Understanding the Role of Edge Cities in the Application of Polycentric Development in China's Mega City Regions

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By

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Abstract

The term polycentricity originally emerged in the West, but with multiple meanings. More recently, the concept of polycentricity has been increasingly invoked as a policy idea, seeking balanced development within both cities, and more broadly, regions. Consequently, polycentricity has been applied to a variety of spatial plans at a number of different scales. Edge cities have become a part of the polycentric city regions used to try to create balanced development particularly at the intra-urban scale. Towards the end of 20th century, polycentricity and the edge city, were introduced as new planning concepts into China. Subsequently a number of super/mega city regions (*shiyu*) began to apply polycentric development spatial planning strategies designed to better facilitate more sustainable and balanced development. After more than fifteen years' development, there is, however, little research available on how successful this application has been, and it remains unknown whether Chinese edge cities, at a local level, have been effectively planned and formed under the umbrella of upper level polycentric strategies.

This research attempts to fill this gap by developing a conceptual framework for the application of polycentricity and a methodology for investigating it, at both the city regional and local scales with specific reference to the Chines context. More particularly the focus is to reveal and interpret the challenges and difficulties, from the perspective of planning and development, of Chinese edge cities. Methodologically, this research adopts an embedded case study approach. Initially eight super/mega city regions were selected across China based on when the application of polycentricity development first became evident. This macro policy analysis led to two more detailed city regions Guangzhou and Nanjing. After this, the formation of Chinese edge cities was explored at a local scale. This involved looking at the development trajectories of the selected Chinese edge cities through planned, unplanned or integrated processes, and also going beyond the subject of edge cities, and examining the dynamics behind their formation. The data were mainly drawn from documentary analyses of plans/policies and interviews with key stakeholders in China at both the city regional and local scales.

The findings highlight the divergent interpretations of polycentricity in master planning practices at the city regional scale and show how plans have been adjusted to help deliver the idea of polycentric development. Although the concept of polycentricity is relatively new in China, it has also been a fuzzy and flexible term open to different interpretations as in the West. It has become a policy tool especially used in spatial planning to help promote land-centred urban policies, and to further facilitate central cities' prosperity through spatial restructuring. At the local scale, the findings show three different development trajectories of the emerging Chinese edge cities in terms of three elements: spatial form, functional identity and governance arrangements. Major challenges in effectively delivering polycentric development strategies and in forming Chinese edge cities are recognised particularly from the perspective of key actors.

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List of Acronyms

CBD	Central Business District
CEC	Commission of the European Communities
CPPCC	Chinese People's Political Consultative Conference
ESDP	European Spatial Development Perspective
ESPON	European Spatial Planning Observation Network
ETDZ	Economic and Technological Development Zone
EU	European Union
FTZ	Free Trade Zone
GD	Guangdong
GDP	Gross Domestic Product
GHM	Guangdong-Hong Kong-Macao
HKUST	Hong Kong University of Science and Technology
HSR	High-speed Railway
NETDZ	National Economic and Technological Development Zone
PPRD	Pan-Pearl River Delta
PUR	Polycentric Urban Region
SCUT	South China University of Technology
SME	Small and Medium Sized Enterprise
TVE	Township or Village Enterprise

CHAPTER ONE

Introduction

Around 2000, facing the increasing problems raised by rapid urban expansions and urbanisation process, a number of super/mega city regions in China began to adopt a Western concept, polycentricity, in seeking to organise multiple centres and enhance the competitiveness of the whole city regions. For example, in the *1999 Shanghai City Master Plan*, a spatial structure of 'multi-axes (*duozhou*), multi-layers (*duoceng*), multi-cores (*duohe*)' was proposed. Promoting 'multi-cores (*duohe*)' and seeking to enhance these functional centres was applying the concept of polycentricity to strategic plans in Shanghai. Subsequently, terms other than 'multi-cores' were also used in spatial planning around 2000, such as a 'polycentric, clustered and networked spatial structure *(duozhongxin-zutuanshi-wangluoxing)*' in the *2001 Guangzhou City Master Plan*, 'clustered spatial layout (*zutuanshi*)' in the *2005 Tianjin City Master Plan*, and 'one-ring multi-nodes (*yihuanduodian*)' in the *2001 Hangzhou City Master Plan*, and so on. These are different variations of the polycentricity concept visible in China's spatial planning.

The introduction, application and delivery of the concept of polycentricity into a Chinese context have raised some crucial problems and challenges, which have attracted attention. First, polycentric development has been adopted in a number of super/mega city regions' spatial planning at different spatial scales across China, with the aim of shaping future spatial structures. However, there is an absence of an articulated rationality to decide whether this is an ideal model before actually applying it in planning activities. Secondly, as a Western concept and more recently a popular term in strategic planning in China, it remains unknown as to how this concept has been applied, on the ground, in a Chinese context. Thirdly, the planned

polycentric development approach is intended to deliver from a city regional scale to a local scale, and to promote the development of local settlements or centres within a polycentric structure. A question mark remains as to whether these centres are properly formed in practice. To a wider extent, these problems and challenges will also help to develop a better understanding of the latest suburbanisation or outer-suburbanisation processes in Chinese super/mega city regions, and the logic and dynamics of planning activities under transitional economies in China. The above issues, therefore, are the focus of this research.

1.1 The formation of edge cities under a polycentric development framework

The idea of polycentricity can be traced back to Geddes (1949) and Mumford (1938) in the early twentieth century, or even Howard (1898) in the late nineteenth century, and more recent theoretical discussions on the multi-cored urban regions that come from *The World Cities* by Sir Peter Hall (1966). The literal term or concept of polycentricity was first used by Leven (1978), at least according to the Scopus bibliographic database (van Meeteren et al., 2016). Since the early 1990s, urban spaces in Europe, North America and Japan have all exhibited polycentric development trends (Z. Yang and Cai, 2008), which indicates that the urban spatial structure had entered a new stage of development. Meanwhile, researchers in Western countries began to use multiple methods to study the morphology, composition and governance of polycentricity; these studies mainly focused on cities such as Atlanta (Hartshorn and Muller, 1989a; Fujii and Hartshorni, 1995), Cleveland (Bogart and Ferry, 1999), San Francisco (Cervero and Wu, 1997), Houston (Craig and Ng, 2001; Craig, Kohlhase and Perdue, 2016), Barcelona (Garcia-López and Muñiz, 2010), Rome and Milan (Veneri, 2013), Randstad (Musterd and van Zelm, 2001; Lambregts, 2006; van Oort, Burger and Raspe, 2010; Spaans and Zonneveld, 2016), and countries and regions such as Belgium (Riguelle, Thomas and Verhetsel, 2007; Hanssens et al., 2014), California (Modarres, 2011) and Rhine-Main (Hoyler,

Freytag and Mager, 2008). The concept of polycentricity has been increasingly invoked as the main objective in seeking balanced development within cities and, more broadly, regions (Hall and Pain, 2006). Consequently, under the impetus of urban planners and policy-makers, polycentricity has been applied in a variety of spatial plans and policies at a number of different scales, and among these perhaps the most influential one is the *European Spatial Development Perspective (ESDP)* (CEC (Commission of the European Communities), 1999), aiming to enhance both competitiveness and cohesion. It can be argued, in a Western context, that the concept of polycentricity is regarded not only as an analytical concept to explain an existing or emerging reality, but is also increasingly applied both as a strategic planning tool to guide and promote this transformation, and as a political framework to determine and regulate that reality (Hague and Kirk, 2003; Shaw and Sykes, 2004; Eskelinen and Fritsch, 2009).

Simply speaking, the basic elements of polycentricity include two major aspects, centres/nodes within the polycentric structures, and connections/linkages between those centres. Even so, from the Western literature, one of the key arguments is that polycentricity is, so far, a fuzzy concept and open to multiple interpretations (Kloosterman and Musterd, 2001; Davoudi, 2003; Shaw and Sykes, 2004; Meijers, 2008; Lambregts, 2009), which has enabled its application in different country settings with variations of explanations, adapting to different social and economic backgrounds and contexts. China exists as one example to explore the application of the polycentricity concept in a totally different context under state-transitional economies. Particularly among the vast literature on the polycentricity research so far, China has been identified as one of the eight specific clusters within the polycentricity citation network, the only one named from the geographical context, and together with seven other clusters, including intra-urban, inter-urban, inter-regional, governance, world city, commuting and economic geography (van Meeteren et al., 2016). Clearly, polycentricity or polycentric urban systems, has become an oft-used descriptive term in the Chinese context, especially in recent

years, and has also been applied or invoked as a policy concept.

The concept of polycentricity was introduced into China towards the end of the twentieth century. It was originally used as an analytical framework, before it quickly became part of the policy discourse, mainly through planning polycentric cities or regions. A number of super/mega city regions[1] in China all began to apply the polycentricity idea as a core strategy and objective in spatial planning towards future development of their city regions (Luo and Zhu, 2008). These super/mega city regions include, for example, Shanghai, Beijing, Chongqing, Guangzhou, Tianjin, Wuhan, Nanjing and Hangzhou. Constructing or promoting edge urban settlements or sub-centres became the main approach in delivering polycentric spatial development strategies. However, after more than fifteen years of the polycentricity application, there is little research available on how successful the application of the concept has been. In effect, this imported concept, polycentricity, bears little resemblance to actual development practices in China. Furthermore, compared with the research process of polycentricitiy in Western countries, relevant studies are still in their initial stage in China, and influential theories on polycentricity within urban China research have yet not been constructed (Y. Wang et al., 2012). Existing studies on polycentricity in China have mainly focused on reviewing and introducing the polycentricity concept based on Western interpretations (Shi, 1999; H. Shen, Zhang and Chen, 2005; Luo and Zhu, 2008; Z. Yang and Cai, 2008; Q. Li, 2012; Qin and Li, 2012), characteristics of polycentric patterns (Wei and Zhao, 2006; Y. Gu, Zheng and Cao, 2009; L. Jiang and Wu, 2009; B. Sun, Shi and Ning, 2010; T. Sun, Wang and Li, 2012; Yan and Sun, 2015; Y. Li and Phelps, 2016; Mu and Yeh, 2016; M. Zhao, Derudder and Huang, 2017; D. Huang et al., 2017; T. Zhang, Sun and Li, 2017) and the governance of polycentric cities or regions (J. Zhang, Luo and Yin, 2008; C. Yang, 2008; X. Huang, Li and Hay, 2016; X. Zhang, 2016). Therefore, this thesis seeks to contribute to fill this gap in academic knowledge by developing a

[1] In this research, the term city region (*shi yu*) in China refers to the entire city administrative area. It often comprises a central or core city, and its surrounding districts, counties or county-level cities.

conceptualisation of the application and a methodology for investigating it. This includes conducting an empirical study of the application and delivery of polycentricity at both the city regional and local scales through a three-fold analysis: 1) an overall survey of the polycentric development practices in master planning in China; 2) detailed analysis and comparisons in selected super/mega city regions; and 3) an explanation of the formation of Chinese edge cities.

From the perspective of polycentricity, the approaches in seeking balanced development within cities and regions are to promote functionally interdependent centres and establish horizontal linkages between them. Therefore, it is of interest how and why these centres are formed under the delivery of polycentric development in China's super/mega city regions. Thus, another concept came into view: edge cities, which resemble those settlements or centres within polycentric structures.

The term 'edge city' is first coined by Garreau (1991), a *Washington Post* journalist, to describe the substantial new non-contiguous urban development at the edge of established major cities in the United States. He believes that Americans are creating a new future, having changed nearly all the routines associated with living, working, communicating and playing. These new multiple urban centres, or 'edge cities', are denoted as employment centres, but are located far from the old urban cores at the edge of the city regions, and on land that, 30 years ago, is occupied by villages or farmland. In considering the term edge city, it is clear that edge cities are defined basically based on these two words, edge and city, which represent the location and function of settlements. Specifically, from the perspective of location, edge cities are developed in suburbs surrounding original urban cores (Garreau, 1991). It has also been argued based on Garreau's description that edge cities are located at the intersections of main roads, on the fringe of urban built areas or at the intersections of suburban highways (Stanback, 1991). From the perspective of function, Garreau (1991) believes these new centres should have typical city functions, including housing, employment, transportation and recreation. Furthermore, based on empirical research of American edge cities, the industrial structure of edge cities indicates a

high level of specialisation as well as diversity, and they have replaced some of the functions of the city centres (Bingham and Kimble, 1995; Dietsch, 2001). Overall, the connections between edge cities and their urban cores, and between different edge cities, start to emerge both spatially and functionally, creating the semblance that edge cities are emerging as settlements or centres within a polycentric spatial structure, with the latter mainly focusing on interdependent centres (functionally) and horizontal linkages (spatially). In effect, edge cities have already been recognised as sub-centres in forming polycentric structures, particularly at the intra-urban scale (Krugman, 1996; Bontje and Burdack, 2005; Liu and Wang, 2016). Therefore, this thesis uses the term Chinese edge cities to explain the settlements or centres within polycentric spatial structures at a city regional scale. Thus, the other focus of this research is on exploring whether, how and why Chinese edge cities have been formed under the polycentric development strategies proposed at a city regional scale in China. In other words, the focus is specifically on exploring the making, or in some cases, remaking, of Chinese edge cities under the polycentric development practices. Here, it is also essential to redefine edge cities within a Chinese context.

Exploring the making and remaking of Chinese edge cities, does not just refer to looking at the trajectory of edge cities' development through planned, unplanned or integrated processes, but also implies looking beyond the subject of edge cities, and into the dynamics facilitating or hindering their formations. Meanwhile, the challenges and difficulties encountered during the polycentric development practices and the formation of Chinese edge cities are also revealed. Based on the above discussions on the research background and context, the overall aim and objectives of this thesis is as follows.

1.2 Research aim and objectives

The aim of this thesis is to investigate the application of polycentricity at the city regional scale in China, and to reveal the challenges and problems in spatial planning, particularly from the perspective of the planning and development of Chinese edge

cities. The following research objectives respond to this overall aim and lead the research:

1) To understand the origin and meaning of the polycentricity concept and the roles edge cities have had as part of polycentric development in spatial planning;

2) To explain whether, why and how polycentricity has been introduced and applied in spatial planning in China, and the development of Chinese edge cities;

3) To investigate how successful the application of polycentricity has been in spatial planning in China:

    - To evaluate the role and scope of polycentricity in spatial planning at the city regional scale and to investigate different application processes;

    - To evaluate the formation of Chinese edge cities in selected city regions and to explore dynamic mechanisms in their development;

4) To evaluate the challenges and difficulties of developing Chinese edge cities within the context of polycentric development at the local scale;

5) To make planning and policy recommendations related to the application/ delivery of polycentricity and in the formation of Chinese edge cities.

1.3 Research strategy

Figure 1.1 below illustrates the overview of this thesis and the five parts adopted in investigating the application of polycentricity to the development of Chinese super and mega city regions.

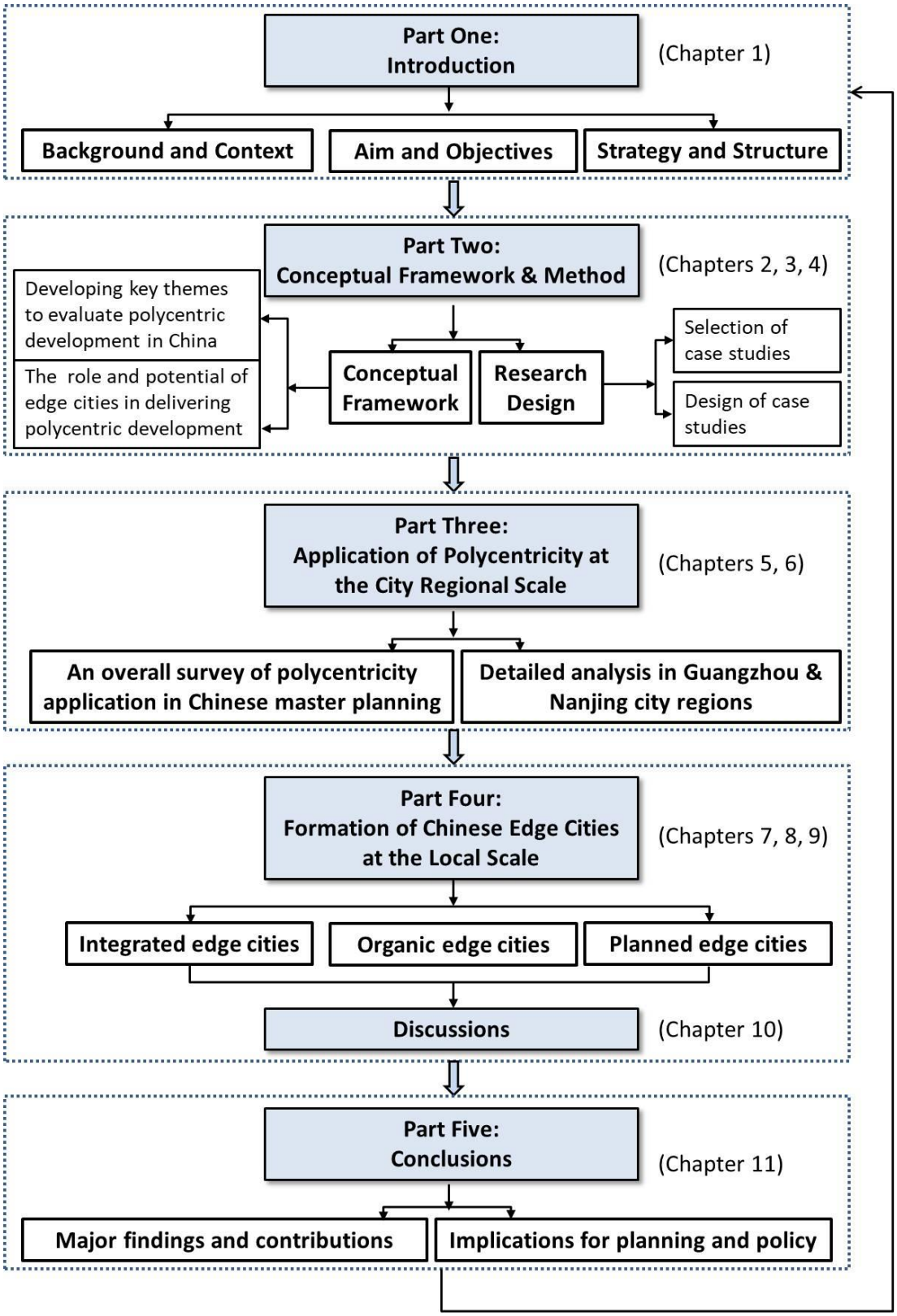


Figure 1. 1 Research strategy of the thesis

After demonstrating the context, overall aim and objectives, and the methodological overview of this research (Part One), Part Two informs the conceptual framework and the methodology of this study. Conceptually, the first two chapters of Part Two explore the conceptual background of polycentricity and edge cities, and based on this, develop key themes in evaluating the polycentric development in China, and investigate the role and potential of edge cities in delivering polycentric development. Methodologically, this research adopts an embedded case study approach. The selection of cases is based on a multi-scalar approach used to narrow down the cases. These include 1) an overall survey of the polycentric development practices at the city regional scale, 2) detailed analysis and comparisons at the city regional scale, and 3) defining and classifying Chinese edge cities at the local scale. Specifically, eight super/mega city regions were initially selected across China based on when the application of polycentric development first became evident. This macro policy analysis led to two more detailed city regions, Guangzhou and Nanjing, being chosen, primarily for their continuities in polycentric development practices in the latest two rounds of spatial planning at the city regional scale. After that, three local cases were chosen from different spatial scales and types of Chinese edge cities, including an integrated Chinese edge city at the metropolitan scale (Nansha), an organic Chinese edge city at the city regional scale (Xintang), and a planned Chinese edge city at the central city scale (Guangzhou HSR new town). Data collection techniques mainly included semi-structured interviews and documentary analysis. The data were collected during fieldwork in China, and are analysed in the empirical analysis (Parts Three and Four). Finally, conclusions (Part Five) are made on the basis of the empirical work and respond to the overall research aim.

1.4 Structure of the thesis

The structure of the thesis is organised to reflect the above research strategy and to address the overall aim and objectives of this study. This chapter has briefly introduced the concept and application of polycentricity, the formation of edge cities

under a polycentric development framework, and identified the value and significance of conducting this research at this point. The aim and objectives have then been introduced. In order to respond to the study's aim of investigating the application of polycentricity to the development of Chinese super/mega city regions, the research objectives need to reflect the different approaches as well as the different scales in application. Thus, both horizontal analysis (overall survey and typology of application at the city regional scale) and vertical analysis (formation of Chinese edge cities at the local scale under the city regional scale polycentricity delivery) need to be taken into consideration.

Chapters two and three of the thesis respond to the first two objectives of the study mainly to understand the origin and meaning of the polycentricity concept and edge cities both in the West and in China, and to explain how and why the polycentricity concept has been introduced and applied to spatial planning in China. The interpretations and discussions of the relevant concepts and contexts in the literature inform the development of a conceptual framework for the study.

Chapter four addresses the research design and methodology used in this study. The chapter first illustrates the rationale for the adoption of an embedded case study approach, and then proceeds with a discussion of the case study selection based on the analysis at three spatial scales. The design of the case studies is elaborated afterwards, including identifying unit(s) of analysis, explaining data collection techniques and the approach used for data analysis and interpretations. A discussion of ethical issues associated in the methodology is also offered.

