitalism. *International Journal of Urban and Region Research*, 24(2), 323-360.
- Johnson, G. E. and Y.-F. Woon. (1997). Rural Development Patterns in Post-Reform China: The Pearl River Delta Region in the 1990s. *Development and Change* 28: 731-751.
- Johnson, D Gale. (2002). Comment on 'The U.S. Structural Transformation and Regional Convergence: A Reinterpretation'. *Journal of Political Economy*. 110(6):1414–1418.
- Lin, George C S. (2006). Peri-urbanism in Globalizing China: A Study of New Urbanism in Dongguan. *Eurasian Geography and Economics*. 47(1):28–53
- Liang, Zai; White, Michael J. (1997). Market Transition, Government Policies, and Interprovincial Migration in China: 1983–1988. *Economic Development and Cultural Change*; 45(2):321–339
- Legates, R., & Hudalah, D. (2014). Peri-Urban Planning For Developing East Asia: Learning From Chengdu, China And Yogyakarta/kartamantul, Indonesia. *Journal of Urban Affairs*, 36(S1), 334-353.
- McGranahan, G., Satterthwaite, D., and Tacoli, C. (2004). *Urban-rural change, boundary problems and environmental burdens*, International Institute for Environment and Development.
- Massey, Douglas S.; Arango, Joaquin; Hugo, Graeme; Kouaouci, Ali; Pellegrino, Adela; Taylor, J Edward. (1993). Theories of International Migration: Review and Appraisal. *Population and Development Review*. 19:431–466.
- McGregor, D. F., Simon, D., and Thompson, D. A. (2006). *The peri-urban interface: Approaches to sustainable natural and human resource use*. London: Earthscan.
- Nilsson, P.A. (2002). Staying on farms: an ideological background. *Annals of Tourism Research*, 29,7-24.
- Narain, V. (2009). Growing city, shrinking hinterland: Land acquisition, transition and conflict in peri-urban Gurgaon, India. *Environment and Urbanization*, 21(2), 501-512.

- O'Flaherty, B. (2005). *City economics*. Cambridge, MA: Harvard University Press.
- Organization for Economic Cooperation and Development (OECD). (2000). *Main Determinants and Impacts of Foreign Direct Investment on China's Economy*. OECD working papers on international investment (OECD, Paris, December).
- Peri-urbanisation. (2015). Retrieved from <https://en.wikipedia.org/wiki/Peri-urbanisation>
- Page, S. J., & Getz, D. (1997). *The business of rural tourism: International perspectives*. London: Thomson.
- Rakodi, C. (1998). *Review of the poverty relevance of the peri-urban interface production system research*. Report for the DFID Natural Resources System Research Programme, and Draft.
- Rondinelli, D. and Hugh, E. (1983). Integrated regional development planning: linking urban Centers and rural areas in Bolivia, *World Development*, Vol. 11,.
- Ravetz, J., Fertner, C., Nielsen, T.S. (2013). The Dynamic of Peri-urbanization. *Peri-urban futures: Scenarios and Models*, edited by Nilsson et al. Berlin: Springer.
- Sun, L. (2012). Sustainable peri-urban residential settlement development in China – the case of Tianjin. Cardiff University, ProQuest Dissertations Publishing.
- Simon, D., McGregor, D., and Thompson, D. (2006). Contemporary perspectives on the peri urban zones of cities in development areas, *In Peri-Urban Interface: Approaches to Sustainable Natural and Human Resource Use*, edited by D. McGregor, D. Simon, and D. Thompson, pp. 3-17. London, UK: Earthscan Publications Ltd.
- Sajor, E. E. (2003). Globalization and the urban property boom in Metro Cebu, Philippines. *Development and Change* 34, 713-741.
- SIT, V.F.S. and Yang, C. (1997). Foreign-investment-induced exo-urbanization in the Pearl River Delta, China, *Urban studies*, 34(4), 647-677.
- Sassen, S. (1991) *The Global City: New York, London, Tokio*. Princeton: Princeton University Press.
- Sjoberg, O., and Fredrik Sjöholm (2004). Trade Liberalization and the Geography of Production: Agglomeration, Concentration and Dispersal in Indonesia's Manufacturing Industry. *Economic Geography* 80(3): 287-310
- Schteingart, Martha (eds). (1989), *Changement Social et Mutations Urbaines en Amérique Latine*, Bordeaux, CNRS – ORSTOM
- Simon, D., D. McGregor, K. Nsiah-Gyabaah (2004) The Changing Urban-Rural Interface of African Cities: Definitional Issues and an Application to Kumasi, Ghana. *Environment and Urbanization* 16, 235-248.
- Townsend, A. (1992). New directions in the growth of tourism employment epropositions of the 1980s. *Environment and Planning A*, 24,821-832.
- University of Nottingham., University of Liverpool. (1999). *Literature Review on Peri-Urban Natural Resource Conceptualization and Management Approaches*. UK: Natural Resources International.