Chapters five and six respond to the first part of Objective Three and part of Objective Four. Chapter five conducts a broad survey of the application of polycentricity in strategic master plans in China. Strategic master plans over the last 20 years which have applied polycentricity are collected and analysed, in order to explore major emerging thematic strands of polycentric development practices, and identify any differences in polycentricity application between China and the West.

This overall survey and analysis also leads to two city regions being chosen for detailed studies in Chapter six.

Chapter six focuses on selected Guangzhou and Nanjing city regions to investigate in detail different means in terms of polycentric development practices, and to evaluate the challenges and difficulties of effective delivery of polycentric development strategies. This detailed analysis then leads to three case studies, at the local scale, being chosen to investigate the formation and development of Chinese edge cities under the delivery of polycentric development.

Chapters seven, eight and nine respond to the second part of Objectives Three and Four, and evaluate from a spatial planning perspective how and why Chinese edge cities, in practice, have been developed or redeveloped at a local scale to help form a polycentric structure. The analysis also seeks to uncover the challenges and difficulties of developing Chinese edge cities within the context of polycentric development. Case studies are selected from three different spatial scales within Guangzhou city region, and cover three types of Chinese edge cities, namely, integrated edge cities, organic edge cities and planned edge cities. The analytical framework for investigating these case studies is described and justified after a review of the literature in Chapter three. Different trajectories and dynamics of the formation of different edge cities are synthesised and compared in the final chapter.

Chapter ten provides a cross analysis and discussion over three Chinese edge cities. Comparisons are made over three case studies in terms of the three key common themes, including spatial location and spatial linkages, functions and governance.

Chapter eleven brings together the major findings and contributions of the entire study, and sets out planning and policy recommendations based on them, as well as some possible directions for future research.

CHAPTER TWO

Developing Key Themes to Evaluate Polycentric Development in China

2.1 Introduction

The aim of this chapter is to develop key themes around the polycentricity concept within a Chinese context, which is used to evaluate the polycentric development practices of super/mega city regions in China during the empirical analysis of this thesis. In doing so, the chapter thus needs first to demonstrate an understanding of the concept of polycentricity in the Western context, and from a European perspective in particular. This is where the concept has gained the most popularity in spatial planning circles. In addition to this, as the geographical context of this thesis is China, theoretical discussions of the concept and the historic process in terms of the application of polycentricity in China's spatial development and spatial planning to date are explored.

This chapter is organised as follows. First, drawing upon the vast literature on the polycentricity concept in the Western spatial planning, the origin, multivalent and fuzzy interpretations of the concept, as well as its application and practices in a planning/policy framework, are elaborated. Secondly, moving on to a Chinese context, section 2.3 focuses on the introduction and interpretations of the concept, research progress to date, and different stages of polycentric development practices in Chinese spatial planning. Thirdly, based on the above discussions, this chapter articulates three key themes of the polycentricity concept in spatial development and spatial planning in China, including conceptualising polycentricity in practice, multiple scales in application, and multi-level governance under a polycentric

framework. Finally, this chapter is concluded by summarising the key issues identified from all of the above discussions, and also by pointing out its linkages with the next chapter on the development of edge cities, and their role within polycentric development in spatial planning.

2.2 Polycentricity in Western spatial planning: Origin, interpretations and practices

Within this section, which focuses on the concept of polycentricity in Western spatial planning, three themes are explained, including 1) tracing the origin of polycentricity in spatial development and spatial planning; 2) multivalent and fuzzy interpretations of polycentricity; and 3) the application and practices of polycentricity in a planning/policy framework.

2.2.1 Tracing the origin of polycentricity in spatial development and spatial planning

The central idea of polycentricity – that cities have multiple cores – has been noted in a series of classic works, and can be traced back to Geddes's 'conurbation' in 1915 (Geddes, 1949, p.34) and Mumford's 'poly-nucleated city' (Mumford, 1938, p.489) in the early twentieth century, or even Ebenezer Howard (1898) in the late nineteenth century. But this notion 'only started gaining theoretical momentum because of the popularity of Peter Hall's book *The World Cities* (Hall, 1966)' (van Meeteren et al., 2016, p.1281), and the 'polycentric' type of metropolis it discusses. Hall states that the Randstad of the Netherlands, and the Rhine-Ruhr complex of Germany, 'are world cities of a very special form. Instead of concentrating all the metropolitan functions into a single, highly centralised giant city, these countries have managed through accidents of history to distribute them among a number of smaller, specialised, closely related centres' (Hall, 1966, p.3). Their unique advantage is their 'polycentric quality' (Hall, 1966, p.116). However, despite the widespread discussions of this notion in the theoretical discourse, the literal concept,

‘polycentricity’, was not used until Leven (1978), according to the Scopus bibliographic database (van Meeteren et al., 2016). Leven (1978) argues whether the monocentric land value model should be replaced by the emerging polycentric, spatially dispersed version in urban economics.

The term polycentricity is usually discussed with its counterpart, monocentricity, which stems from urban system theory. The traditional starting point for urban system theory is Burgess’s concept of the monocentric city (Burgess, 1925), which was later extended by Muth (1961), and then Alonso (1964) in his location and land use theory. The structure of these urban systems can range from those that are fully monocentric, to those that are fully polycentric (de Goei et al., 2010). Although the concept of polycentricity was introduced in the early part of the twentieth century, together with monocentricity (Burgess, 1925; Harris and Ullman, 1945), it was not as widely used as the concept of monocentricity at this time, as monocentricity remained the most influential concept in explaining urban development until the 1960s (Davoudi, 2003).

Since the early 1990s, the notion of polycentricity has been widely applied at the intra-urban scale, focusing on emerging sub-centres within metropolitan areas (Vasanen, 2013). Such approaches were traditionally introduced and widely applied in the United States (Garreau, 1991; Anas, Arnott and Small, 1998) but issues regarding intra-urban polycentricity have also been addressed elsewhere in Europe and North America (Bontje and Burdack, 2005; Suárez and Delgado, 2009; Garcia-López and Muñiz, 2010). More recently, polycentricity has gained renewed attention, not only as a definition of an urban structure in a region or country alone, but also as a strategic planning concept (van Houtum and Lagendijk, 2001).

2.2.2 Multivalent and fuzzy interpretations

Despite the vast amount of literature on this topic, polycentricity is still considered a vague and fuzzy concept (Meijers, 2008). Previously, the concept was predominantly understood in morphological terms and polycentric urban systems were approached

as topographical entities formed of a number of adjacent centres that were located within the same urban system (Vasanen, 2013). Although there is still not a shared definition, polycentricity has not only been defined in morphological terms, but has been interpreted in different places through multi-perspectives and at multiple scales. Just as Lambregts (2009, p.185) remarks, polycentricity is 'in the eye of the beholder'. The remainder of this section seeks to present the multivalent and fuzzy meaning of the polycentricity concept from three main perspectives: 1) context-sensitivity, differentiation in geographical and professional contexts; 2) scale-dependency, or the differentiation in polycentric nodes; and 3) morphological and functional polycentricity.

Context-sensitivity: Differentiation in geographical and professional contexts

Indeed, polycentricity is still in its first phase of development, where many conceptual interpretations co-exist (Kloosterman and Musterd, 2001). The concept's fuzzy and imprecise nature opens doors for it to be used in widely different ways, in terms of morphological and functional terms, as well as in diverse geographical contexts and by different professional communities such as researchers, urban planners and policy-makers (Eskelinen and Fritsch, 2009).

Over a decade ago, Shaw and Sykes (2004) pointed out that the geographical context was 'indeed a key factor in determining how policy concepts, such as polycentricity, are reconstructed and applied in practice'. A recent study argues again that, rather than focusing on spatial scales in polycentricity research, 'more apt categorisations to understand the origins of polycentricity's conceptual ambiguity relate to different methodological traditions and geographical contexts in which the research is conducted' (van Meeteren et al., 2016, p.1278). In terms of interpretations within different professional contexts, polycentricity can mean different things to different people. For example, urban planners use the concept as a strategic spatial planning tool; economic and human geographers use it to explain the changing spatial structure of cities; the European Union (EU) Commissioners and their counterparts in member states often promote the concept as a socio-economic policy goal aimed at

achieving a balanced regional development; and civic leaders use the term for 'place-marketing', presenting the notion of polycentricity as synonymous with pluralism, multi-culturalism and dynamism, as well as a symbol of the 'postmodern' life style. The concept 'has become part of the new vocabularies of inclusive politics' (Davoudi, 2003, p.980).

Scale-dependency: Differentiation in polycentric nodes

Apart from the context-sensitive nature of the polycentricity concept, it can also be applied at multiple spatial scales associated with different polycentric nodes. In the European Commission's second report on economic and social cohesion (CEC (Commission of the European Communities), 2001, p.31) it is suggested that 'polycentric development can occur at two levels', the EU level and a regional level. Yet from a planning policy perspective at least, polycentricity can refer to at least three spatial scales: 1) an intra-urban or 'micro' agglomeration scale; 2) an inter-urban, territorial, or 'meso' scale; and 3) an inter-regional or the pan-European 'macro' scale (Davoudi, 2003; Sykes, 2005). At each scale, different polycentric nodes have been widely discussed in terms of planning and policy-making.

First, at the intra-urban or 'micro' agglomeration scale, polycentricity refers usually to emerging employment or population sub-centres within individual cities. These sub-centres are thoroughly observed by Garreau (1991) within the US context. The emergence and growth of edge cities in the suburbs ('internal or external' edge cities) and even the outermost reaches of large metropolitan areas ('outermost' edge cities) are seen as the most recent phase in the evolution of urban spatial structure (Garreau, 1991). Examples of polycentricity studies at an intra-urban scale include Atlanta (Hartshorn and Muller, 1989b; Fujii and Hartshorni, 1995), Cleveland (Bogart and Ferry, 1999), San Francisco (Cervero and Wu, 1997), Houston (Craig and Ng, 2001), the four largest Belgian cities (Brussels, Antwerp, Ghent and Liège) (Riguelle et al., 2007), Barcelona (Garcia-López and Muñiz, 2010), Rome and Milan (Veneri, 2013), and Rotterdam (Musterd and van Zelm, 2001).

Secondly, at the inter-urban, territorial or 'meso' scale, polycentric urban regions are believed to be the next stage in the expansion of urban living space, particularly in densely populated countries or regions (Meijers, 2005). Interestingly, planning policy concepts referring to polycentric urban regions often make use of the network metaphor and the idea of synergy, or 'being more than the sum of the parts' as a central objective in many policies for polycentric urban regions (Meijers, 2005). Thus, polycentric regional growth at the inter-urban scale has generally been defined as urban regions, and synergy or functional complementation within networks as the key point in applying polycentricity. Empirical cases have been focused on California (Modarres, 2011), the mega-city-region of central Belgium (Riguelle et al., 2007; Hanssens et al., 2014), the Dusseldorf and Stockholm city-regions (Schmitt et al., 2015), the Dutch Randstad (Amsterdam, Rotterdam, the Hague and Utrecht) (Lambregts, 2006; Goess, de Jong and Meijers, 2016; Spaans and Zonneveld, 2016), and the German Rhine-Ruhr (Goess et al., 2016).

Thirdly, the most extensive scale on which the concept of polycentricity has been examined is the inter-regional scale (Davoudi, 2003) or the pan-European 'macro' level. From the European context, perhaps the most famous is the *European Spatial Development Perspective (ESDP)* (CEC (Commission of the European Communities), 1999). This approach is tightly linked with European spatial development policies, which aim at achieving balanced spatial development within the European Union through promoting territorial polycentric development (CEC (Commission of the European Communities), 1999; Vasanen, 2013).

Morphological and functional polycentricity

Besides the context-sensitive and scale-dependent nature of the concept of polycentricity, literature has distinguished between morphological and functional polycentricity (Hall and Pain, 2006; Green, 2007; de Goei et al., 2010; Burger et al., 2011; Burger and Meijers, 2012; Vasanen, 2012). The analysis of morphological polycentricity often focuses on the distribution of sizes of centres and their territorial distribution across space (Batty, 2001; Meijers, 2008; Veneri and Burgalassi, 2012;

Vasanen, 2013; Brezzi and Veneri, 2015; Giffinger and Suitner, 2015; Zhong et al., 2017). From a morphological dimension, 'no city is so big as to dominate others' and those centres should be 'as evenly spread over the territory as possible' (Halbert, 2008, p.1149). However, urban systems that are morphologically polycentric do not necessarily imply they are also functionally polycentric, or vice versa (Green, 2007; Burger and Meijers, 2012). Functional polycentricity, on the other hand, considers the functions of each of the settlement or centre and the functional connections/linkages between the centres (ESPON 1.1.1, 2004; Green, 2007; de Goei et al., 2010; Rauhut, 2017). Economic functions of the settlements or centres become the key determinant in identifying emergent or dominant metropolitan spaces (Taylor et al., 2009; Taylor et al., 2010; Taylor et al., 2013). Meanwhile, from the urban system point of view, a functional polycentric system is formed when a multidirectional set of relations exist, in which functional connections are not just between the urban core and its sub-centres, but also between the individual sub-centres (Burger et al., 2011; Burger and Meijers, 2012; Vasanen, 2013). Functional polycentricity is often designated with the main objective of achieving integrated and balanced development. Just as the West Midlands Local Government Association [WMLGA] (2000) states 'the relative significance of a particular place …[depends] not on its size, but on the importance of the specific function, the coincidence of functions, and/or its linkages to other functions and places.'

2.2.3 Application and practice in planning/policy framework

The above discussed the polycentricity concept from a theoretical perspective in terms of the origin and meaning of the concept in spatial development and spatial planning. This section turns to a practical perspective, focusing on the application and practice of the concept in a planning and policy framework.

Around the application and practice of polycentricity, debates are still ongoing in terms of how to promote effective polycentric development. The concept of polycentricity has, increasingly been invoked as the main objective in seeking balanced development within cities and regions (Hall and Pain, 2006). Polycentricity

has already been applied to a number of different plans and policies at different scales, and among these maybe the most influential ones are the *ESDP* (CEC (Commission of the European Communities), 1999), and the Territorial Agendas of the European Union, 2007 and 2011 (EU Ministers responsible for Urban Development and Territorial Cohesion, 2007; EU Ministers responsible for Spatial Planning and Territorial Development, 2011).

Polycentricity is one of the key principles in the *ESDP* (CEC (Commission of the European Communities), 1999). The objective behind the *ESDP*'s concept of polycentricity is to achieve territorial cohesion between economically strong areas and weaker, less dynamic rural areas or smaller cities (Hall and Pain, 2006). The *ESDP* exists as 'a means of delivering an integrated regional perspective by bringing together the economic, social, urban and rural structures of a region into a single framework that can assist in encouraging balanced spatial development' (Shaw and Sykes, 2004, p.297).

Besides different interpretations at different spatial scales which led to different planning and policy frameworks in practice, the concept of polycentricity may also be 'interpreted and applied in different ways at the same spatial scale in different localities (e.g. between one region and the next or one city and the next)' (Shaw and Sykes, 2004, p.301), which enhances localism in every unique locality. At the same time, from a much broader vision, many spatial issues call for an approach that is formulated and implemented at multiple scales and across several administrative tiers (Meijers, 2005). Therefore, as Davoudi (2003, p.995) points out, polycentricity 'provokes a "positive" image, yet one which can be shaped and re-shaped to serve any given purposes'.

2.2.4 Summary: towards a strategic planning tool and a policy framework

From an academic discourse, the concept of polycentricity is associated with multiple and fuzzy interpretations from multi-perspectives and among multiple scales, and also from morphological terms to functional terms. Meanwhile, the concept of

polycentricity was, and remains, problematic from a policy point of view. It exemplifies an 'idealistic approach' to spatial planning (Krätke, 2001), highlighting both a theoretical and practical gap. In other words, it still remains unclear what kind of policies could be effectively delivered and implemented in order to achieve more balanced and sustainable development. It is also not clear 'whether polycentricity really is a panacea for the European spatial, economical and social structure' (Governa and Salone, 2005, p.266).

Regarding the growing popularity of the term amongst urban planners and policy-makers recently, it can be argued that the concept of polycentricity is increasingly being applied both as a strategic planning tool and as a policy framework. Instead of being an analytical tool to explain an existing or emerging reality, polycentricity is now being used as a strategic planning tool to guide and promote this transformation, as well as a policy framework to determine and regulate that reality.

In fact, the notion of polycentricity has increasingly been recognised and adopted as a planning and policy term. Instead of being used to explain the structural changes of cities and urban systems, the polycentricity concept is now transformed and proposed as a strategic planning and policy tool. Additionally, 'the application of polycentricity is extended towards higher spatial levels', and it is regarded as 'a policy strategy for promoting globally competitive zones of integration in different parts of Europe' (Eskelinen and Fritsch, 2009, p.607). Polycentricity is not just a descriptive term, but has become a policy stance prescribing a means to promote spatial integration and equalise economic growth (Hague and Kirk, 2003). Integrated and balanced development is also associated with urban-rural relationships, whereby 'polycentricity is proposed as the main strategy for rural development via an urban–rural partnership approach' (Eskelinen and Fritsch, 2009, p.607). This has also been stated in the ESPON 1.1.1 project (2004, p.3), which notes that 'polycentricity is about promoting the balanced and multi-scalar types of urban networks that are most

beneficial from a social and economic point of view, both for the core areas and for the peripheries'.

It has also been argued that the fact that polycentricity has been loaded with multiple interpretations among different geographical contexts, different professional communities and different spatial scales, 'could be rendered a positive development in the sense that polycentricity succeeds in bringing together different stakeholders that normally do not communicate with each other' (Eskelinen and Fritsch, 2009, p.608). This may be one of the main reasons why it still remains popular in helping address ongoing or emerging conflicts and challenges.

2.3 Introduction and application of the concept of polycentricity to China

Towards the end of the twentieth century, the concept of polycentricity was introduced into China. In order to develop key themes of the polycentricity concept in spatial development and spatial planning in China, this section first explores current studies on polycentricity in China, and the main ideas generated so far in an academic discourse. In addition, a broad overview of different stages of polycentric development practices in China's spatial planning is discussed, which, from a practical perspective, provides the origin and historic process of polycentric development practices in China.

2.3.1 Concept introduction and interpretations

The few studies on polycentricity in China have mainly focused on reviews and introducing the idea of polycentricity based on Western interpretations. In 1999, Shi (1999) first introduced the concept of polycentricity to China. He points out that the emergence of polycentric city regions is the common route of the world's megacities' spatial evolution. After outlining the successful experience of spatial organisation in the world's major cities and analysing the advantages of polycentric spatial structures compared to monocentric ones, he proposes some development

suggestions for Chinese megacities in terms of building polycentric spatial structures. These include promoting satellite towns, constructing the fast transportation links between satellite towns and core cities, decentralising the functions of core cities, and promoting institutional innovations. Similarly, Shen, Zhang and Chen (2005) carry out a comparative study among some large cities internationally, including the Moscow, London, Paris, Seoul, Tokyo and Randstad urban agglomerations, and learned some valuable lessons and experience in applying polycentricity to Chinese large cities. These mainly focuse on providing institutional support for the new centres, promoting the polycentric spatial structure at different spatial scales, coordinating the balance between working and living of the new centres, increasing the accessibility of public transportations, and leaving green spaces between the new centres.

After both the *European Spatial Development Perspective (ESDP)* and the book *The polycentric metropolis: Learning from mega-city regions in Europe* (Hall and Pain, 2006) were translated and introduced into China, more in-depth explanations of the concept of polycentricity have emerged. Luo and Zhu (2008) explain some key ideas associated with the concept of polycentricity, such as its multiple connotations, the morphological, functional and governmental polycentricity, and its scale-dependent and process-dependent nature. Yang and Cai (2008) emphasise different characteristics of polycentric planning and development at different spatial scales by drawing on various examples (the *ESDP*, Randstad and American metropolises). Based on the project of *Sustainable Management of European Polycentric Mega-City Regions (POLYNET)*, Li (2012) explores the social background, main characteristics and contributions of European polycentric mega-city region theory. Qin and Li (2012) summarise existing studies on the concept of Polycentric Urban Regions (PURs) in Western countries, including the connotation and definition of PURs, the method for measurement, and their evolution and functions.

In summary, in the Chinese context, the concept of polycentricity is originally used as an analytical framework, before it quickly becomes part of the policy discourse mainly through discussions addressing the planning of polycentric cities or regions.

2.3.2 Research progress in China

Despite the few studies focusing on the introduction and interpretations of the concept, other research on polycentricity in China is concentrated on two primary aspects: the way cities and city regions exhibit patterns of polycentricity; and the governance of polycentric city regions. In closer detail, the first group of research offers two perspectives. The first one is patterns, which measure the degree of polycentricity in cities/city regions by choosing different indicators, and examining the evolution of polycentric urban patterns. The second aspect is that of performance: the economic, transportation and ecological performance associated with polycentric patterns. This latter group of research focuses on the governance of polycentric cities or regions, and puts forward strategies or policy recommendations in building polycentric structures.

Characteristics of polycentric patterns

First, some of the studies have focused on identifying the population or employment sub-centres of large city-regions in China (e.g. Beijing, Shanghai and Guangzhou), so as to indicate the emergence of polycentric structures therein. For example, using Beijing's employment population data of 2001 and 2004, and applying classical theories in urban economics, employment sub-centres are identified in Beijing. In addition, by analysing the main characteristics and development trends of employment sub-centres, it is argued that the spatial structure of Beijing is transforming into a polycentric one (Y. Gu et al., 2009). A few more recent studies also justify the same transformation trend of Beijing into a polycentric structure (D. Huang et al., 2017; T. Sun et al., 2012), and the mechanism deployed in the formation of employment sub-centres in the Beijing metropolitan area (T. Sun, Wang and Li, 2013). Similarly, Jiang and Wu (2009) examine the spatial structure of

Guangzhou based on the employment population from the economic census. Results show that employment centres and sub-centres have already existed in some metropolitan areas in China. However, unlike Western countries, the mechanism in their formation comes from secondary industries. The polycentric urban structure of another large city, Shanghai, has also been measured on the basis of both residential centres and employment centres (B. Sun et al., 2010).

Secondly, some other research evaluates the patterns associated with connections and linkages within and between particular cities or metropolitan regions and ascribes these to polycentricity. For example, the co-production of knowledge linkages in the Yangtze River Delta (Y. Li and Phelps, 2016), interactions between the corporate networks in the Pearl River Delta (M. Zhao et al., 2017), and intercity connections and migration patterns within city regions (Mu and Yeh, 2016).

Thirdly, a few studies have tried to examine the performance of polycentric spatial structures, mainly with the purpose of exploring whether those cities or regions have become more efficient and sustainable with polycentric structures compared with monocentric ones. For example, based on understandings of the polycentric spatial structure in metropolitan areas, Wei and Zhao (2006) propose a method to measure the performance of the spatial structure using four indicators: performance density, degree of performance stretch, performance of population gradient and performance of origin-destination ratio. Regarding the performance of a particular aspect, research to date in China has mainly focused on economic performance (X. Wang and Sun, 2011; T. Zhang et al., 2017), transportation performance (B. Sun et al., 2013) and ecological performance (Yan and Sun, 2015), aiming to evaluate the effectiveness of polycentricity.

Governance of polycentric cities or regions

Few studies are found which discuss the governance of polycentric cities or regions, even though both horizontal and vertical perspectives are involved in the research. From a horizontal perspective, studies mainly focus on multi-scalar state interactions

in the formation of polycentric city-regions (X. Huang et al., 2016), and the emerging polycentric governance in transitional China, including three clusters: enterprises; governments and communities; and associations and non-profit organisations (X. Zhang, 2016). From a vertical perspective, research on multi-level governance has focused on the inter-city or regional scale; examples include the two most developed regions in China, the Yangtze River Delta (J. Zhang et al., 2008) and the Pearl River Delta (C. Yang, 2008).

Promoting development strategies in order to build polycentric patterns of large cities or city regions is another major focus in the empirical study of polycentricity. For example, Wei, Zhao and Xiao (2006) choose Guangzhou as a case study, to elaborate upon its necessity to transform from monocentric sprawl to an orderly and compact polycentric spatial system, and propose future development directions and strategies in adjusting urban spatial structure. Another piece of research uses Shanghai as an empirical case. Based on an examination of its typical spatial features and problems, the authors point out its inevitable choice to build a polycentric development structure in future, and put forward some valuable policy recommendations (Y. Wang et al., 2012).

2.3.3 Stages of polycentric development practices in China's spatial planning

Along with the process of urbanisation and the emergence of new types of plans, polycentric development practices in China's spatial planning can be divided into three stages. The initial stage of polycentric development practice could be characterised by variations in polycentricity terminology. The second stage started in 2000, with the emergence of a new type of plan, the strategic plan, and the terminology, polycentricity, was adopted. The third stage is when cities are increasingly regionalised, and polycentric development practices enter into a new era. Each stage is discussed in detail as follows.

Initial stage of polycentric development practice and variations of polycentricity terminology

Since the economic reforms and opening-up policy started in 1978, China has experienced a rapid urban growth associated with economic development. Table 2.1 shows the dramatically increased number of cities and towns between 1981 and 1995. In response to this, the *1989 Urban Planning Act* of China was created by the central government, which marked the start of a 'legalised urban planning system' era in China (P. Zhao, 2015). According to the *Urban Planning Act* (1989), a city plan should include both an urban (town) system plan and an urban plan. An urban plan includes a master plan and a detailed plan, while the master plan here only covers urban areas, focusing on the cities themselves. An urban (town) system plan covers the whole city region, and mainly aims to establish a clear hierarchical system for cities and towns (P. Zhao, 2015).

Table 2. 1 Numbers of China's cities and towns between 1981 and 1995

Type		1981	1995
City	Mega city	18	32
	Big city	28	43
	Medium city	70	192
	Small city	117	373
Town		2678	16992
Total		2911	17632

Source: Zhang (2000).

Towards the year 2000, facing ever more severe problems caused by monocentric expansions of the core cities, a number of super/mega city regions began to adopt a polycentric idea in organising spatial structures of the metropolitan regions. For example, in the *1999 Shanghai City Master Plan*, a spatial structure of 'multi-axes (*duozhou*), multi-layers (*duoceng*), multi-cores (*duohe*)' was proposed (B. Sun et al., 2010, p.58), which was made up of the central city, new towns, central towns and market towns. 'Multi-cores (*duohe*)' can be regarded as the first presentation of a polycentric spatial structure and the first application of polycentricity in strategic metropolitan plans in China (B. Sun et al., 2010). However, these 'multi-cores' still

followed a hierarchical system of cities and towns. Therefore, although *duohe* intended to apply the polycentric idea and form a polycentric structure, it failed to grasp the essence of the concept. At this stage, this could be regarded as another version of the hierarchical urban (town) system planning. In the meantime, other terms including 'multi-cores' were also used in spatial planning around 2000: 'multi-clusters (*duozutuan*)' in the *1984 Guangzhou City Master Plan*; 'clustered spatial layout (*zutuanshi*)' in the *2005 Tianjin City Master Plan*; and 'one-ring multi-nodes (*yihuanduodian*)' in the *2001 Hangzhou City Master Plan*. These are all variations of the polycentricity concept in a Chinese context at the initial stage of polycentric development practices. The designed clusters or nodes may be either single-function industrial areas, or residential areas, and were not necessarily fully functional or interdependent with their core cities. Therefore, they could not be regarded, in the real sense, as polycentric structures.

Emergence of strategic planning and the first adoption of polycentricity terminology

After entering the twenty-first century, the process of China's urbanisation moved into a further rapid development stage, which is called the *Fourth Wave* of urbanisation (Yeh, Xu and Yi, 2006). On March 15, 2001, the *Outline of the 10th Five-Year Plan of National Economic and Social Development* was approved by the National People's Congress. 'Implementing an urbanization strategy and promoting the progress of both urban and rural areas' exists as a whole chapter, demonstrating a new era of Chinese urbanisation process from a national perspective. Some details of this strategy are as follows:

> With the improvement of the level of agricultural productivity and the acceleration of the industrialisation process, the conditions to promote urbanization in China are increasingly mature. Thus we should seize the opportunity to implement urbanization strategies. To do this, we should promote focused development of small towns, actively develop small cities, improve the functions of regional central cites, as well as develop leading large cites to guide and drive sequent development of urban dense areas (The State Council, 2001).

In the light of national policies and in-depth, market-oriented reforms, the statutory city master plan under the City Planning Act was increasingly criticised for a lack of flexibility and not being suitable in the context of rapid local urban growth (Leaf and Hou, 2006). Municipal governments thus sought to find new approaches in promoting urban development and the growing trend towards political decentralisation gave local municipal governments a greater capacity to do so (P. Zhao, 2015). A strategic plan therefore emerged. Unlike a city master plan, which deals with every aspect associated with future urban development, a strategic plan usually addresses three strategic questions, "What status should the city achieve?" "What status can the city possibly achieve?", and "How can such a desirable status be achieved?" (B. Zhang, 2002). The strategic plan is more flexible and mainly emphasises local governments' aspirations and ambitions for local development. Its functionality is more proactive and instrumental for market-oriented development (F. Wu, 2007). In 2000, Guangzhou made the first attempt in China to prepare and propose a strategic plan, in which the terminology 'polycentricity' *(duozhongxin)* was adopted for the first time in describing its future spatial structure. Subsequently, the *2001 Guangzhou City Master Plan*, *2001 Nanjing City Master Plan* and *2004 Beijing City Master Plan* all applied polycentricity to their spatial planning strategies.

From cities to city regions and the polycentric development practices in a new era

Since the economic reforms stimulated by the open door policy, the considerable decentralisation of power from the central government to localities has given municipal governments more autonomy and motivation to facilitate economic growth in their respective jurisdictions (He and Zhu, 2007). Municipal governments now play a more important role in local urban growth (P. Zhao, 2015). This gained momentum particularly when, after the establishment of the new tax sharing system in 1994 (Z. Huang et al., 2015), municipal governments became motivated to promote growth in order to secure extra-budgetary revenue (Eckaus, 2003). Accordingly, land-centred urban policies have become one of the most important

driving forces facilitating urban expansion (G. C. S. Lin, 2007). In the meantime, the adjustment of administrative divisions, through absorbing rural counties or county-level cities into suburban districts, has become one of the primary means by which municipal governments boost city regional economies. For example, the administrative divisions of Guangzhou and Nanjing city regions both turned into 11 districts in 2014. Cities are increasingly becoming regionalised, and city regions are becoming integrated in governance terms into urbanised areas. Urban planning and management therefore are carried out at the city regional scale, mainly operated by municipal governments. Consequently, the traditional urban (town) system is no longer suitable for those integrated city regions. More recently, polycentric appreciations of the settlement system have been increasingly adopted as part of the strategic planning of super/mega city regions in China.

2.3.4 Summary

The introduction of the concept of polycentricity to China is relatively late. Critical research is still in its infancy, and influential theories on polycentricity have not yet been constructed which are bespoke to the country context (Y. Wang et al., 2012). Besides a limited number of studies on introducing the concept from the West to a Chinese context and interpretations of polycentricity, research to date has focused on the characteristics of polycentric patterns, governance of polycentric regions, and strategies in building polycentric structures. Overall, there are several deficiencies of polycentricity research in China so far. First, the origin, development and connotation changes of the concept of polycentricity have attracted little attention. Secondly, existing studies on the characteristics of sub-centres are more general, and there has not been research conducted on the typology of sub-centres, as well as their respective features. Thirdly, few studies focus on the mechanism and driving bodies in the formation of sub-centres or polycentric spatial structures. Finally, through reviewing the processes of polycentric development practices in China's spatial planning, it is noted that, around the year 2000, a number of super/mega city regions began adopting polycentric spatial development strategies which were intended to

guide future development (Luo and Zhu, 2008). However, there is little research which evaluates whether this concept has successfully been applied from a policy perspective, and how those planned sub-centres at the local scale are formed under polycentric development strategies.

2.4 Key themes of the polycentricity concept in spatial development and spatial planning practices in China

This section develops key themes of the polycentricity concept in China's spatial development and spatial planning practices, by integrating key ideas of the concept generated in both the Western and Chinese contexts. There was a thorough explanation of this concept in the Western context in section 2.2. In China, with the mass application and implementation of the polycentric development concept in spatial planning in Chinese super/mega city regions, polycentricity has been understood, or explained in the literature. Thus, the key ideas of the polycentricity concept in China have been drawn from this literature. By comparing and integrating key issues from both the West and China, three key themes emerge in the application of the concept in China, including conceptualising polycentricity in practice, multiple scales in application and multi-level governance under a polycentric framework.

2.4.1 Conceptualising polycentricity in practice

In terms of the meaning and connotation of polycentricity, it remains a fuzzy concept in China as within the Western context, and polycentric nodes can refer to population centres, employment centres, or service centres, and so on. Nevertheless, from a policy perspective polycentricity is often associated with two theoretically distinct aspirations: functional balance and spatial integration (Lambregts, 2009; Burger, 2011; Burger et al., 2011; Burger and Meijers, 2012; Vasanen, 2013). These two perspectives when combined have become the new objective of 'functional polycentric' development, which, if applied at a regional scale, can deliver an 'integrated polycentric region'. A defining feature of polycentricity therefore can be regarded as similar sized interdependent centres with horizontal functional linkages

replacing the classical urban hierarchy. The spatial relationship of the centres should be defined by their horizontal connections and functional interdependences at a variety of spatial scales (H. Qian and Wong, 2012).

Hence, the basic nature of polycentricity, from a planning or policy perspective, should embody two major principles: a settlement system and a spatial structure. In other words, urban form should be considered as a networked system consisting of urban centres and rural towns, or functional interdependent centres/towns, all of which are horizontally and functionally interconnected at different spatial scales.

2.4.2 Multiple scales in application

Since the early 1990s, urban space in Europe, North America and Japan has increasingly shown polycentric development trends (Z. Yang and Cai, 2008), suggesting that urban spatial structures were entering a new stage of development. Researchers in Western countries have been using multiple methods to study the morphology and composition of polycentric development across a variety of spatial scales. The concept of polycentricity has then been applied in a number of different plans and policies at different spatial scales, aiming to facilitate more sustainable and balanced development. In China, the concept has mainly been applied in academic discourse at both the intra-city scale (F. Wu, 1998; F. Wu and Yeh, 1999; P. Zhao, Lu and de Roo, 2011; H. Wen and Tao, 2015) and inter-city scale (J. Yang, Song and Lin, 2015; Liu, Derudder and Wu, 2016; L. Wang, Wong and Duan, 2016). This thesis focuses on the intra-city scale of polycentricity application in China's super/mega city regions. Here a city region (*shiyu*) refers to the entire city administrative area, which includes all the urban districts, administrative counties and county-level cities. Multiple urban and rural settlements or centres distribute across the space, with different linkages among them.

2.4.3 Multi-level governance under a polycentric framework

Polycentric systems have been used in analysing collective-action problems involved in the provision of diverse public goods and services (McGinnis, 2012; Ostrom,

2010a), and in coping with global problems such as climate change (Ostrom, 2010b), with the aim to achieve effective governance of metropolitan areas. In China, a number of studies has highlighted the changes of governance in the process of spatial agglomerations and reconstructions (T. Zhang, 2006; Phelps and Wu, 2008; F. Wu and Phelps, 2011; Y. Li and Wu, 2012), and research to date in exploring the multi-level governance in China has focused only on the inter-city scale (J. Zhang et al., 2008; C. Yang, 2008). Thus, at the intra-city scale, governance changes are identified as another key theme which is worthy of detailed analysis in the promotion and formation of polycentric spatial structures in China's city regions. Therefore, the third theme in evaluating polycentric development in China considers the governance of city regions, including changes of governance bodies and governance structures. Table 2.2 summarises the three key themes of the concept of polycentricity in spatial planning practices in China and their respective explanations.

Table 2. 2 Key themes of the polycentricity concept in the spatial development and spatial planning practices in China

Key concept	Understandings and definitions within a Chinese context	Main research elements for local cases	Explanations of the main research elements
Polycentricity	Conceptualising polycentricity in practice: 1) a settlement system; 2) a spatial structure	1) Major functions in Chinese edge cities; 2) Interconnections between Chinese edge cities and core cities	1) Major functions of Chinese edge cities; 2) Spatial linkages with core cities
	Multiple scales in application	City regional scale	Already considered for research scale
	Multi-level governance under a polycentric framework	Governance changes under a polycentric framework	Governance changes in Chinese edge cities

2.5 Conclusion

This chapter presented a literature review on the concept of polycentricity and aimed to promote an understanding of the potential and possible value of the concept in a Chinese context, and on this basis drew out key themes of the concept of

polycentricity in China's spatial planning and spatial development practices. These key themes serve as the theoretical foundation for the empirical studies in the following chapters. In doing so, the chapter reviewed and unpacked the concept of polycentricity in both the Western context and China, in order to have a thorough understanding from academic and policy perspectives. Based on this, three key themes have been proposed, including conceptualising polycentricity in practice, multiple scales in application and multi-level governance under a polycentric framework.

To sum up, based on the three key themes identified in the last section, in evaluating the polycentric development in China, this thesis focuses on evaluating the settlement system, spatial structure and governance changes, at the intra-city scale, in selected Chinese super/mega city regions. First, as polycentricity is a scale-sensitive concept, the scale pertinent to each particular issue under discussion needs to be clarified. In this thesis, the spatial scale chosen is the intra-city scale, where edge cities exist as sub-centres to help form a polycentric spatial structure. Secondly, with regards to the settlement system, functional interdependent centres/towns at different spatial scales (or Chinese edge cities, which is discussed further in Chapter three) within a city region are explored. Thirdly, for the spatial structure, the horizontal and functional interconnections between Chinese edge cities and their respective core cities are analysed. Lastly, for the governance of polycentric city regions, the concept of polycentricity is increasingly regarded as a strategic planning tool and a policy framework; thus, this thesis mainly focuses on its application and delivery in strategic master planning in China, and investigates the challenges and difficulties in this planning and policy delivery process. Multi-level governance in polycentric development, and integrations and conflicts during the process of governance changes, are explored in the empirical chapters.

The next chapter, Chapter three, examines the development of edge cities both in the West and in China, as well as their role and potential in delivering polycentric development, and the link between edge cities and polycentricity. These two chapters

of reviews and discussions provide the theoretical framework to evaluate polycentric development practices and the formation of Chinese edge cities. As Bontje (2004, p.706) observes, the ‘tendency towards more polycentricity could have both positive and negative consequences for sustainable regional development, depending on the type of new centres being developed and the functions the central city manages to hold on to or acquire’.

CHAPTER THREE

The Development of Edge Cities, and Their Role and Potential in Delivering Polycentric Development

3.1 Introduction

Chapter two ended by summarising and proposing key themes utilised to evaluate polycentric development in China, which could help in devising a preliminary analytical framework for empirical analysis considering both the city regional and local scales in Chinese super/mega city regions. At the city regional scale, how the concept of polycentricity was introduced, explored and applied in China's spatial planning was discussed in the last chapter. Correspondingly, Chapter three focuses on the local scale, and explains the theoretical discussions of edge cities in both Western and Chinese contexts, and their role and potential in delivering polycentric development. Based on understandings from the city regional and local scales, Chinese edge cities are redefined in this chapter as polycentric nodes, and a more detailed analytical framework is proposed in order to evaluate the formation of Chinese edge cities under a polycentric framework. This analytical framework is used to explore the selected empirical cases in the latter part of this thesis.

Chapter three is organised as follows. It starts by discussing suburban development in America and the emergence of the edge cities concept, and subsequently considers the main characteristics and dynamism of American edge cities. Edge cities in Europe and elsewhere are then examined. After this, the Chinese context is explored, and the research progress of edge cities in China is discussed more comprehensively in section 3.4. Section 3.5 investigates the link between edge cities and polycentricity, which can be summarised into three aspects: 1) nodal points within polycentric city

regions at the intra-urban scale; 2) a complementary role in supporting polycentric development; and 3) the promoter of polycentric city regions towards balanced development. Finally, in section 3.6, an analytical framework is constructed on the basis of the key issues identified from Chapters two and three. This framework is utilised to explore the case studies in Chapters seven, eight and nine.

3.2 Edge cities in America

The following section offers an understanding of American edge cities, focusing on a series of aspects, including the origin, definition, defining criteria, typology, main characteristics and dynamism of edge cities.

3.2.1 Suburban development in America and the emergence of edge cities

Based on the technology background, the development speed and main characteristics of suburbanisation, the suburbanisation of American cities can be divided into, the modern suburbanisation (before 1920) and contemporary suburbanisation (after 1920) (Q. Sun, 2005). The development of contemporary American suburbanisation has undergone three stages, or what have been called, America's three waves of suburbanisation. Cervero (1989, p.4) explains the process of America's suburbanisation: 'The first wave involved the mass movement of middle class and upper income residents to the outskirts of cities in search of spacious living conditions and detached, single family homes.' This phase was a stage of residential suburbanisation (Q. Sun, 2005). The wide use of private cars, the formation of highway networks, the development of post-industrial economy, the guidance of federal and local government policies, as well as the resistance of suburbs to the mergers of central cities (Q. Sun, 2005), resulted in a rapid suburban expansion and a higher growth rate of population in the suburbs than in central cities.

The second wave is the early post-war period and the 1950s-1970s, which 'witnessed the migration of commercial and industrial activities to the outskirts, attracted to the vast reservoir of potential consumers and workers living in the suburbs' (Cervero,

1989, p.4). Industrial and commercial suburbanisation pushed the suburbanisation of America to a new climax.

The third wave of suburban expansion is after the 1970s, and edge cities in US suburbs finally formed at this time (Q. Sun, 2005). As Cervero (1989, p.4) notes,

> The arrival of workers, particularly those in the office and high-technology sectors, has brought many American suburbs full circle. With the addition of a day-time workforce population, many suburbs have become virtually indistinguishable from traditional urban centres, featuring a mosaic of places, from office towers and executive parks to fern bars[2] and performing arts centres.

Some large company branches, divisions, and even many corporate headquarters gradually moved into the suburbs, hence many office parks were established (Q. Sun, 2005). The suburbanisation of corporate headquarters promoted an increased employment in American suburbs, with the result that suburbs thus bore more and more urban functions (Muller, 1981). Especially after the 1980s, the high-tech revolution brought more capital and technology to the suburbs, which accelerated the construction and development of suburbs.