- United Nations Conference on Trade and development STAT Database (UNCTAD). (2013). Retrieve from <http://unctadstat.unctad.org/ReportFolders/>
- Webster, D. (2002). *On the edge: Shaping the future of peri-urban Asia*. Stanford, CA: Stanford University, Asia-Pacific Research Center.
- Webster, D., Muller, L (2002). Challenges of Peri-urbanization in the Lower Yangtze Region: The Case of the Hangzhou- Ningbo Corridor. In M. Freire & B. Yuen (Eds.), *Enhancing urban management in East Asia* p. 23–54. Aldershot, UK: Ashgate.
- Webster, D., Cai, J., Muller, L., and Luo, B. (2004). *Peri-urbanization in Chengdu, Western China: from “third line” to market dynamics*. Stanford, CA: Asia-Pacific Research Center, Stanford University.
- Webster, D., Cai, J., Muller, L. (2014). The new face of peri-urbanization in East Asia: modern production zones, middle-class lifestyles, and rising expectations. *Journal of Urban Affairs*, 36, 315-333.
- Woltjer, J. (2014). A global review on peri-urban development and planning. *Jurnal Perencanaan Wilayah dan Kota*, 25, 1-16.
- Winarso, H., T. Firman. (2002) Residential Land Development in Jabotabek, Indonesia: Triggering Economic Crisis?. *Habitat International* 26, 487-506.
- Wu, J and I. Radbone. (2005) Global Integration and the Intra-Urban Determinants of Foreign Direct Investment in Shanghai. *Cities* 22 (4), 275–286
- World Bank. (2014). China’s Urbanization and Land: A Framework for Reform. *Urban China: Toward Efficient, Inclusive, and Sustainable Urbanization*.
- Wu, F., Zhang, F., & Webster, C. (2012). Informality and the Development and Demolition of Urban Villages in the Chinese Peri-urban Area. *Urban Studies*, 50(10), 1919-1934.
- Williams, A. M., & Shaw, G. (1999). *Tourism and economic development: European experience*. Wiley.
- Wu, J. (2008). The peri-urbanisation of Shanghai: Planning, growth pattern and sustainable development. *Asia Pacific Viewpoint*, 49(2), 244-253.
- Yaping, W., & Min, Z. (2009). Urban spill over vs. local urban sprawl: Entangling land-use regulations in the urban growth of China’s megacities. *Land Use Policy*, 26(4), 1031-1045.
- Yang, Z., Cai, J., & Sliuzas, R. (2010). Agro-tourism enterprises as a form of multi-functional urban agriculture for peri-urban development in China. *Habitat International*, 34(4), 374-385.
- Zhang, Kevin Honglin. (2002). What Explains China’s Rising Urbanisation in the Reform Era? *Urban Studies*. 39(12):2301–2315.
- Zhao, Yaohui. (2003). The Role of Migrant Networks in Labor Migration: The Case of China. *Contemporary Economic Policy*. 21(4):500–511.
- Zhao, P. (2012). Urban–rural transition in China’s metropolises: New trends in peri-urbanisation in Beijing. *International Development Planning Review*, 34, 269–294.

Zhang, X., Zhang, X., Hu, S., Liu, T., & Li, G. (2013). Runoff and sediment modeling in a peri-urban artificial landscape: Case study of Olympic Forest Park in Beijing. *Journal of Hydrology*, 485, 126-138.

Zhu, J., & Guo, Y. (2013). Fragmented Peri-urbanisation Led by Autonomous Village Development under Informal Institution in High-density Regions: The Case of Nanhai, China. *Urban Studies*, 51(6), 1120-1145.

陈良波, 王金演, 李丽桢. (2010). 泉州半城市化特征与机制研究. *福建商业高等专科学校学报*. 2010(1), 14-19.

曹国华, 张培刚. (2010). 经济发达地区半城市化现象实证研究-以江苏省常熟市为例. *规划师*. 26(4), 78-83.

曹卫东. (2005). *中国西部典型地区半城市化的机制研究-以成都新津县为例*. 安徽师范大学.

东西湖人民政府. (2008-2014). *东西湖年鉴*. 武汉, 湖北: 长江出版社

东西湖区统计局. (2002-2014). *东西湖区国民经济和社会发展统计公报*. Retrieved from <http://www.dhx.gov.cn/wcm/res/qgdj/P12010072715550900063.shtml>

黄云凤, 崔胜辉, 石龙宇. (2012). 半城市化地区土地利用变化及驱动力分析-以厦门市集美区为例. *环境科学与技术*. 35(6), 199-205.

刘盛和, 张攀. (2008). 杭州市半城市化地区空间分布变化. *地理研究*. 27(5). 982-992.

刘盛和, 叶舜赞, 杜红亮, 陆翔兴. (2005). 半城市化地区形成的动力机制与发展前景初探. *地理研究*. 24(4). 601-611.

潘卓. (2009). 中国西南地区半城市化特征与发展模式研究-以重庆市北碚区为例. *安徽农业科学*. 37(16), 7740-7742.

田莉, 戈壁青, 李永浮. (2014). 1990年以来上海半城市化地区土地利用变化-时空特征和影响因素研究. *城市规划*, 38(6), 17-23.

我国产业转移现状和特点分析. (2015). Retrieved from <http://cyzy.miit.gov.cn/node/6281>

王佑汉. (2009). 半城市化地区土地利用变化及驱动力分析-以成都市龙泉驿区为例. *资源与产业*. 11(2), 61-65.

朱青, 赵瑾, 姜兆瑞, 李红军. (2006). 山东南部地区的半城市化现象及问题探讨. *城市规划*, 30(9), 42-47.

郑艳婷, 刘盛和, 陈田. (2003). 试论半城市化现象及其特征-以广东省东莞市为例. *地理研究*. 22(6). 760-76.