Overall, after its widespread residential suburbanisation, with a concomitant proliferation of shopping malls, America has entered a comprehensive suburbanisation of jobs. American suburbs occupy a dominant position not only in population, but also in employment and therefore present more obvious urban characteristics (Q. Sun, 2005). Suburbs no longer can be referred to just as suburbs; they have become urban areas (Birch, 1975; Cervero, 1986).

Against this background, in 1991, an American journalist from the *Washington Post*, Joel Garreau, first proposed the concept of 'edge city' (Garreau, 1991) to describe the third phase of the American suburbanisation process in the twentieth century. His

[2] This term is a 1970s/1980s American slang and refers to an upmarket bar that caters to the 'singles' market, apparently often decorated with real or artificial greenery.

book, *Edge City* (1991), has played a key role in the promotion of this concept and prompted a change in the way of thinking about American cities (Henderson and Mitra, 1996). Edge cities are widely considered to have been a new trend in suburban development in the late twentieth century in North America (Bontje and Burdack, 2005). The development of urban areas is no longer solely reliant on an independent growth pole (the city centre); on the contrary, the new urban development is characterised by the formation of new centres in suburban areas (Garreau, 1991). Metropolitan areas are gradually organised in decentralised forms to form a new geographic landscape.

In addition to edge cities (Garreau, 1991), other agglomeration or settlement types termed 'edgeless cities' (Lang, 2003) or 'technoburbs' (Fishman, 1987) have also been used to describe the complexity of city region sprawl and the changes in the constituent elements of suburbs (F. Wu and Phelps, 2011). It can be claimed that these terms promoted by the new suburban landscape in America are all trying to break with processes of urbanisation that produced traditional residential suburbs (Phelps and Wu, 2011). Henderson and Mitra (1996) analyse the phenomenon of edge-city development and urban sprawl. The participants are edge city developers (active participants) and central cities (passive participants). Conclusions indicate that developing edge cities is a rational choice of developers, and the development of edge cities can effectively suppress overly uncontrolled urban sprawl (Gao, 2008). It has been argued that edge cities have become a new model for rational expansions of metropolitan areas, and it can even be said that this phenomenon represents the advent of a post-suburban era (Phelps and Wu, 2011). The remainder of this section explains the concept of edge cities from three perspectives: the definition, defining criteria, and typology of edge cities.

Definition

Garreau (1991) believes that edge-city development is a new form of urban development in American cities. They are commercial, employment and residential

centres located and developed in suburbs surrounding original urban cores (or central business districts, CBDs). These new centres have typical city functions, including housing, employment, transportation and recreation and so on, but with a lower density than their city centres. Generally speaking, 'edge cities' describe the dispersed clusters or settlements located on the edge or periphery of urban cores (Garreau, 1991; Beauregard, 1995; Teaford, 1997).

Most scholars in subsequent studies follow this concept as defined by Garreau, but some question this connotation. Byrum (1992) believes that edge cities challenge the traditional paradigm of urban and regional planning, and it is detrimental to the development of central cities if edge cities would replace them. Nelson (1993) also points out that edge cities will adversely affect the land value of exurban areas of American cities. However, in 1994, Garreau further claimed that edge cities were the most promising markets in America, and that they had surpassed old urban cores in many respects.

In addition, Stern and Marsh (1997) extend the meaning of edge cities from the perspective of the influencing factors of urban development models. By studying an emerging edge city, Owings Mills on the outskirts of Baltimore, Maryland, they argue that the development of edge cities has become a general approach of contemporary American cities, and a decentralised development model characterised by the formation of a large number of edge cities is becoming a worldwide universal urban development phenomenon. Meanwhile, there are inevitable significant regional differences in this phenomenon. Thus, the research agenda is to accelerate the relevant research on their sustainable development, in order to seek a rational approach to their planning and policy-making.

Defining criteria

Garreau (1991) considers that although it is relatively narrow to use functional criteria (such as increased employment opportunities and centralisation of other urban functions) to define edge cities, nevertheless, this approach facilitates accuracy

in comparing the differences between edge cities and city centres. Therefore, Garreau (1991, pp.6-7) proposes five functional defining criteria, which include:

- *Has five million square feet or more of leasable office space – the workplace of the Information Age;*
- *Has 600,000 square feet or more of leasable retail space.* This is the equivalent of a fair-sized mall… probably has at least three nationally famous department stores, and eighty to a hundred shops and boutiques;
- *Has more jobs than bedrooms.* When the working day starts, people head toward this place, not away from it;
- *Is perceived by the population as one place.* It is a regional end destination for mixed use – not a starting point – that "has it all", from jobs to shopping to entertainment; and
- *Was nothing like a "city" as recently as thirty years ago*.

According to the above criteria, Garreau (1991) identifies 123 edge cities, 78 emerging edge cities and 5 planning ones in 45 metropolitan areas across America. Almost every large or medium-sized city has one or more edge cities.

Most scholars also use the above set of criteria to identify edge cities for empirical studies. Additionally, further studies complement the above criteria. Stanback (1991) believes that edge cities usually appear after the development of suburbanisation, or after the counter-urbanisation of population, retail and domestic services. Therefore, it is necessary to identify their locations first. He proposes an additional defining standard. Edge cities should locate at the intersections of main roads on the fringe of urban built areas, or at the intersections of suburban highways. That is to say, 'edge cities feature a subtype – the corridor – that captures office areas which form along freeways or other major transportation routes' (Lang, Sanchez and Oner, 2009, p.730).

Typology

Based on the above five functional defining criteria of American edge cities, Garreau (1991) identifies and divides them into three categories:

1) Suburban residential centres which already have a small population before the widespread use of cars, and which develop into edge cities with the popularisation of roads and cars;

2) Those which are located at the intersections of highways, and become edge cities following the construction of large shopping centres; and

3) Edge cities which are built in compliance with certain professional planning criteria.

Bingham and Kimble (1995) extend this and classify edge cities based on their functions. They believe most edge cities in Ohio perform specialised functions that are significantly different from the functions perform by their urban cores or by other edge cities. In this way, various types of edge cities are defined, including retail edge cities, manufacturing edge cities, hospital edge cities, edge cities that are major government centres, and edge cities catering to tourists and business travellers (Bingham and Kimble, 1995).

3.2.2 The main characteristics and dynamism of American edge cities

Garreau (1991) describes the features of American edge cities as having high-rise buildings, bright lights, office space for white-collar workers, shopping centres, entertainment venues, upscale hotels, corporate headquarters, high quality hospitals and crowds. Edge cities 'were never subordinate appendages of the historic urban core, but rather evolved into mixed-use entities in their own right' (Herbert and Murray, 2015, p.474). In short, an edge city contains all the functions a city ever has.

In considering their relationships with urban cores, Garreau (1991) thinks edge cities are more independent, thus they can be regarded as some sort of New Towns. The

industrial structure of 26 edge cities, or emerging edge cities, in Ohio is more complex than expected, which indicates a high level of specialisation in terms of functions in edge cities, and this is different from that of urban cores (Dietsch, 2001). Also, it can be seen from their industrial structure that the functions of edge cities are significantly more diverse compared with urban cores, and they have replaced some of the functions of the urban cores (Bingham and Kimble, 1995). Specifically, management agencies and their personnel tend to cluster in urban cores, while real estate developers and SMEs (small and medium sized enterprises) prefer edge cities (Gendron, 1994).

Concerning the driving forces behind their formation, it has been generally believed that they are the products of the conversion of city functions and the reorganisation of urban spatial structures. The emergence of edge cities reflects an evolutionary trend of the urban structure from monocentricity to polycentricity (L. Shen, 2007). To sum up, residential suburbanisation, construction of highways and major traffic stations, the widespread use of cars, commercial relocation, the development of service industries, and advances in information and technology are direct driving forces in the emergence of edge cities. In addition, relatively inexpensive suburban land and economic development also promote the formation of edge cities (Dietsch, 2001). More informational, flexible and decentralised industries have further enriched the functions of edge cities (Nelson, 1993).

Meanwhile, it is worth noting that the development of American edge cities was initially promoted by private developers and the market, rather than by state interventions (‘There is no zoning, only deals’) (Bontje and Burdack, 2005, p.318). The market and its most capable assistant-developers became promoters in the formation of edge cities. ‘The land use pattern and design standards for housing and commercial uses were most often set by the developers and often rigorously enforced.’(Bontje and Burdack, 2005, p.319) However, it has also been noted that, although in the initial stages of edge-city development, private developers often played a decisive role, ‘once the Edge City development had gained momentum,

local governments often started to play an important role' (Bontje and Burdack, 2005, p.318). In fact, 'these new edge cities are remarkable planning successes in economic development and urban design' (McGovern, 1998, p.1) and controls in edge cities with the purpose of 'safety' and 'comfort' are exactly the results of massive planning (Garreau, 1991). Therefore, it is clear that, although the market and developers provide the initial dynamism in making edge cities, their further development depends largely on the guidance and control from government and relevant planning schemes.

3.3 Edge cities elsewhere

Edge cities have also been identified outside of the US, and in different regions and countries such as Europe, Australia, Thailand and South Africa. In order to offer a broad overview of edge cities before explaining the development of Chinese ones, this section discusses edge cities that have emerged elsewhere.

A key question is whether there are edge cities in Europe that are just the same as those in America. European edge cities do have some similarities with American ones mainly in terms of urban forms and the multiple functions maintained. In the past 15 years, edge cities were the major growing areas at the edge of US cities. They often formed along with the widespread use of cars, but 'generally have no coherent urban form in the traditional sense' (Stern and Marsh, 1997, p.243). This situation is similar for European edge cities. Holden and Turner (1997) study some edge cities in Paris and Northern European metropolitan areas, and point out that, due to the development of network technology, edge cities show different geographical manifestations compared with traditional cities. That is to say, edge cities are the nodal points in a series of networks which span the 'urban' and 'rural' municipal boundaries. Most edge cities have high-intensity, developed central areas, and they are independent nodes following a low-density development model, thus differing from the forms of traditional cities (Phelps, 1998). The designing ideas and urban forms of edge cities are also different from each other. On the other hand, regarding

their functions, Bontje and Burdack (2005, p.328) conclude that European edge cities 'bear a significant resemblance to American Edge Cities in their functional complexity, their quantitative size in terms of jobs and their development patterns'. It is undeniable that although European edge cities do not meet all the defining criteria developed by Garreau (1991), they do meet certain criteria, such as being important job centres (Phelps et al., 2006) and are at the forefront of urbanisation.

European edge cities differ from the American experience in several respects. Kloosterman and Musterd (2001) believe that so far there is no evidence that there are edge cities in Europe as defined by Garreau. Although most of the emerging European economic centres also appear at the intersections of roads or railways at the urban fringe, these centres mainly maintain a strong complementary relationship with their city centres, rather than being competitive. There are some notable differences in the development trend of metropolitan areas between Europe and North America. Therefore, it has been argued that 'the European Edge cities are not mere copies of their American counterparts, but rather a "typically European" variation of the original Edge City model' (Bontje and Burdack, 2005, p.317). In addition, unlike American edge cities which are promoted by the market and developers, European edge cities are mainly initiated under the guidance of planning, with 'a much higher level of involvement of the public sector in all aspects of their development' (Bontje and Burdack, 2005, p.328). National and local governments, as well as public sectors, play a more important role in their formation. Central governments in Europe have more power and qualifications, and are large landowners in themselves (Harding, 1991; Harding, 1997).

Beyond the US and European examples, only a few other studies of edge cities have been made elsewhere, mainly in Australia, Thailand and South Africa. Freestone carries out empirical research on North Ryde, the suburban centre of Sydney. By comparing it with American edge cities, he points out the differences with American ones, mainly including 'the nature of a national economy significantly smaller and more dependent than that of the United States, the strength of metropolitan and local

planning controls, contrasting central city – suburban relationships, and less freeway-dependent urban transportation systems' (Freestone, 1997, p.252). In Thailand, since the 1980s, many developers have attained a high level of land ownership, and invested huge amounts of capital in urban construction. A new development form appeared within the city regions, which were called new towns. Industrial land, highway systems, harbours and airports were linked to these new towns, and a large number of workplaces, shops and recreational facilities were built there (Dick and Rimmer, 1998). Because of the development of export-oriented industries, these new centres spread rapidly in the urban fringe, and have attracted a large number of high-income consumer groups. This new urban development model is very like Garreau's edge cities, and can be regarded as Thai edge cities.

Another example comes from South Africa. On the east coast of South Africa, the La Lucia-Umhlanga Ridge, north of Durban, displays the characteristics of a possible 'edge city'. Like a typical edge city, it has fully urban functions, and its location is also typical compared with American edge cities (Michel and Scott, 2005). However, the South African 'edge city' is still developing, and as a developing society, the decentralisation of business/residential nodes cannot be completely aligned with processes occurring in the developed world.

3.4 Edge cities in China

Existing research on edge cities in China mainly focuses on three aspects, which are the introduction and explanation of the concept of edge cities, empirical analysis, as well as reflection and criticism on edge cities. The empirical analysis includes: 1) the identification and characteristics of edge cities; 2) the urban spatial structure's evolution under the influence of edge cities; and 3) the planning and construction of development zones or industrial parks based on the concept of edge cities.

3.4.1 Concept introduction and theoretical progress

In 1997, Sun and Ma (1997) first introduced the concept of edge cities as proposed by Garreau (1991), and made an assessment based on multiple existing analysis and proposed future research directions on edge cities in China. They argue that edge cities reflect the transformation trend of urban spatial structure from monocentricity to polycentricity. They are gathering areas during the diffusion process of central cities, and a balanced development status between central cities and edge cities is perhaps the future development trend of American cities. Following Sun and Ma (1997), some other scholars also draw conclusions about edge cities based on the context of Western developed countries. Wu and Ma (2000) contend that the emergence of Western edge cities is one of the inevitable consequences of suburbanisation after central cities in developed countries have entered a later stage of urbanisation development. Based on renewed analysis of theory and practice regarding Western edge cities and exploring the emergence and formation of them, they divide edge cities in China into three categories: 1) edge cities developed based on the original suburban centres; 2) new centres developed at the periphery of urban areas, which are promoted by strong growing nodes, such as airports and universities; 3) edge cities which are under unified planning schemes and are newly built. After discussions on the typology of edge cities in China, they also explore the urban morphology of the three types of edge cities from three aspects, including the evolution of roads, city size and scales in dividing land, as well as the morphology of buildings. More recently, Lin et al. (2014) evaluates the applicability of adopting the theory of edge cities in China, and argues that the edge city theory may provide some reference point for urban planning in China.

In summary, Chinese scholars generally consider that edge cities are the new products of post-suburbanisation in Western cities and regions. They are gathering areas based on employment rather than living as the main feature, and are emerging nodes for (post-)modern cities and regions in the development of a polycentric spatial structure. Western edge cities are products in the continuous search for new

investment pathways under the mechanisms of the real estate market in metropolitan areas. They can avoid the protectionism in urban centres, and gain some kind of autonomy at the urban periphery (Tong, 2007). However, it should be noted that existing studies on Western edge cities are still significantly insufficient in China.

3.4.2 Empirical analysis

Identification and characteristics of edge cities in China

Some scholars combine the concept of Western edge cities with the development situations of Chinese cities and, on this basis, carry out empirical studies on the defining criteria as well as main characteristics of edge cities in China. Research elements in identifying edge cities in a Chinese context can be summarised as follows: the functions and size of edge cities, distance from core cities, and attractive scope of edge cities, as well as historical and regional development conditions.

Regarding the main characteristics of edge cities in China, Deng, Wang and Wu (2001) summarise the main features of Shanghai's edge cities as being more than 20km away from the urban core of Shanghai; close to the transit but not locate at the transportation hub; and a new product in the stage of economic growth. Similarly, Yizhuang new town in the Beijing city region is also considered as a new core in *Beijing Comprehensive Planning* and *Yizhuang New Town Planning* documents. With the gradual development and improvement of residences, services, entertainment as well as public transportation, Yizhuang is turning from a suburban industrial area into a fully functional new town (F. Wu and Phelps, 2011). In turn, Yizhuang new town is also called a 'stealth city', which is very similar to American edge cities (Knox, 1993). Another edge city, Fengtai Science Park in Beijing, has also been regarded as a typical edge city in China, and is developed under the rapid development of China's producer service industries and the spatial restructuring of Beijing's producer service industries (G. Zheng and Meng, 2012).

It can be seen from the above review that existing research on identifying edge cities in China mainly selects a few influencing factors, and compares those factors with

those of Western edge cities. The defining criteria for edge cities in China have not yet been systematically studied. Moreover, the characteristics of edge cities in China are insufficiently studied at the moment since they have only been summarised based on edge cities identified from certain super city regions (such as Beijing and Shanghai). However, these city regions may not represent many other less prominent Chinese cities.

Urban spatial structure evolution under the influence of edge cities in China

In recent years, with the acceleration of the urbanisation process, Chinese cities have experienced rapid expansion, in only a short period of time. Some scholars focus their attention on the transformation development of the urban spatial structure and, as a result, research on edge cities has received more attention.

It has generally been considered that edge cities are important symbols and the inevitable outcome for cities and regions in the development of a polycentric spatial structure from a monocentric one. In the process of urban spatial expansion, cities do not occupy the space continuously; on the contrary, they develop edge cities or sub-centres in the form of "enclaves". The emergence of edge cities is an extreme case of the urban spatial expansion (Z. Wang et al., 2001). Li, Wu and Phelps (2008) explore the dynamic mechanism in the formation of edge cities within Chinese metropolitan areas, by drawing on two case studies of rapidly developing settlements, Yizhuang and Kunshan, within the Beijing and Shanghai metropolitan areas. In conclusion, they argue that the development of edge cities in China also extends beyond the process of suburbanisation, and represents the politics of polycentricity with Chinese characteristics. In addition, through analysing the economic development stages, current development status and future trends of service industries in China, Zheng (2010) notes that edge cities will become an inevitable trend for future development of mega city regions. He also summarises the paradigm of edge cities in China. In fact, although Chinese cities are still in the development period of large-scale suburbanisation, some of the development features and

governance changes of post-suburbanisation have already begun to emerge. Yizhuang in the Beijing city region is a good example. As an emerging growth node promoting Beijing's regional economic development to the international level, Yizhuang represents a polycentric development form of a city regions' economic development with Chinese characteristics (F. Wu and Phelps, 2011).

As can be seen from the above, a consensus has formed that edge cities can effectively promote the transformation development of the urban spatial structure, and they can better adapt to the evolutionary trends and needs of spatial structures in the transition from monocentricity to polycentricity (G. Lv and Tang, 2008).

Planning and construction of development zones or industrial parks based on the concept of edge cities

In 2000, Chinese suburban development entered a new phase in which the transformation and re-development of suburban development zones (or industrial parks) with single industrial functions have spurred the formation of new suburban centres. These new suburban centres developed from Chinese development zones have become independent nodes within metropolitan areas, which have always been compared with Western edge cities. As Siqi Zheng and other scholars (2017, p.81) note, 'those successful parks will attract skilled workers who will seek a short commute to work. This creates an incentive for developers and retail store businesses to open up quality housing and shopping close to the new parks. Therefore, a new edge city emerges.' It can be argued that the transformation process of development zones creates a development path for one type of edge city in China. Therefore, by learning from the development experience of Western edge cities, scholars have put forward planning and construction suggestions on development zones or industrial parks in China.

Existing research has indicated that similar characteristics between Chinese development zones (or industrial parks) and Western edge cities can be summarised in five respects: 1) spatial locations: both are located at the edge of urban areas; 2)

functions and development trends: both aim at comprehensive development; 3) urban morphology: both follow a similar low-density development model; 4) main characteristics: both areas are developed based on employment rather than living; 5) governance: both have 'stealth governments' (P. Zhao and Peng, 2000; Song and Wang, 2001; X. Yuan and Wang, 2010). Furthermore, drawing on the development experience of Western edge cities, planning and construction strategies have been proposed for Chinese development zones, including shaping liveable landscapes, innovating environmental construction, adjusting and upgrading industries, developing comprehensive urban functions, promoting intensive and efficient land uses, improving facilities and innovative social management, as well as strengthening external relationships (P. Zhao and Peng, 2000; X. Yuan and Wang, 2010; Liu and Bu, 2013; S. Zhao et al., 2017a; S. Zhao et al., 2017b).

3.4.3 Reflection and criticism

As a new urban form, edge cities not only possess their own significance and merits, but also exhibit certain negative impacts. There is limited literature that addresses the adverse effects caused by edge cities (B. Lv, 1999; L. Wu and Liu, 2002). It has been argued that the drawbacks of edge cities include the following points. First, they fail to solve the problems associated with traffic jams and air pollution completely. Secondly, there are few opportunities for face-to-face communication in edge cities. Thirdly, a great waste of land, energy and other resources results in an increasing cost for infrastructure investments. Finally, the relationships between communities in edge cities are not close, lacking a kind of cohesion and a sense of belonging, which results in the emergence of a series of social problems (B. Lv, 1999; L. Wu and Liu, 2002). Based on these findings, the central idea in urban development in the United States has started to transform from 'Edged Urbanism' to 'New Urbanism', which assures the return of the value rationality from the perspective of philosophy, and reveals the importance of the humanism in today's urban constructions (L. Wu and Liu, 2002).

3.4.4 Summary

In summary, theoretical and empirical research on edge cities in China is still in its initial stage, and there have not been systematic studies on the definition, formation and development process of edge cities in China. To be more specific, first, at the conceptual level, the introduction and elaboration of current literature on edge cities is not sufficient in China, and this directly limits empirical research. Secondly, in the empirical analysis, most scholars identify edge cities in China only by selecting several influencing factors and with reference to the concept and characteristics of Western edge cities, and these are not necessarily appropriate criteria for defining Chinese examples. Meanwhile, in analysing the impacts of edge cities on the evolution of urban spatial structures, scholars have come to the consensus that edge cities can effectively promote the transformation development of urban spatial structures, and that the emergence of edge cities in China is associated with the development stages of central cities. Finally, some scholars have pointed out that there are some similarities between Chinese development zones (or industrial parks) and Western edge cities. Therefore, by learning from the development experience of Western edge cities, future development strategies have been put forward regarding the future prospects of Chinese development zones.

3.5 The link between edge cities and polycentricity

With a thorough understanding of the development of edge cities both in the West and in China, this section reviews the concepts of polycentricity (discussed in Chapter two) and edge cities (discussed in previous sections of Chapter three), and considers the link between the two of them, in order to explore the role and potential of edge cities in delivering polycentric development. Generally speaking, the link between edge cities and polycentricity can be summarised from three dimensions: 1) nodal points within polycentric city regions at the intra-urban scale; 2) a complementary role in supporting polycentric development; and 3) the promoter of polycentric city regions towards balanced development.

3.5.1 Nodal points within polycentric city regions at the intra-urban scale

Across the developed world, metropolitan regions have become increasingly polycentric (Bontje and Burdack, 2005). Since the early 1970s, urban geographers have begun to study the evolution of polycentric urban regions; however, among all these studies, the one which has done most to focus both academic and popular attention on this aspect of metropolitan restructuring has been Joel Garreau's *Edge City: Life on the New Frontier* (1991). Indeed, the term 'edge city' has quickly established itself in the lexicon of urban affairs writers as a kind of shorthand label for the accelerated suburbanisation of jobs and other activities (Knox, 1993).

Garreau (1991) observes that the growth of edge cities in the suburban and even the outmost reaches of large metropolitan areas can be seen as the most recent phase in the evolution of urban spatial structure. Edge cities are 'characterised by large concentrations of office and retail space often in conjunction with residential and other types of development at the nodes of major transport networks' (Davoudi, 2003, p.982). Together with Garreau's (1991) 'edge cities', the evolution of major employment and commercial centres in metropolitan peripheries, what Soja (1996) refers to as 'exopolis' and Fishman (1987) terms 'technoburbs' have been a significant focus of recent urban research and policy work (van Houtum and Lagendijk, 2001).

Regarding all these new terms, the concept of polycentricity has been deepened by scholars who have developed theories and models to analyse polycentric urban growth. Garreau's (1991) edge city can be explained as a variation of a polycentric urban spatial structure (Yue, Liu and Fan, 2010), which is a polycentric pattern with concentrations of development occurring at the intersections of hub and transportation networks surrounding major metropolises. Specifically speaking, in a polycentric region, the metropolitan region does not have a single dense core, but a series of dense areas or sub-centres distributed across a matrix of lower density development (Garreau, 1991; Harris and Ullman, 1945). It has been argued that the

spatial characteristics of cities in the US are indeed polycentric, as they consist of many employment centres (Anderson, 2004). These sub-centres or edge cities have been observed as clusters or nodal points at an intra-urban scale within a polycentric metropolitan or city regional form (Garreau, 1991; van Meeteren et al., 2016; Liu and Wang, 2016).

3.5.2 A complementary role in supporting polycentric development

Mostly based on agglomeration economies, Anas, Arnott and Small (1998) focus on describing and explaining urban spatial structure, and argue that whilst urban regions have been spreading out for centuries, their growth patterns, more recently, are undergoing a qualitative change. They argue that the process of decentralisation in urban regions 'has taken a more polycentric form, with a number of concentrated employment centres making their mark on both employment and population distributions. Most of these centres are subsidiary to an older central business district (CBD), hence are called "sub-centres"' (Anas et al., 1998, p.1426). Based on a number of empirical case studies in America, two types of sub-centres are identified: the first group refers to older towns that have gradually become incorporated into an expanded but coherent urban area; and the second group refers to newly spawned centres at nodes of transportation networks, which are often so far from the urban core as to earn the appellation 'edge cities' (Anas et al., 1998). Therefore, edge cities are noted as one type of sub-centre forming a more polycentric structure, which play a particularly complementary role; in other words, they are interdependent with older CBDs or core cities.

To explain this more fully, Krugman (1996, pp.76-77) argues that:

> The purpose of what I am calling the edge city model is to explain, in as minimalist a way as possible, how the interdependent location decisions of businesses within a metropolitan area could lead to a polycentric structure, in which business is concentrated in several spatially separated clusters.

Bogart (1998) comments that the development of edge cities (or employment centres) as a complement to industrial era city centres can be thought of as a result of decreasing transportation costs of services (Anderson, 2004). Even in terms of Western Europe, Anas, Arnott and Small (1998) have observed that there has been massive suburbanisation and the emergence of edge cities. Based on empirical findings, Bontje and Burdack (2005, p.328) argue that 'the European suburban economic poles are not meant to be alternatives to the traditional town centres but rather thought of as complementary structures to support a polycentric development'.

3.5.3 The promoter of polycentric city regions towards balanced development

The 'concentrated de-concentration' (Hall and Pain, 2006), was developed in Garreau's (1991) work on edge cities, in which Garreau (1991) portrayed the emergence and formation of employment sub-centres at the edge of metropolitan areas. This transition of the metropolitan structure from monocentricity to polycentricity enables a more balanced distribution of employment across the metropolitan areas. As Arribas-Bel and Sanz-Gracia (2014, p.982) state, 'this 'suburban downtown' phenomenon can be defined as the process by which employment leaves the CBD and recentralises in an orderly and compact fashion in new poles or nodes that constitute a polycentric structure'. Some researchers have also observed that edge cities indicate a shift in the balance of economic forces within polycentric urban regions (Phelps and Ozawa, 2003; Phelps, 2004).

With regards to Europe, Bontje (2004) observes examples of European metropolitan regions where the de-concentration of employment has led to new sub-centres emerging with densities sometimes comparable to the core cities. Promoted by those newly formed sub-centres, new polycentric structures have been formed, and these European metropolitan regions are moving towards more balanced development with a series of (sub) centres. 'The new polycentric structures emerging in Europe could potentially contribute to a more sustainable regional development, providing new job

concentrations closer to suburban and rural living environments and intensifying and diversifying land use in suburban locations' (Bontje, 2004, p.703).

3.6 Analytical framework for exploring Chinese edge cities under the polycentric development practices in China

3.6.1 Redefining and classifying Chinese edge cities

Garreau (1991) only provides a few general guidelines and characteristics for an edge city, and none of these can be applied and measured systematically across a metropolitan region (Forstall and Greene, 1997). Considering their unique context and historic growth, edge cities elsewhere can only be noted as a variation of the original American Edge City model, and how to define and identify edge cities in different geographical contexts should always be considered first. Therefore, when applying the concept of edge cities to China, it is essential to redefine their meanings and connotations based on the development context of Chinese cities, to ascertain a phenomenon-context relationship with Chinese characteristics.

Until now there has not been a well-accepted definition of edge cities in a Chinese context, and explanations about edge cities were still made based on the context of Western developed countries. Even so, it has been widely accepted in China that edge cities are agglomerative areas based on employment rather than living as the main feature, and emerging nodes within (post-) modern cities and regions undergoing development into a polycentric spatial structure. As stated previously in this chapter, in the West, edge cities have been recognised as sub-centres in forming polycentric structures at intra-urban scales (Garreau, 1991; Krugman, 1996; Anderson, 2004; Bontje and Burdack, 2005; Garcia-López and Muñiz, 2010). Considering the ambiguity of edge cities in China, it is also necessary to redefine the concept of edge cities, particularly through the perspective of the polycentric development.

The term ‘edge cities’ originally came from the US, and five functional defining criteria were identified for them (Garreau, 1991). Existing literature has already pointed out some of the limits in applying the term edge city outside of the US (Phelps, 1998; Phelps and Parsons, 2003; Bontje and Burdack, 2005; Phelps et al., 2006; Phelps and Wu, 2008). In addition, in terms of the development background and spatial scales of city regions being vastly different in China in comparison with the US, those five defining criteria are also not applicable for edge cities in China. Therefore, in view of the context-specific feature of the term edge city, this thesis avoids applying the exact term to China. Rather, in this thesis, Chinese edge cities specifically describe the polycentric nodes emerging at a city regional scale within China’s super/mega city regions. Similar to edge cities in the US or Europe, Chinese edge cities are also considered as a type of urban settlements or sub-centres within polycentric spatial structures at the intra-urban scale. Moreover, instead of adopting definitive criteria from the US, this thesis redefines Chinese edge cities, based on the two words ‘edge’ and ‘city’, and also from the lens of polycentricity (see Table 3.1). Specifically, regarding the first word ‘edge’, a Chinese edge city should be located outside of the central city, at the edge or periphery. However, it can locate at the edge of an urban area at different spatial scales within a city region, in terms of the central city, metropolitan and city regional scales. Additionally, a Chinese edge city always has a well-defined boundary or edge. As to the other word, ‘city’, in the US context, an edge city contains all the functions a city ever has, and it should be a fully functional centre (Garreau, 1991). In this research, it is argued that every city has its major function or functions, therefore, a Chinese edge city should also have its specialised function or functions. However, it does not necessarily have to have all of the functions of a city, but, should be functionally interdependent upon its core city. In addition to these two perspectives, from the lens of polycentricity, Chinese edge cities also help consisting polycentric structures at an intra-urban scale. In this research, the intra-urban scale refers to the city regional scale. Here a city region refers to the whole administrative area, which includes all the urban districts, administrative counties and county-level cities. Moreover, as ‘cities’, Chinese edge

cities are considered as a mature type of urban settlement or sub-centre, and horizontal linkages are exited between Chinese edge cities and core cities, and also between different Chinese edge cities, which together form a networked spatial structure. Since the polycentric development has only been applied in strategic master planning activities of Chinese super and mega city regions for around fifteen years, it is the relatively early stage of their transformative processes from monocentric structures to polycentric ones. Therefore, the focus of this thesis is mainly on the formation of the planned sub-centres at the local scale, and their spatial and functional interrelationships with the core cities.

Table 3. 1 Redefining Chinese edge cities

Key concept	Dimensions for redefining Chinese edge cities	Understandings and definitions within a Chinese context	Main research elements for local case studies	Explanations of the main research elements
Chinese edge cities	Edge	1) Located at the edge or periphery areas at three spatial scales within city regions, central city scale, metropolitan scale and city regional scales; 2) Have well-defined boundaries or edges	1) At the edge of central city, metropolitan area and city region within selected super/mega city regions; 2) Well-defined administrative areas or functional areas	1) Spatial location of Chinese edge cities; 2) Will be considered in selecting Chinese edge cities as case studies
	City	1) Have specialised function or functions; 2) Be functionally interdependent with core cities	1) Specialised function or functions; 2) Functionally interdependent with core cities	1) Major functions; 2) Functional interrelationships with core cities
	Polycentricity	Help consisting polycentric structures at the city regional scale	Spatial structures formed at the city regional scale	Spatial linkages with core cities

After redefining Chinese edge cities, it is also important to classify different types of edge cities in China. As mentioned earlier in section 3.2.1 of this chapter, Garreau (1991) divides American edge cities into three categories. In China, based on a re-analysis of the theories and practices of Western edge cities and exploring the

emergence and formation of them, Wu and Ma (2000) divide edge cities in China into three categories (see section 3.4.1). Some other scholars have also tried to explain different types of edge cities. These types mainly include newly planned suburban central towns (Tao and Liu, 2003); suburban secondary centres developed from residential areas (G. Huang, 2010); and edge cities based on emerging suburban economic cores such as suburban superstores, outer suburban holiday villages or mega university towns (Meng, 2008). Partly in light of the above literature regarding classifications of edge cities, both in the West and in China, this study classifies Chinese edge cities into three types. These are, mainly based on the dominant driving forces in their formation: 1) integrated edge cities, which initially grow self-organised, then quickly integrate with and are guided by a series of follow-up plans and policies, and eventually develop into Chinese edge cities from previous suburban areas or towns; 2) organic edge cities, in which the initial developments are 'unplanned' and 'self-organised', although subsequent plans and policies might involve, the 'self-organised' development model still maintains relatively strong local initiatives compared with the integrated edge cities; 3) planned edge cities, which are newly planned and promoted on the basis of strong growing nodes, such as major infrastructure, suburban superstores or universities, and so on.

3.6.2 Constructing an analytical framework for exploring Chinese edge cities

Based on the key themes of the polycentricity concept in spatial development and spatial planning practices in China generated in Chapter two (see Table 2.2), and the definition and understandings of Chinese edge cities (see Table 3.1), the corresponding themes to explore Chinese edge cities are generated accordingly (see Table 3.2). Three key themes are synthesised based on the explanations of the main research elements for local case studies, which are used to examine to what extent Chinese edge cities have formed within the polycentric structure at the city regional scale in selected super/mega city regions. The key themes include spatial location and spatial linkages, functions (including major functions and functional connections), and governance.

Table 3. 2 Constructing an analytical framework for exploring Chinese edge cities

Key concepts	Understandings and definitions within a Chinese context	Main research elements for local cases	Explanations of the main research elements	Key themes for exploring Chinese edge cities
Polycentricity	Conceptualising polycentricity in practice: 1) A settlement system; 2) A spatial structure	1) Major functions of Chinese edge cities; 2) Interconnections between Chinese edge cities and core cities	1) Major functions of Chinese edge cities; 2) Spatial linkages with core cities	1) **Spatial location and spatial linkages**; 2) **Functions**: -Major functions -Functional connections; 3) **Governance**
	Multiple scales in application	City regional scale	Already considered for research scale	
	Multi-level governance under a polycentric framework	Governance changes under a polycentric framework	Governance changes in Chinese edge cities	
Chinese edge cities	Edge: 1) Located at the edge or periphery areas at three spatial scales within city regions: central city, metropolitan and city regional scales; 2) Have well-defined boundaries or edges	1) At the edge of central city, metropolitan area and city region within selected super/mega city regions; 2) Well-defined administrative areas or functional areas	1) Spatial location of Chinese edge cities; 2) Will be considered in selecting Chinese edge cities as case studies	
	City: 1) Have specialised function or functions; 2) Are functionally interdependent with core cities	1) Specialised function or functions; 2) Functionally interdependent with core cities	1) Major functions; 2) Functional interrelationships with core cities	
	Polycentricity: Help consisting polycentric structures at the city regional scale	Spatial structure formed at the city regional scale	Spatial linkages with core cities	

3.7 Conclusion

This chapter has presented a literature review on the development of edge cities and aims to understand the concept of edge cities both in the West and in China. Drawing on these understandings, the connectivity between polycentricity and edge cities were explained in section 3.5 of this chapter, in order to reveal and clarify the interrelations and mechanisms between them. On this basis, an analytical framework was constructed to explore Chinese edge cities under polycentric development practices in China.

Edge cities have been described as concentrations of commercial and business activities, which are located far from the traditional city centres, commonly at the urban edge with a considerable distance from the central city. The aim of applying polycentricity to the development of super/mega city regions is primarily to seek balanced and sustainable development within the whole city region. As a polycentric model at an intra-urban scale, the emergence and development of edge cities can help promote this balanced development within city regions and enhance collaborated urban networks. Meanwhile, as has been noted from the review, there should be no competition between edge cities and their core cities, but collaboration. Polycentrism and localism should be coordinated and addressed at the same time.

After understanding both the concepts of polycentricity and edge cities, and constructing the analytical framework for exploring the empirical cases of this research, the next chapter, Chapter four, develops a methodology for investigating polycentric development practices in China and the formation of Chinese edge cities, before conducting an empirical study of the application of polycentricity. Based on the discussions and findings in Chapters two and three, at least three issues are addressed in the methodology chapter following this. First, given that there is little research on polycentric development practices in master planning in China, an overall survey of polycentric development is initially carried out. Different application processes are examined both in a broad way and in detail at the city

regional scale. Then an embedded case study approach is adopted at the local scale, and case studies are chosen in different types at different scales within the selected city region. Finally, data collection techniques are introduced and ethical issues are considered.

CHAPTER FOUR

Research Design and Methodology

4.1 Introduction

Chapter four presents the research design and methodology which were adopted in response to the overall aim and each objective of this research. It guides the empirical analysis and research findings. The chapter mainly explains why the methodology adopted is most effective in answering the research questions, and the different data collection techniques chosen to best fit the proposed methodology. A research design is described as a plan that 'guides the investigator in the process of collecting, analysing, and interpreting observations. It is a logical model of proof that allows the researcher to draw inferences concerning causal relations among the variables under investigation' (Frankfort-Nachmias and Nachmias, 1992, p.77-78). The empirical part of this thesis (presented in Chapters five to ten) is carried out based on the methodology set out in this chapter. The empirical analysis aims to fulfil Objectives Three and Four of this research.

4.1.1 Re-cap of research aim and objectives

Research aim

To investigate how successful the application of polycentricity has been at the city regional scale in China, and to reveal the challenges and problems in spatial planning, particularly from the perspective of the planning and development of Chinese edge cities.

Research objectives

Objective One: To understand the origin and meaning of the polycentricity concept and the role edge cities have had as part of polycentric development in spatial planning;

Objective Two: To explain whether, why and how polycentricity has been introduced and applied in spatial planning in China, and the development of Chinese edge cities;

Objective Three: To investigate how successful the application of polycentricity has been in spatial planning in China:

1) To evaluate the role and scope of polycentricity in spatial planning at the city regional scale and to investigate different application processes;

2) To evaluate the formation of Chinese edge cities in selected city regions and to explore dynamic mechanisms in their development;

Objective Four: To evaluate the challenges and difficulties of developing Chinese edge cities within the context of polycentric development at the local scale;

Objective Five: To make planning and policy recommendations related to the application/delivery of polycentricity and in the formation of Chinese edge cities.

4.1.2 Methodological framework

In order to fulfil Objectives Three and Four of this research, a framework was constructed to help illustrate this exploratory research process. Figure 4.1 provides the framework for the proposed methodology. Initially this chapter explains the case study method and in particular justifies the rationale in adopting an embedded case study approach as well as a mixed-method approach for this piece of research. Then it moves to explain a threefold methodology for investigating polycentric development practices in spatial planning in China and the formation of Chinese edge cities within the polycentric spatial structure. Finally, ethical issues relating to

this research are explicitly considered.

The threefold methodology is organised following the research sequence set in the aim and objectives. An overall survey of polycentric development practices in master planning in China is intended to gain an overview of the role and scope of polycentricity in spatial planning. Through this overview, super/mega city regions which best illustrate the application of polycentricity stand out and become the focus of the next stage. Stage Two of the detailed analysis and comparisons of the polycentric development practices between two selected city regions aims to investigate different application processes over time. Meanwhile, the comparisons also lead to the selection of one city region which becomes the context of embedded case studies (Chinese edge cities). The design of case studies is elaborated in Stage Three. This includes defining the unit(s) and subunit(s) of analysis, introducing the different data collection techniques used in this research, and explaining the methods of data analysis.

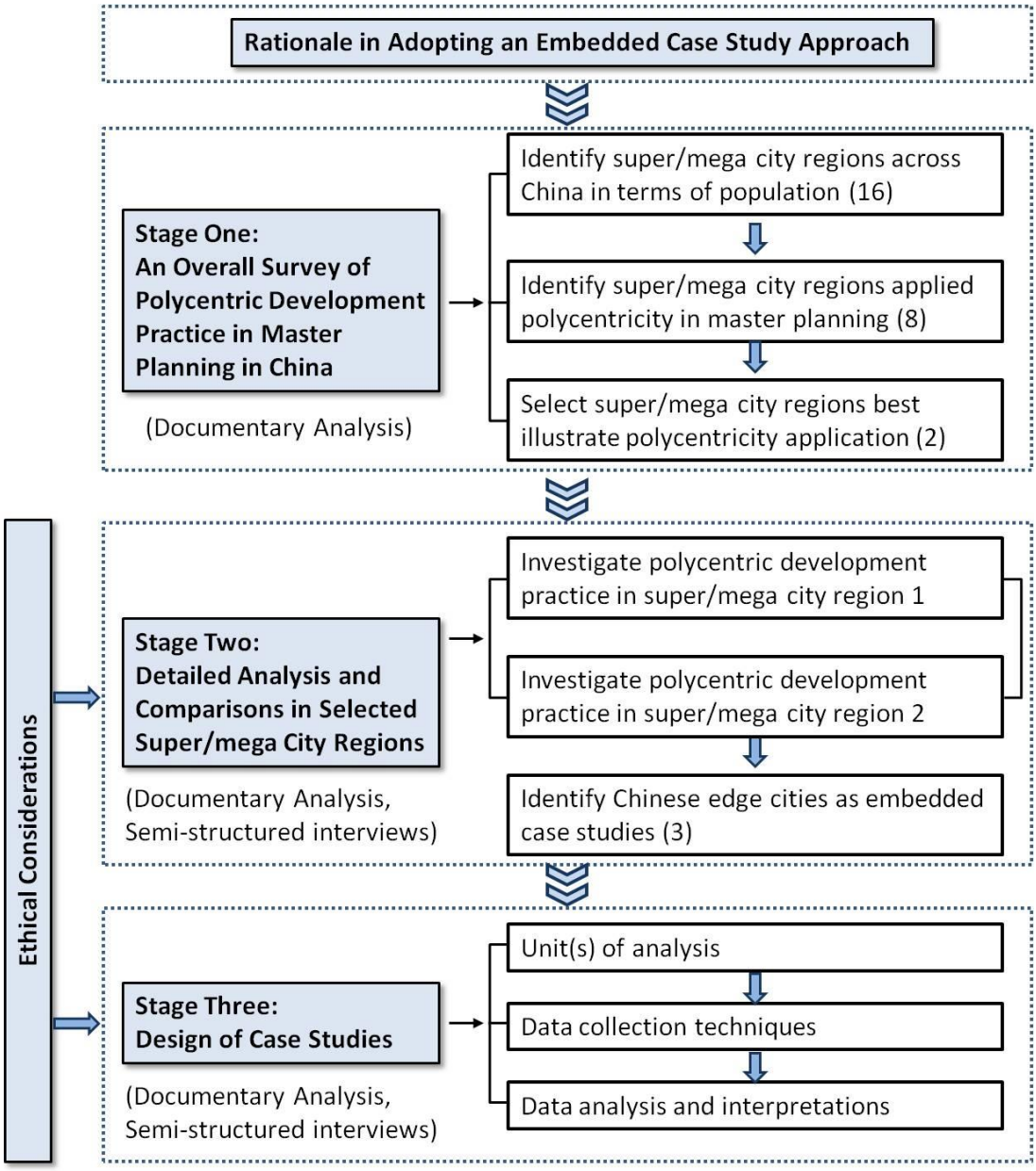


Figure 4. 1 Methodological Framework

4.2 Rationale in adopting an embedded case study approach

4.2.1 What is a case study approach?

As one of the several forms of social science research, case study research is used to understand complex social phenomena. Stake (1988, p.258) defines a case study as 'a study of a bounded system, emphasising the unity and wholeness of that system, but

confining the attention to those aspects that are relevant to the research problem at the time'. From a sociological perspective which is also applicable in other social science disciplines, Theodorson and Theodorson (1969, p.38) define a case study method as:

> A method of studying social phenomena through the thorough analysis of an individual case. The case may be a person, a group, an episode, a process, a community, a society, or any other unit of social life. All data relevant to the case are gathered, and all available data are organised in terms of the case. The case study method gives a unitary character to the data being studied by inter-relating a variety of facts to a single case. It also provides an opportunity for the intensive analysis of many specific details that are often overlooked with other methods. This approach rests on the assumption that the case being studied is typical of cases of a certain type, so that through intensive analysis generalizations may be made which will be applicable to other cases of the same type.

Considering the characteristics and strengths of the case-study approach as a research strategy, Yin (2014, p.16) makes a more comprehensive, twofold definition of the case study. First, it begins with the scope of a case study:

> A case study is an empirical inquiry that
>
> - investigates a contemporary phenomenon (the 'case') in depth and within its real-life context, especially when
> - the boundaries between phenomenon and context may not be clearly evident.

One should thus adopt a case-study approach where 'you deliberately wanted to cover contextual conditions – believing that they might be highly pertinent to your phenomenon of study' (Yin, 2003, p.13). Secondly, it may be appropriate

> because phenomenon and context are not always sharply distinguishable in real-world situations. Therefore, other methodological characteristics become relevant as the features of a case study:
>
> A case study inquiry
>
> - copes with the technically distinctive situation in which there will be

many more variables of interest than data points, and as one result

- relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result
- benefits from the prior development of theoretical propositions to guide data collection and analysis (Yin, 2014, p.17).

Thus the 'case study research comprises an all-encompassing method—covering the logic of design, data collection techniques, and specific approaches to data analysis' (Yin, 2014, p.17).

4.2.2 Why adopt an embedded case study approach for this research?

Compared with other research methods in the social sciences, Yin (2014, p.2) suggests that a case-study approach offers a distinct advantage when '(1) the main research questions are 'how' or 'why' questions; (2) a researcher has little or no control over behavioural events; and (3) the focus of study is a contemporary (as opposed to entirely historical) phenomenon' (see Table 4.1). For this research, first, the main research questions asked have been focusing on *how* and *why* questions associated with the application of polycentric development strategies and the formation of Chinese edge cities. Secondly, the researcher has little or no control over the participants involved in understanding, planning, or delivering polycentricity, or in witnessing and facilitating the formation of Chinese edge cities. Nevertheless, the participants' views and interpretations are an important and indispensable element in exploring the above research questions. Thirdly, the focus of this research is a contemporary phenomenon, although historic processes are also considered.

Therefore, this research adopts a case-study approach as the main research strategy. The selection of a case-study approach is strongly justified by the characteristics and strengths of the research, and by the overall aim and objectives of this research. The case-study research allows a more focused, explanatory and exploratory examination of the research subject. Moreover, in this research, selected case studies at the local scale are embedded in their wider city regions, or in other words, they are embedded in the polycentric city regional context. Thus, this research specifically adopts an

embedded case study approach, in which the embedded case studies refer to selected Chinese edge cities, and the context of cases refers to the identified super/mega city region from which the case studies are chosen.

Table 4. 1 Relevant situations for different research methods

METHOD	(1) Form of Research Question	(2) Requires Control of Behavioural Events?	(3) Focuses on Contemporary Events?
Experiment	How, why?	Yes	Yes
Survey	Who, what, where, how many, how much?	No	Yes
Archival Analysis	Who, what, where, how many, how much?	No	Yes/no
History	How, why?	No	No
Case Study	How, why?	No	Yes

Source: Yin (2014, p.9).

4.2.3 Why mixed-methods research?

There is an increasing literature in the Western context discussing a number of quantitative indicators in measuring and assessing polycentricity, which have focused on population/employment concentrations or flows of information in urban networks (Hall and Pain, 2006; Green, 2007; Burger et al., 2011; Burger and Meijers, 2012; Veneri and Burgalassi, 2012; Vasanen, 2013). In China, a number of metropolitan areas has adopted polycentric spatial planning development strategies which are intended to guide future development (Luo and Zhu, 2008). However, after more than fifteen years of applying the ideas of polycentricity into planning policy, there is little research available which evaluates whether this concept has successfully been applied from a policy perspective. Instead, as was discussed in Chapter two, much of the research has focused on identifying population or employment centres of large city regions (Y. Gu et al., 2009; L. Jiang and Wu, 2009; T. Sun et al., 2012; L. Jiang and Wu, 2013; T. Sun et al., 2013; D. Huang et al., 2017), or the connections and linkages within and between cities or regions (Y. Li and Phelps, 2016; Mu and Yeh, 2016; M. Zhao et al., 2017) and ascribe these to polycentricity. In an attempt to

overcome this limitation, this research seeks to critically evaluate the application of polycentric policy development practices in China through the lens of master planning and strategic planning, and to reveal and interpret the challenges and problems in spatial planning, particularly from the perspective of the planning and development of Chinese edge cities.

The aims of this research determine that the embedded case studies rely on qualitative techniques focusing on relevant planning and policies, as well as interviews with key participants involved in the implementation of these processes. Meanwhile, embedded case studies also call upon statistical methods or other quantitative techniques to collect data about the embedded subunit(s) of analysis (see 4.5.1 Unit(s) of analysis), such as statistical records on economic development. Therefore, this research adopts a mixed-methods approach, in which other research methods are embedded within case study research.

4.3 Stage One: An overall survey of polycentric development practices in master planning in China

4.3.1 Methodology

Stage One of this overall survey aims to fulfil the first part of Objective 3: to evaluate the role and scope of polycentricity in spatial planning at the city regional scale and to investigate general different application processes. City regions which have applied polycentricity in their strategic plans (master plans) are the main focus of this stage. First, all the super/mega city regions across China in terms of resident population by the end of 2015 were selected. A super city region has a resident population in urban districts of over 10 million, and a mega city region has a resident population in urban districts of between 5 million and 10 million. As a result, a total of sixteen cities were selected. Seven were super cities and nine were mega cities. Four broad types of practices emerged in terms of the application of polycentricity in two rounds of master plans since 1995:

1. Those city regions that had applied polycentric principles to both rounds of master plans;

2. Those city regions that had applied polycentric principles in their latest iteration of master plans, and had been adopted before 2005;

3. Those city regions that applied polycentric principles in their latest round of master plans, but were adopted after 2005; and

4. Those city regions which had never applied polycentricity to any of their master plans.

Therefore, super/mega cities which fall into the first and second types became the focus. Hence, eight super/mega city regions out of the total sixteen were selected across China based on when the application of polycentricity first became evident. Subsequently, how the polycentric ideas were applied to plan-making processes in these eight super/mega cities regions were evaluated, with the focus on considering their application at different planning levels of city master plans in China. Documentary analysis was utilised for Stage One. Formal and current master planning documents which have applied the concept of polycentricity in these eight super/mega city regions were needed at this stage of research. The documentation was obtained either from the Urban Planning Bureaus of selected super/mega city regions or from their official websites.

4.3.2 Criteria for identifying case studies

The overall survey of polycentric development practices in Chinese master planning not only aims to fulfil the first part of Objective Three, but also provides the initial step in selecting case studies (see Figure 4.2). Two super/mega city regions were identified in the end of this survey which best illustrate polycentricity application. That is, they should have both applied polycentricity to both rounds of their latest master plans, and they have also explicitly applied polycentricity narratives and strategic thinking at the city regional level. These two city regions were thus selected

for detailed analysis and comparisons in Stage Two, in which one city region was identified as the context for the embedded case studies whereby the ideas of polycentricity were applied at each planning level.

4.4 Stage Two: Detailed analysis and comparisons of polycentric development practices in selected super/mega city regions

4.4.1 Methodology

The macro planning/policy analysis in Stage One led to two more detailed city regions chosen primarily for their continuities in polycentric development practices in the latest two rounds of master planning, at the city regional scale. Detailed analysis and comparisons were carried out between them, which were intended to fulfil the first part of Objective Three and part of Objective Four of this research. Consequently, the main research questions for Stage Two focused on the following:

1) How and why have the polycentric development strategies been applied, over time, in the strategic spatial planning of selected super/mega city regions and are there any differences in their polycentric development practices?

2) What are the challenges and difficulties in planning and delivering polycentric super/mega city regions?

This stage of analysis also provides the context for identifying as well as exploring the embedded case studies. It uncovers what happens at the city regional scale where polycentric development strategies are being delivered, as well as within which embedded Chinese edge cities are located. Because of the interrelationships between Stages Two and Three, the sources of evidence and data collection techniques chosen are the same, albeit applied at different scales. The approach is elaborated in Stage Three.

4.4.2 Identifying three Chinese edge cities as embedded case studies

Before identifying Chinese edge cities as case studies, the polycentric city region

needs to be selected first. This selection goes through the two steps discussed previously. The super/mega city regions which best illustrate polycentricity application are identified in Chapter five. Subsequently a super/mega city region which seeks to develop a real sense of polycentric spatial structure and balanced development has been identified as the polycentric context of embedded case studies from Chapter six. A real sense of polycentricity is observed through the functional interdependencies and spatial linkages between the core cities and sub-centres. The context of case studies having been identified, the selection of case studies within the city region now follows. The selection criteria are outlined below:

1. Types of Chinese edge cities;

2. Planning scales within the super/mega city region; and

3. Planning documents and interviews at city regional scale in the selected super/mega city region

First, three types of Chinese edge cities were identified based on literature in Chapter three, including integrated, organic and planned edge cities, and case studies were intended to be chosen to cover each type. Secondly, master planning scales are discussed in Chapter five, and case studies are also intended to be chosen to cover each planning scale. Thirdly, case studies are finally identified based on recent rounds of master plans of selected city regions and interviews with key actors from the city regional scale. Again, the focus is upon their interdependent functions and their horizontal linkages with the core city. Figure 4.2 illustrates the two phases in selecting the embedded case studies, identifying the context and identifying Chinese edge cities within the context.

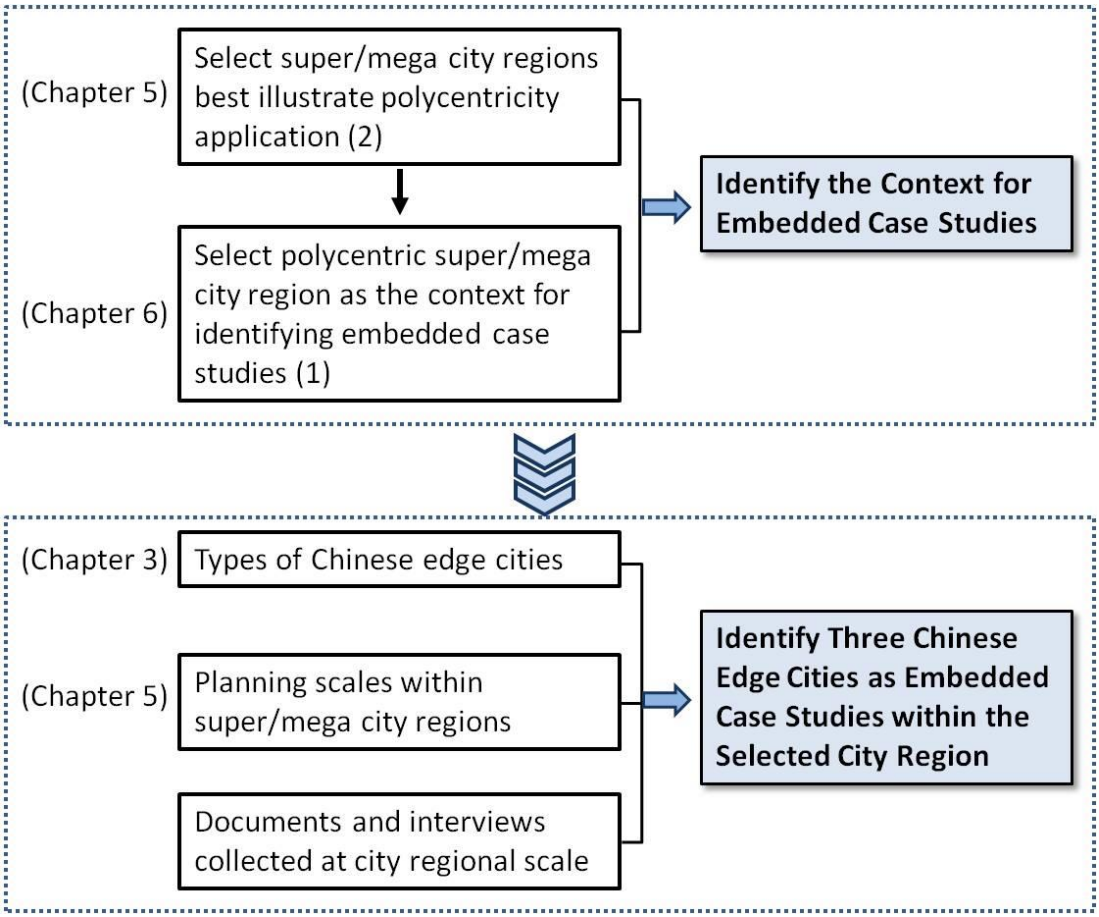


Figure 4. 2 Selection of embedded case studies

4.5 Stage Three: Design of case studies

Yin (2014, p.29) suggests that the research design for case study research consists of five especially important components:

1. A case study's questions;
2. its propositions, if any;
3. its unit(s) of analysis;
4. the logic linking the data to the propositions; and
5. the criteria for interpreting the findings.

The case studies of this research are intended to fulfil the second part of Objective Three and Objective Four. Correspondingly, the case study questions can be

summarised:

1) How and why are Chinese edge cities formed (or subject to failure) under the polycentric development strategies proposed at the city regional scale?

2) What are the challenges and difficulties of developing Chinese edge cities at the local scale within the context of polycentric development?

To answer the above two questions, this research adopts an embedded case study approach as the three selected case studies are embedded in the polycentric city regional context of a selected city region. Moreover, the case study research includes multiple-case studies (comprised of three case studies) as opposed to one single-case study. These two approaches have been distinguished in some fields, such as political science and public administration, and two different sets of rationales have been developed for doing a single-case study and multiple-case studies (or what has been called comparative case studies) (Agranoff and Radin, 1991; Dion, 1998; Eckstein, 2000). However, Yin considers that the single-case study and multiple-case studies are in reality 'two variants of case study designs' (2014, p.18), which are 'within the same methodological framework' (2014, p.56). This research follows Yin's ideas and considers that both of them are included under case study research. The rationale for adopting multiple-case studies derives directly from the researcher's 'understanding of literal and theoretical replications' (Yin, 2014, p.61). 'The simplest multiple-case design would be the selection of two or more cases that are believed to be literal replications… More complicated multiple-case designs would likely result from the number and types of theoretical replications you might want to cover' (Yin, 2014, p.62). Therefore, the rationale for multiple-case designs in this research results from the types of Chinese edge cities (identified in Chapter three) that are intended to be covered, so as to provide a broad picture of the formation of Chinese edge cities. In summary, therefore, this research adopts embedded, multiple-case designs (see Type 4 in Figure 4.3).

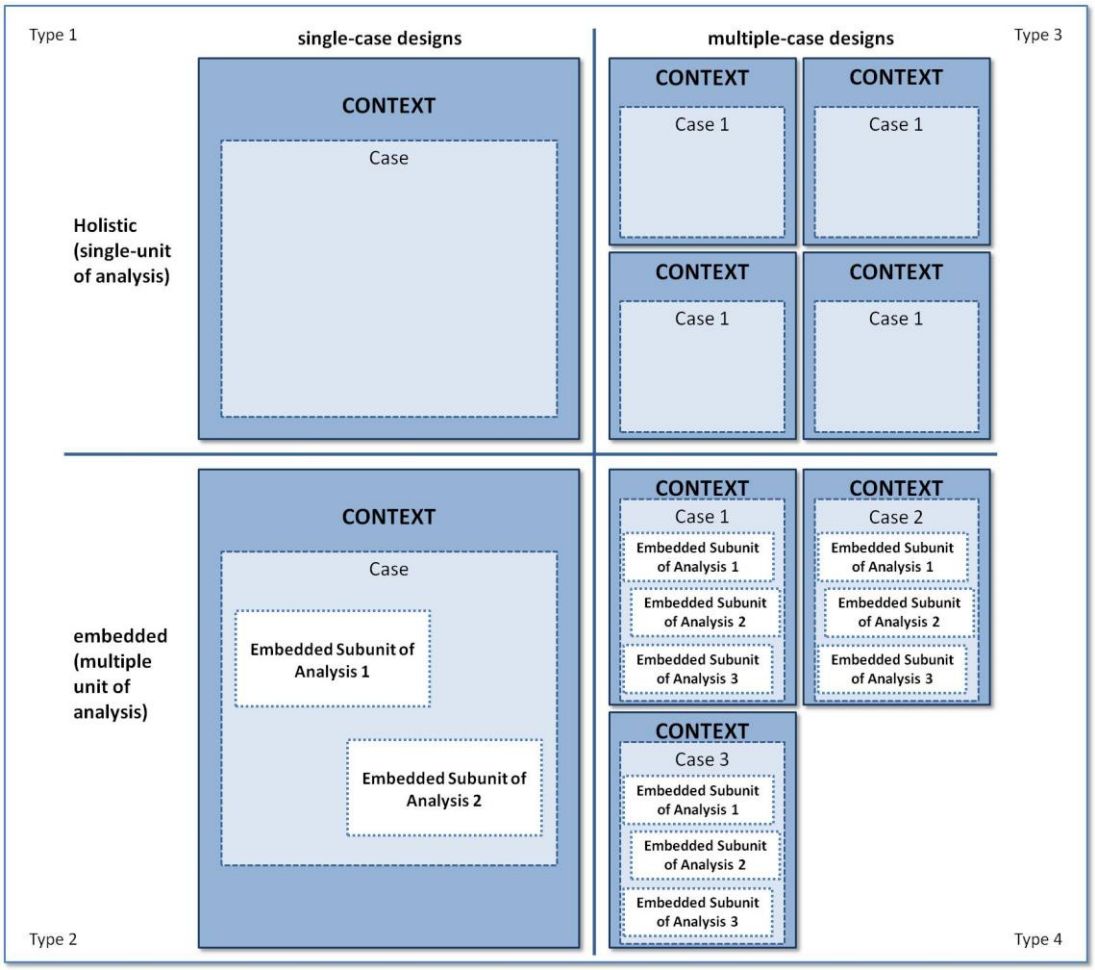


Figure 4. 3 Basic types of designs for case studies

Source: Yin (2014, p.50). Adapted by the author.

4.5.1 Unit(s) of analysis

The unit of analysis (or the 'case'), 'is related to the fundamental problem of defining the "case" to be studied' (Yin, 2014, p.31). In this research, the multiple-case studies involve units of analysis at two levels: first, three case studies of Chinese edge cities are the targets of this research, therefore, the main unit of analysis should be each case study (Chinese edge city); and secondly, a number of subunits of analysis is embedded in each case study (see Type 4 in Figure 4.3). The embedded subunits of analysis are the key issues in exploring case studies (Chinese edge cities), which have been discussed in Chapter three, including 1) spatial location and spatial linkages, 2) functions, and 3) governance. These subunits of analysis are repetitive

among the three case studies, allowing cross-case comparisons and conclusions to be generated.

4.5.2 Data collection techniques

This section presents the data collection techniques used for Stage Two (the context of case studies) and Stage Three (embedded case studies). Yin suggests that 'a good case study will want to rely on as many sources as possible' (Yin, 2014, p.105), and in fact, 'a major strength of case study data collection is the opportunity to use many different sources of evidence' (Yin, 2014, p.119). This data triangulation 'is about observing an object of study from different angles' (Grix, 2004, p.136). In using multiple sources of evidence, the most important advantage for the researcher is the development of convergence of evidence. In doing so, 'any case study finding or conclusion is likely to be more convincing and accurate… following a similar convergence' (Yin, 2014, p.120).

Considering both the strengths of case studies as well as using multiple sources of evidence, this research combines two sources of evidence – documentation and interviews – which are highly complementary. The rationale in choosing these two sources of evidence rests upon the main research aims stated earlier in this chapter, which are, to investigate how successful the application of polycentricity has been at the city regional scale in China, and to reveal the challenges and problems in spatial planning, particularly from the perspective of planning and development of Chinese edge cities. Therefore, relevant documentary information plays a most important role in doing this research, as the main research questions are most related to planning and policy application or delivery. Case studies in this research regarding the delivering of planning strategies and the making of Chinese edge cities are all about 'human affairs and actions', and 'well-informed interviewees can provide important insights into such affairs or actions' (Yin, 2014, p.113). Table 4.2 illustrates the strengths and weaknesses of the two sources of evidence used, which need to be considered when collecting data.

Table 4. 2 Documentation and interviews: Strengths and weaknesses

Sources of Evidence	Strengths	Weaknesses
Documentation	• Stable—can be reviewed repeatedly • Unobtrusive—not created as a result of the case study • Specific—can contain the exact names, references, and details of an event • Broad—can cover a long span of time, many events, and many settings	• Retrievability—can be difficult to find • Biased selectivity, if collection is incomplete • Reporting bias—reflects (unknown) bias of any given document's author • Access—may be deliberately withheld
Interviews	• Targeted—focuses directly on case study topic • Insightful—provides explanations as well as personal views (e.g. perceptions, attitudes, and meanings)	• Bias due to poorly articulated questions • Response bias • Inaccuracies due to poor recall • Reflexivity—interviewee gives what interviewer wants to hear

Sources: Yin (2014, p.106).

Documentary analysis

1) At city regional scale

Detailed analysis and comparisons of polycentric development practices in spatial planning in selected super/mega city regions were mainly based on relevant policy, planning reviews and analysis over time. The types of documents collected were thus focused on the master plans and strategic plans of selected city regions, government reports both at provincial level and municipal level, and reports or plans from relevant governmental departments, especially from economic sectors, urban-rural construction sectors, as well as online academic literature. Through analysing the following documents (see Table 4.3), the context, process, key participants involved in the plan-making, plan-adjustment or plan-implementation process; the detailed content and explanations of the polycentricity concept in plans/policies; and the major driving forces facilitating the above actions emerged and were identified.

Table 4. 3 List of relevant documentation in selected super/mega city regions

	Scales	Name of documentation	Source
Super/mega city regions	Provincial level	Provincial-level government reports (latest 10 years)	Official websites of the provincial-level people's governments
		Provincial-level economic and social development plans (latest 10 years)	Official websites of the provincial-level development and reform commission
	Municipal level	Municipal-level government reports (latest 10 years)	Official websites of the municipal-level people's governments
		Municipal-level economic and social development plans (latest 10 years)	Official websites of the municipal-level development and reform commission
		Municipal-level 11th and 12th five-year plans of economic and social development	Municipal-level development and reform commissions
		Municipal-level housing and urban-rural development reports/plans	Municipal-level departments of housing and urban-rural development
		City master plans (latest 3 to 5 rounds); strategic plans (latest 1 to 2 rounds)	Municipal planning bureaus or their official websites
	——	Academic literature	Obtained online

2) At local scale

The types of documents collected for the case studies were based on each embedded subunit of analysis within the first case study question. Three subunits of analysis can be summarised more specifically as: 1) spatial location and spatial linkages to core cities and their roles in the spatial structure evolution of city regions, 2) major functions and their connections with core cities, and 3) changes of governing bodies and the governance structure. Therefore, three main types of documents were collected as evidence for the subunits of analysis of case studies: 1) the master plans and strategic plans of selected Chinese edge cities, 2) economic and social development documentation and statistics, 3) local government reports and policies. In addition, academic literature exploring or discussing the above themes, local

yearbooks and newspaper articles were collected as complementary evidence to help bring in different ideas and historic events associated with the formation of Chinese edge cities. The range of sources sought is identified in Table 4.4. Documentary analysis was the initial stage in evaluating the formation of Chinese edge cities and interpreting the challenges in the delivery of polycentric development. Subsequent interviews provided a more in-depth mechanism to explore these themes and any associated delivery problems more thoroughly.

Table 4. 4 List of relevant documentation in selected case studies

	Name of documentation	Source
Case studies	Local government reports and policies	Official websites of the people's governments
	Local 11th and 12th five-year plans of economic and social development	Local development and reform bureaus or their official websites
	Local economic and social development statistics bulletins, statistical yearbooks	Local development and reform bureaus or their official websites
	Local master plans, strategic plans and development plans	Local urban planning bureaus
	Academic literature	Obtained online
	Local yearbooks	Local archives offices
	Local newspaper articles	Local chronicles offices

Semi-structured interviews

An interview is a type of qualitative method, in that its starting point is words, as opposed to numbers (David and Sutton, 2004). The forms of the interviews can be described based on the degree of structure involved. These can include structured interviews, focused or semi-structured interviews and unstructured interviews (Minichiello et al., 1990; Fontana and Frey, 1994). In structured interviews, 'all respondents receive the same questions in the same order, delivered in a standardised manner. Flexibility and variation are minimised, while standardisation is maximised' (K. Punch, 2014, p.146). The negative side of this research tool is that 'you may miss the opportunity to discovering important information, owing to the inflexible nature of this type of interview' (Grix, 2004, p.127). An unstructured interview, on the other

hand, ‘is the most flexible form of personal interviewing… The researcher does not employ a schedule to ask a pre-specified set of questions, nor are the questions asked in a specified order’.(Frankfort-Nachmias and Nachmias, 2008, p.215) However, Grix (2004, p.128) points out that ‘the answers and data gathered from such sessions are not comparable, as the content of each interview is likely to be very different’. This research used the semi-structured interview (or in-depth interview) format, which means that participants were asked prompt questions, while at the same time they were also encouraged to tell their own stories in the order they felt was appropriate, with minimal interruptions from the researcher. Compared to structured and unstructured interviews, the advantage of semi-structured interviews is that ‘it allows a certain degree of flexibility and allows for the pursuit of unexpected lines of enquiry during the interview’ (Grix, 2004, p.127). Meanwhile, Grix (2004, p.128) also indicates that the results and findings of semi-structured interviews ‘can still be compared, contrasted and even converted into statistics’. The prompt questions asked in the interviews for this research reflect how the individuals and representatives who have been involved in the planning schemes, who are professional in urban planning or economic development, who have witnessed the historic growth of local areas explain from their perspectives how polycentric development practices in the city regions an upper level strategy and policy have developed. In this research, interviews were conducted at two scales:

1. At the city regional scale in selected super/mega city regions. The purpose of these interviews was to better understand the polycentric development practices and challenges faced by the key actors at the city regional scale when planning and delivering polycentricity; and
2. Local scale. Here the purpose was to better understand the three subunits of analysis and any challenges faced by the key actors at the local scale when putting the polycentric development strategies into actual planning practice.

There can be a number of potential problems in the use of interviews, in terms of identifying and selecting appropriate research participants, preparing and designing

interview questions, as well as arranging interviews.

1) Research Participants

Interviews were conducted with people from different organisations who were responsible for, or involved in, the planning and policy-making processes of polycentric development practices, in the planning/implementation/regulation associated with the formation and growth of Chinese edge cities. To be more specific, research participants included governmental officials from both city regional and local agencies; public planners and consultants who had participated in the city regional and local planning schemes; academics with expertise on urban planning and economic development; and state-owned enterprises, large-scale private enterprises, major development companies and citizens who had witnessed the historic growth of Chinese edge cities. This research identified about five to ten participants per city regional scale analysis focusing on the context of polycentric development, and about 10-15 participants per local case study. Table 4.5 sets out the list of anticipated stakeholders from different governmental departments or public sectors or others both at the city regional and local scales. A full list of interviewees is attached in Appendix II.

Table 4. 5 List of anticipated research participants in selected super/mega city regions and case studies

Scales	Governmental departments/public sectors/others	Interviewees
Super/mega city regions	Municipal-level development and reform commission	Governmental officials
	Municipal-level planning bureau	Planners
	Municipal-level Urban Planning and Design Research Institute or Co., LTD	Planners
	Universities	Academics
Chinese edge cities – embedded case studies	Local development and reform bureau	Governmental officials
	Local urban planning bureau	Planners
	Local housing and construction bureau	Governmental officials
	Sub-district office/Local management committee	Managers and officers
	Local large-scale enterprises	Entrepreneurs
	Local community	Community directors

2) Addressed Issues

The questions used during semi-structured interviews are more flexible, and the researcher is likely to engage more with the participants. The interviews 'resemble guided conversations rather than structured queries' (Yin, 2014, p.110). When preparing the interview questions, at least three aspects need to be borne in mind: 1) the way questions are delivered, 2) the wording that is used, and 3) the sequence and types of questions that can be asked (K. Punch, 2014). To address the first issue, specific techniques can be used in the interviews, such as reading the questions slowly to allow the participants time to understand the questions and formulate answers; asking the questions in the same order as in the prepared question list; and repeating and clarifying misunderstood or misinterpreted questions (Frankfort-Nachmias and Nachmias, 2008). In terms of the wording used in interviews, Yin (2014, p.110) suggests that during case study interviews, the researcher is required not only to satisfy the needs of the line of inquiry, but to put forth '"friendly" and "non-threatening" questions' at the same time. For the latter topic, Patton (2002) classifies interview questions into several categories, including experience/behaviour, opinion/belief, feeling, knowledge, sensory and demographic/background. In this research, interview questions were designed respectively for participants from the city regional and local scales.

At the city regional scale, questions were designed around the research questions asked at this stage, mainly focusing on the planning and application of polycentric spatial development strategies, and the challenges encountered in this process. The interview structure was organised into four parts, with one or several questions being included in each part. Part One focused on the participants' general knowledge about the selected city region, helping them to recall their understanding of the development of the city region as a whole. Parts Two and Three represented the main body of questions, focusing on the application of polycentricity in master planning and strategic planning, and any implementation and governance issues generated during the above processes. Questions were organised around the three key themes of

the polycentricity concept in spatial development and spatial planning practices identified in Chapter two, including 1) the concept of polycentricity (e.g. *"How and why the concept of polycentricity was introduced into China and applied in spatial planning?"*); 2) the scales of application (e.g. *"Which aspects or items in master planning have applied polycentricity and why?"*); and 3) governance under a polycentric framework (e.g. *"Which public sectors or stakeholders have the key impacts in implementation and governance issues?"* and *"Is the task of interpreting and applying polycentricity best left to the local scale or to the city regional scale?"*). In addition, questions also covered the challenges in applying polycentricity, such as *"What are the main problems and challenges encountered in the application of polycentricity?"*, *"Are there any conflicts in coordination among different public sectors or stakeholders?"* and *"Are there any conflicts in coordination that cross administrative boundaries?"*. Finally, Part Four included some other points which interviewees wished to raise in relation to the above issues. A full list of interview questions at the city regional scale is attached in Appendix I.

At the local scale, questions were also designed around the research questions asked at this stage, mainly focusing on the formation of Chinese edge cities within a polycentric spatial structure, and any challenge encountered in the making or remaking of Chinese edge cities. The range of questions also consisted of four parts, with one or several questions being included in each part. Part One focused on the participants' general knowledge about the selected case studies, helping them to recall their understanding of the growth of Chinese edge cities as a whole. Parts Two and Three were the main body of questions, which were designed in relation to the delivery of polycentric development strategies to local planning practices, and the implementation and governance issues generated during the above processes. Questions for example included *"How did polycentric spatial development contribute or influence the local plan/policy-making process in terms of approaches used and policy choices made?"*, *"Which public sectors or stakeholders have the key impacts in implementation and governance issues?"*, and *"Are the tasks of*

interpreting and applying polycentricity, and making and governing Chinese edge cities best left to the local scale or to the city regional scale?". In addition, questions were also related to the challenges/difficulties associated with the effective delivery of polycentricity at the local scale, e.g. *"What are the main issues and challenges in the formation and governance of Chinese edge cities?"*, *"Are there any vertical conflicts in coordination among different public sectors or stakeholders between the city regional scale and local scale?"*, and *"Are there any horizontal conflicts in coordination among different public sectors or stakeholders at the local scale?"*. The last part, Part Four, was related to other points that interviewees wished to raise. A full list of interview questions at the local scale is included in Appendix I.

3) Interview arrangements

This methodology also considered issues of gaining access to the anticipated participants and scheduling appropriate time and places to conduct interviews. Interview participants were identified through a process of "snowballing", which means obtaining information on further potential participants from interviewees. In the initial approach to interviewees, a list of research questions, copies of the Participant Information Sheet and Participant Consent Form (see 4.6 Ethical considerations) were sent to respondents. Interviews were then scheduled with interviewees in advance either by email or by phone, in order to leave time for them to prepare or perhaps gather any relevant materials for the raised issues. All of the interviews took place in a mutually agreed public place, where participants would feel comfortable and relaxed. As all of the interviews were conducted in China with Chinese interviewees, the records of the interviews were first written and analysed in Chinese, and subsequently direct quotes and key findings were translated into English by the researcher in the preparation of this thesis.

4) Interviews conducted during fieldwork in China

At the city regional scale, a total of 14 semi-structured interviews were conducted in selected super/mega city regions, with seven interviews for each of the city region

(see Appendix I). At the local scale, a total of 36 semi-structured interviews were conducted for the two case studies, with 18 interviews respectively (see Appendix I). With respect to the third case study, it had finished its planning stage and just started construction; therefore, it serves as a minor case for this research and only a plan/policy evaluation was carried out.

4.5.3 Data analysis and interpretation

Miles, Huberman and Saldana (2013) suggest three main components to data analysis, including data reduction, data display, and drawing and verifying conclusions, together making an interactive model by which to analyse data (see Figure 4.4). Data reduction and data display are continually used at all stages throughout the analysis. In the early stages, data reduction occurs through editing, segmenting and summarising the data. In the middle stages, data reduction happens through coding and finding themes, clusters and patterns. In the later stages, it happens through conceptualising and explaining (Miles et al., 2013). Data display, on the other hand, enables data to be organised and summarised. Graphs, charts, networks, and diagrams are all different ways of displaying data (Miles et al., 2013). Finally, data reduction and data display both aim to assist in drawing and verifying conclusions. Conclusions are not finalised until all the data are included and analysed. This stage of drawing and verifying conclusions 'is the most difficult to describe, because it typically involves a number of different analytical processes, which may be used simultaneously rather than sequentially, and which cut across and combine with each other' (K. Punch, 2014, p.173). In drawing and verifying conclusions, Frankfort-Nachmias and Nachmias (2008, p.267) suggest one important step: looking for negative cases or instances that refute the hypotheses, because both positive and negative cases need to be compared 'to determine whether the hypothesis can be modified to better fit all of the data or if the hypothesis must be rejected entirely'.

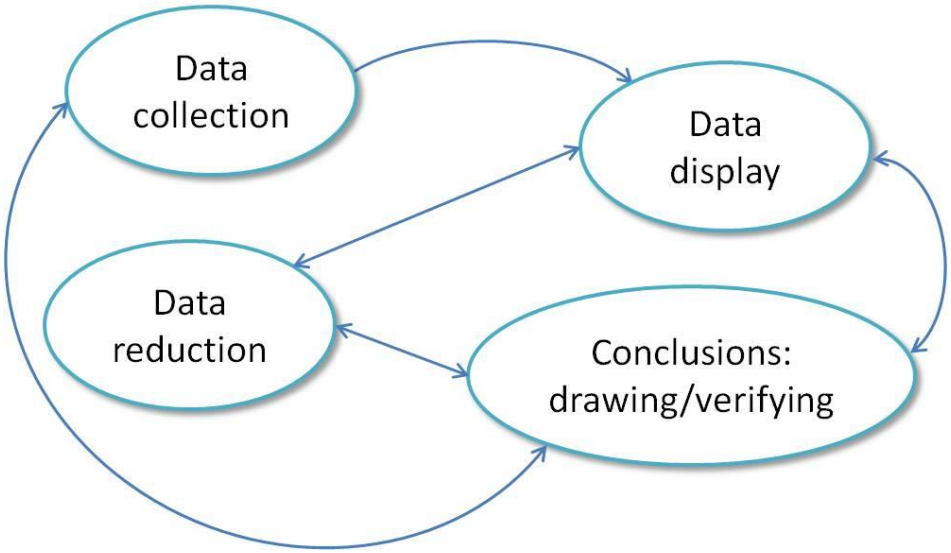


Figure 4. 4 Components of data analysis: Interactive model

Source: Miles and Huberman (1994, p.12).

This research follows the data analysis approach by Miles, Huberman and Saldana, going through data reduction, data display, and drawing and verifying conclusions, an iterative approach. Therefore, in the process of analysing data, there is a constant need to revisit the original data to look for new clues, check assumptions and identify underlying factors, helping to refine the analysis produced (Spencer, Ritchie and O'Connor, 2003). In this research, the data obtained from documents and interviews were put into several categories to manage and analyse. One important issue for interview data was that the background and the role of each particular participant should be borne in mind when considering their responses and exact words in relation to certain issues. Moreover, although interviews are an essential technique in doing case studies, they should 'always be considered *verbal reports* only. As such, even in reporting about such events or explaining how they occurred, the interviewees' responses are subject to the common problems of bias, poor recall, and poor or inaccurate articulation' (Yin, 2014, p.113). Therefore, in this research, interview data were always be complemented by documentary evidence and information.

4.6 Ethical considerations

Maurice Punch (1994) summarises the main ethical issues in social science research, including harm, consent, deception, privacy and confidentiality of data. Hammersley and Traianou (2012) suggest similar concerns regarding ethical issues: risk of harm; autonomy and informed consent; privacy, confidentiality and anonymity. In this research, given that semi-structured interviews require primary information to be given by the research participants, it was appropriate to address potential ethical issues beforehand. Informed consent should be obtained from participants and the research findings should be reported before publication in an ethically sound manner.

Before approaching the research participants, an application for the approval of a project involving human participants, human data, or human material was sought, and the application documents were submitted and approved by the committee on research ethics in the University of Liverpool, including a Participant Information Sheet, a Participant Consent Form, and a University of Liverpool Research Ethics Application Form. The design of this research was clearly explained and the committee was assured that the research project would not include any vulnerable groups be they adults or children. All participation was voluntary and respondents were selected only provided they had capacity to give written informed consent.

Informed consent requires full disclosure of the nature of the research project, as well as the intended uses of the interview material (Miles and Huberman, 1984; David and Sutton, 2004). This work needed to be done at the very early stages prior to the interviews taking place. When approaching research participants, the investigator provided the Participant Information Sheet and Participant Consent Form to participants, and explained relevant issues about the interviews. This research was conducted in China with Chinese participants, therefore translated copies of the Participant Information Sheet and Participant Consent Form in Chinese were provided, together with the original documents. The following information was made clear to the participants, including what the research is about and its potential

benefits; the background of the researcher and her institution and affiliation; how participants had been selected for interview, and what they were being asked to do. Participants were informed concerning confidentiality and their right to withdraw from the interview at any time. They were reassured that their responses would remain confidential. It was also explained how the data would be stored, used and how it may be used in publications. Participants were given the above information and signed the Participant Consent Form to demonstrate that they were familiar with the interview process, agreed to take part in this research, and felt free to withdraw their agreement at any time during the research. All of the responses from participants were recorded by handwriting, and any audio recording of interviews required further consent from participants before the start of the interviews. The right to *privacy* means that participants have the right 'to be free from any research intervention that they may construe as unwelcome and intrusive, and to withhold any information that they deem personal or sensitive' (K. Punch, 2014, p.47), which was explained to them.

After the interviews, all storage, access and usage of data complied with the University of Liverpool's strict Data Protection Policy. Data collected through interviews have been stored in an anonymous format on the University's secure network up to the period of publication. Personal details (name, address, telephone number, email address) were stored securely for the period of the research to allow correspondence with research participants. Only the student researcher of this thesis has direct access to the interview data; however, the data may also be viewed by appropriate supervisors at the University of Liverpool during the research period only. Participants are free to ask for access to the information they provided at any time and can request to withdraw that information if they wish at any time before the publication of the information. In any publication results from this research, this thesis or academic papers, participants will not be identified or identifiable. To ensure anonymity in this thesis and subsequent publications, the names or other identities of the participants were linked to a code number or label, for example, P1

for Planner 1 and A1 for Academic 1. In summary, this *confidentiality* is utilised 'on the basis of researchers' assurance that the connection between the individual respondent and the information disclosed will not be made known to third parties by the researcher, nor will it be able to be inferred from the research report' (K. Punch, 2014, p.47).

In addition to ethical considerations relating to the interviews and participants in this research, there are also ethical considerations regarding the sponsorship of this thesis. This research is sponsored by the China Scholarship Council (CSC) and the University of Liverpool. In all publications that result from this research, the sponsors will be clearly stated and acknowledged.

4.7 Summary

The above has set out the research design and methodology for the empirical part of this thesis. An embedded case study approach was adopted in consideration of the research topic, overall aim and objectives. The methodology for Stage One of an overall survey and Stage Two of the detailed comparisons was established and justified, through which embedded case studies were identified. The design of case studies were elaborated in Stage Three, with the ethical issues considered in this research explained. Data collection techniques in this research, including documentary analysis and semi-structured interviews, were explicitly described.

Based on the information collected from a series of semi-structured interviews and relevant documents, the empirical part of this thesis (Chapters five to ten) analyses case study evidence mainly from two perspectives: the application of polycentricity at the city regional scale and the formation of Chinese edge cities under polycentric delivery at the local scale.

CHAPTER FIVE

An Overall Survey of Polycentricity Application in Master Planning in China

5.1 Introduction

After outlining the whole research design and methodology for this research in Chapter four, Chapter five seeks to evaluate critically the application of polycentric policy development practices in China through the lens of master planning. Specifically, this chapter identifies the main differences in the application of polycentricity between China and the West, and explores the major emerging thematic strands of polycentric development practices, as illustrated through an evaluation of master planning in eight super/mega city regions across China. In particular, the chapter highlights the divergent interpretations of polycentricity in master plan-making practice and shows how plans have been adjusted to help deliver the idea of polycentric development, as well as identifies any challenges arising from this application in practice.

The chapter starts by providing an overview of master planning in China and the origins of polycentric development practices, before evaluating the way the concept has been applied in selected super/mega city regions at a variety of scales, before focusing particularly on Guangzhou and Nanjing. The analysis is based on a temporal review of formal planning documents. This then highlights similarities and differences in the way that polycentricity has been interpreted and applied between the West and China.

5.2 A conceptual framework for master planning and origins of polycentric development practices

5.2.1 Urban and rural planning system and planning levels in city master plans of China

The current urban and rural planning system in China was introduced in 2008 through the *Urban and Rural Planning Act* (2008). This replaced the former *Urban Planning Act* (1989). Before 2008, urban planning frameworks were focused exclusively on the development trajectories of the cities themselves. In theory, the 2008 system created a more integrated and holistic planning approach, exploring not just urban form but also the connectivities, both real and potential, between settlements to create a more integrated network covering rural and urban areas (see Figure 5.1).

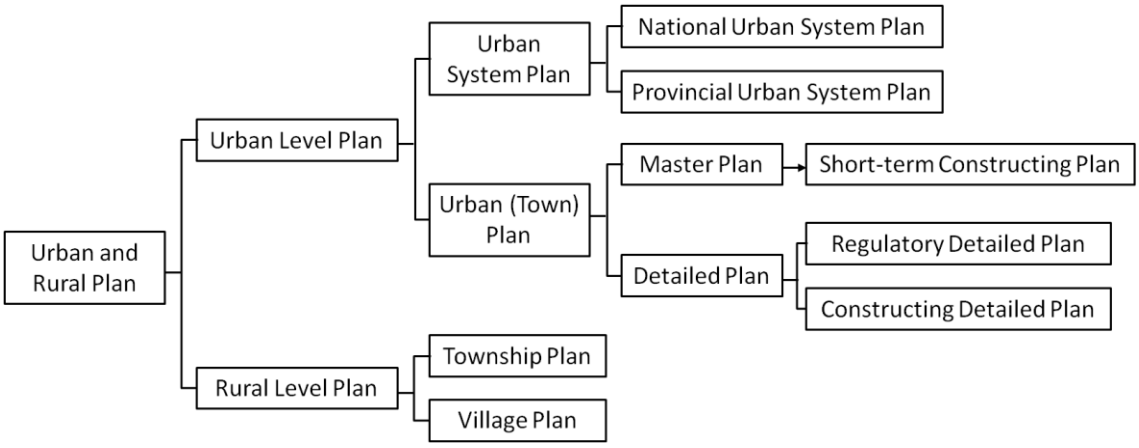


Figure 5. 1 Urban and rural planning system currently practised in China

Sources: Urban and Rural Planning Act (2008); Qian and Wong (2012).

Based on the urban and rural planning system outlined in Figure 5.1, a city region's urban (town) system planning and a county's urban (town) system planning were not legally binding but designed to create a framework to guide urban master plans and rural level plans. Hence, under the new urban and rural planning system, urban master planning was extended from the central city to cover the entire city's

administrative area (H. Qian and Wong, 2012), with urban master planning being understood as an integrative planning tool considering both rural and urban needs together. Therefore, in most cases in China, a city master plan (*chengshi zongti guihua*) generally includes two (but possibly three) levels of planning. The term city region (*shi yu*) is used here for the highest level of planning and focuses on the concept of functional regions, often comprising a core or main city and its surrounding districts, counties or county-level cities. The spatial scale for city regional level urban (town) system planning is the whole administrative area, which includes all the urban districts, administrative counties and county-level cities. In some cases, middle-level planning, sometimes called metropolitan planning, can be included in the master planning activities of some cities. This usually focuses upon a metropolitan area (*shi qu/dushiqu*) and thus planning policy covers the central city, its urban-rural fringe and some rural areas. Nevertheless, the most important plan is focused on the central city (*zhongxinchengqu*). Normally it covers the continuous built-up area of the central city and regulates its major future development (see Table 5.1).

Table 5. 1 Spatial scope of different levels of city master plans in China

Planning level	Spatial scope
City region (*shi yu*)	Entire city administrative area
Metropolitan area (*shi qu/dushiqu*)	Central city, its urban-rural fringe and some rural areas
Central city (*zhongxinchengqu*)	The continuous built-up area of the central city

5.2.2 Tracing the origins of polycentricity practices in China

After the founding of modern China, in 1949, urban construction was mostly focused on the central part of a city (Shi, 1999). This resulted in an increasingly monocentric urban structure characterised by a concentration of city functions and high population densities in the core cities. Further expansion of these urban agglomerations quickly meant that the drawbacks of monocentric model became increasingly evident. In an attempt to overcome the diseconomies of scale associated with such development

trends, Shanghai and Beijing (in particular) drew inspiration from the development experience of large Western cities. A number of new development zones, high-tech industrial parks, township industrial parks and various other forms of development were rapidly promoted in suburban areas, with the expressed purpose of decanting the ever-expanding population and industries from central areas. For example, from the beginning of the 1950s, Shanghai established six suburban industrial areas, including Wusong, Wujiaochang, Yangpu, Caohejing, Changqiao and Gaoqiao, and seven outer suburban satellite towns, Jiading, Anting, Songjiang, Minhang, Wujing, Jinshanwei and Baoshan. Beijing followed suit, establishing satellite towns such as Yanshan, Tongzhou, Huangcun and Changping (Shi, 1999).

The early creation of these industrial parks and satellite towns certainly played a role in relocating expanding industries and population from the central cities. However, since they were largely single-function industrial areas or suburban residential areas, the development of much of the necessary key infrastructure and public services failed to keep pace with the speed of development. This often made these satellite places extremely unattractive to new residents. Furthermore, the early successes in terms of growth rates were dependent on foreign investments which, combined with a slowing down in economic growth and acute resource bottlenecks has, today, exacerbated those problems outline above, particularly in Chinese development zones. Hence the development of single-function industrial areas or residential areas is recognised as being challenging and there are urgent calls for planned interventions to ensure restructuring and strategic adjustments to these places (X. Yuan and Wang, 2010; Che, 2012).

The *Shanghai City Master Plan (1999-2020)* covering the functional region, for example, proposed an urban spatial structure of ‘multi-axes, multi-levels, multi-cores’, which would be made up of the central city, new towns, central towns and market towns. ‘Multi-cores’ at different spatial scales can be regarded as the first representation of a polycentric spatial structure and, indeed, the first application of polycentricity to master planning in China. Following Shanghai, other large cities

and metropolitan areas also proposed strategies and policies designed to build a more polycentric spatial structure. The *Hangzhou City Master Plan (2001-2020)* put forward an open spatial structure of 'one core/two circles, three axes/two corridors, and one ring/multi-centres'. The *Beijing City Master Plan (2004-2020)* also argued for a more integrated spatial structure comprising 'two axes - two belts - multi-centres'. A regional spatial layout of 'an axis - two belts - three zones' was proposed in the *Tianjin City Master Plan (2005-2020)* and Guangzhou, in its *City Master Plan* for 2001 to 2010, presented the idea of transforming its urban spatial structure from a mono-centric to a polycentric form along the Pearl River. In consideration of the increasing adoption of polycentricity concepts in master planning, the next section provides a broad overview of polycentricity application in selected super/mega city regions, before moving on to a more detailed analysis of specific examples.

5.3 An overview of polycentricity application in master planning

The defining characteristics of polycentricity have been identified in Chapter two; this chapter therefore continues an evaluation of polycentric application through the lens of master planning in China. It particularly focuses on the way that policy-makers, through the development of selected master plans, have applied polycentricity ideas and principles. At the city regional level, polycentricity application can be regarded as a form that promotes an interconnected multi-nodal structure, with functionally interdependent centres balanced across city regions. At the metropolitan level, polycentricity application often refers to a polycentric or multi-centred spatial structure. At the central city level, sub-centres within an urban development framework – often with horizontal connections – become a polycentric node. Based on the two major concepts of polycentricity (functional balance and spatial integration) and the defining criteria for each level of application, the chapter evaluates the application of polycentricity in selected super/mega city regions to see

how exactly the concept was applied in plan-making at each spatial scale and whether it complies with the basic nature of polycentricity in practice.

5.3.1 Selection of Chinese super/mega city regions in terms of polycentricity application

Reflecting the enormous changes that have taken place in the scale and rate of urbanisation in China since 1990, on 20 November 2014, the State Council of China issued a new *Notification on the Adjustment of City Size Classifications Criteria*. This replaced what had been a fourfold classification, which had been used since the *Urban Planning Act* (1989). Using the resident population in urban districts as the statistical standard, it classified all cities into five groups:

- a small city has a resident population in urban districts of under 0.5 million;
- a medium-sized city has a resident population in urban districts of between 0.5 million and 1 million;
- a large city has a resident population in urban districts of between 1 million and 5 million;
- a mega city has a resident population in urban districts of between 5 million and 10 million; and
- a super city has a resident population in urban districts of over 10 million.

Based on this classification, and the sixth national census which took place in 2010, there are sixteen super/mega cities on the Chinese mainland. The population data from the National Economic and Social Development Statistics Bulletins and Statistical Yearbooks of these sixteen cities show that seven of them are super cities and nine are mega cities, with Shanghai, Beijing, Chongqing and Tianjin having populations exceeding 15 million (see Table 5.2). It is these super and mega cities

which are the focus of the discussion in this chapter.

Table 5. 2 The sixteen super/mega cities and their resident population by the end of 2015

	Super/Mega cities	Province	Resident population in urban districts (10,000)
1	Shanghai	Shanghai	2415.27
2	Beijing	Beijing	2170.50
3	Chongqing	Chongqing	1838.41
4	Tianjin	Tianjin	1546.95
5	Guangzhou	Guangdong	1350.11
6	Shenzhen	Guangdong	1137.89
7	Wuhan	Hubei	1060.77
8	Chengdu	Sichuan	829.10
9	Dongguan	Guangdong	825.41
10	Nanjing	Jiangsu	823.59
11	Foshan	Guangdong	743.06
12	Hangzhou	Zhejiang	679.06
13	Xi'an	Shanxi	635.68
14	Ha'erbin	Heilongjiang	548.70
15	Shantou	Guangdong	547.64
16	Shenyang	Liaoning	529.90

Sources: 2016 Statistical Yearbooks of Shanghai, Chongqing, Guangzhou, Xi'an and Shantou, Statistical Bureaus of Shanghai, Chongqing, Guangzhou, Xi'an and Shantou; 2015 National Economic and Social Development Statistics Bulletins of Beijing, Tianjin, Shenzhen, Wuhan, Nanjing, Chengdu (here use registered population), Dongguan, Foshan, Hangzhou, Harbin and Shenyang, Statistical Bureaus of Beijing, Tianjin, Shenzhen, Wuhan, Nanjing, Chengdu, Dongguan, Foshan, Hangzhou, Harbin and Shenyang.

For over thirty years Chinese municipal governments have been expected to make legally binding spatial plans, city master plans (*chengshi zongti guihua*), to provide a strategic overview of their urban development framework (T. Zhang, 2000). By focusing on these super/mega city regions, all of the master plans that have been

prepared since 1995 have been examined to see whether polycentricity has been invoked to describe both the existing, and future, urban structure. This initial evaluation is intended to act as a basic overview before exploring more specific examples in a little more detail. By 2010, all sixteen super/mega cities had prepared a *shi yu* master plan and, in at least half the cities, the original master plan had been replaced by a more recent and updated version (see Table 5.3).

When determining whether the idea of polycentricity was being invoked, various terms were looked for as an indicator. These included not only the exact term polycentricity (*duozhongxin*) but also different variations of polycentricity terminology, including multi-cores (*duohe*), multi-centres (*duoxin*), multi-clusters (*duozutuan*), clustered spatial layout (*zutuanshi*), multi-nodes (*duodian*), and so on. The above are all variations of an application of the polycentricity concept in the Chinese context, reflecting different stages of polycentric development practices in China's master plans. Although the terms have been applied, at this stage it remains uncertain as to how they have been elaborated in master planning at different scales.

In terms of the application of polycentricity in master plans, four broad types of practices emerged:

1. those city regions that had applied polycentric principles to both rounds of master plans;

2. those city regions that had applied polycentric principles in their latest iteration of master plans, and had been adopted before 2005;

3. those city regions that applied polycentric principles in their latest round of master plans, but were adopted after 2005; and

4. those city regions which had never applied polycentricity to any of their master plans.

The focus of the rest of this chapter is to explore in more detail how and why such a categorisation was evident, based on a more detailed evaluation of a smaller number of case study examples of policy in practice. It is not the purpose to evaluate the effectiveness of the policy, but rather to understand the ways in which polycentric ideas were being applied to plan-making processes. Therefore, super/mega cities which fall into the first (Chongqing, Guangzhou, Wuhan and Nanjing) and second type (Shanghai, Beijing, Tianjin and Hangzhou) become the focus of the remainder of this chapter (see Figure 5.2).

Table 5. 3 Application of polycentricity in the City Master Plans of sixteen super/mega city regions

	Super/Mega cities	Belonging provinces	Planning period of earlier Master Plans (after 1995)	Planning period of current Master Plans
1	**Shanghai**	**Shanghai**	——	**1999-2020 (applied)**
2	**Beijing**	**Beijing**	——	**2004-2020 (applied)**
3	**Chongqing**	**Chongqing**	**1996-2020 (applied)**	**2007-2020 (applied)**
4	**Tianjin**	**Tianjin**	——	**2005-2020 (applied)**
5	**Guangzhou**	**Guangdong**	**2001-2010 (applied)**	**2011-2020 (applied)**
6	Shenzhen	Guangdong	1996-2010	2010-2020 (applied)
7	**Wuhan**	**Hubei**	**1996-2020 (applied)**	**2010-2020 (applied)**
8	Chengdu	Sichuan	2004-2020	2011-2020 (applied)
9	Dongguan	Guangdong	1996-2010	2000-2015
10	**Nanjing**	**Jiangsu**	**2001-2010 (applied)**	**2011-2020 (applied)**
11	Foshan	Guangdong	——	2012-2020 (applied)
12	**Hangzhou**	**Zhejiang**	——	**2001-2020 (applied)**
13	Xi'an	Shanxi	1995-2010	2008-2020 (applied)
14	Ha'erbin	Heilongjiang	1996-2010	2011-2020
15	Shantou	Guangdong	——	2002-2020
16	Shenyang	Liaoning	1996-2010	2011-2020 (applied)

Sources: The City Master Plans of sixteen super/mega city regions, collected from Urban Planning Bureaus or their official websites. Super/mega cities which have applied polycentric ideas in their current or both earlier and current master plans are highlighted in bold in the table.

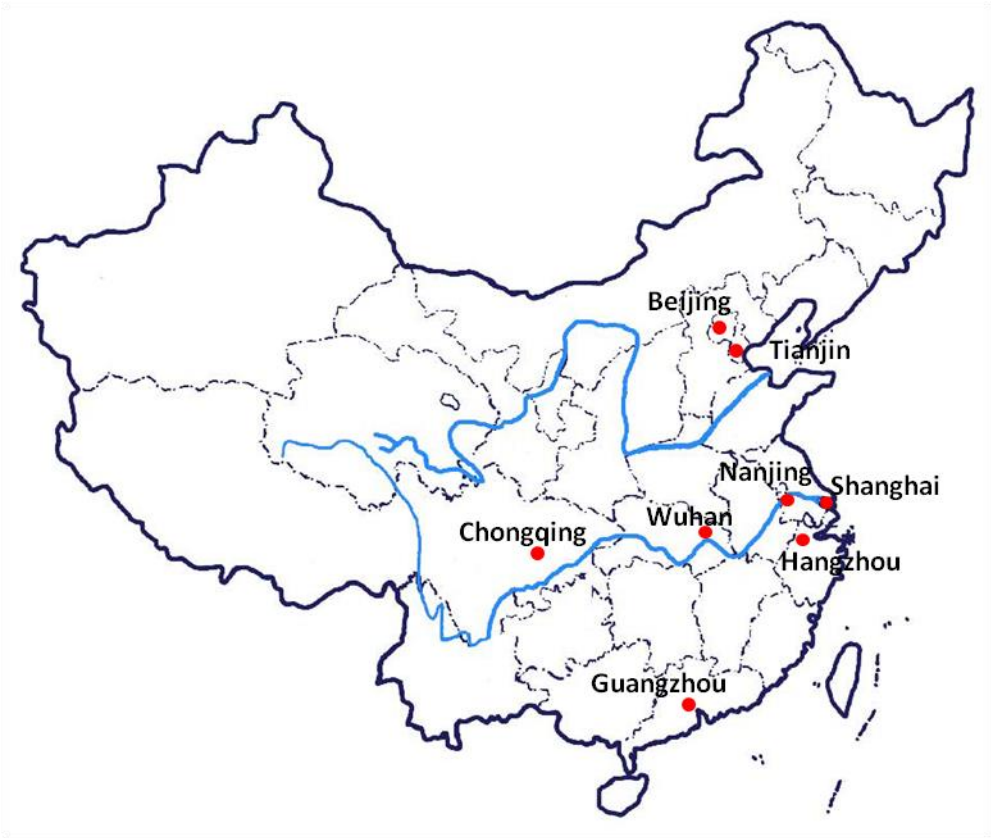


Figure 5. 2 Locations of eight selected super/mega cities in China

Each of these super/mega city regions is enormous (see Table 5.4). All have very big populations ranging from 24 million in Shanghai to 6.7 million in Hangzhou. The areas that these super regions cover are vast and incorporate at least eleven lower tier administrative districts or counties.

Table 5. 4 Basic information for eight selected super/mega city regions

Super/mega city regions	Region type	Resident population in urban districts (10,000) (2015)	Overall area (km²)	GDP (2015) (billion yuan)	Administrative divisions
Shanghai	Municipalities	2,415.27	6,219	2,496.50	16 districts
Beijing	Municipalities	2,170.50	16,411	2,296.86	16 districts
Chongqing	Municipalities	1,838.41	82,400	1,571.97	26 districts, 12 counties
Tianjin	Municipalities	1,546.95	11,920	1,653.82	16 districts
Guangzhou	Provincial capital	1,350.11	7,434	1,810.04	11 districts
Wuhan	Provincial capital	1,060.77	8,494	1,090.56	13 districts
Nanjing	Provincial capital	823.59	6,582	972.08	11 districts
Hangzhou	Provincial capital	679.06	16,596	1,005.36	9 districts, 2 county-level cities, 2 counties

Sources: 2015 National Economic and Social Development Statistics Bulletins of Shanghai, Beijing, Chongqing, Tianjin, Guangzhou, Wuhan, Nanjing and Hangzhou, Statistical Bureaus of Shanghai, Beijing, Chongqing, Tianjin, Guangzhou, Wuhan, Nanjing and Hangzhou.

5.3.2 Spatial scales of polycentricity application in city master plans

In the range of master planning activities within these super/mega city regions, polycentric development strategies have been applied at all three levels. Table 5.5 illustrates the different levels at which polycentric development strategies have been applied in the various rounds of master planning activities in the eight super/mega city regions.

Table 5. 5 Different levels of polycentricity application in earlier and latest rounds of the City Master Plans of eight super/mega city regions

Super/mega city regions		Application levels		
		City region (*shi yu*)	Metropolitan area (*shi qu*)	Central city (*zhongxinchengqu*)
Shanghai (1999-2020)		√		√
Beijing (2004-2020)		√		
Chongqing	1996-2020		√	
	2007-2020		√	
Guangzhou	2001-2010	√	√	√
	2011-2020	√		√
Tianjin (2005-2020)		√		
Wuhan	1996-2020			√
	2010-2020		√	
Nanjing	2001-2010	√	√	√
	2011-2020	√	√	√
Hangzhou (2001-2020)		√	√	√

Sources: The City Master Plans of eight super/mega city regions, collected from Urban Planning Bureaus or their official websites.

It can be seen from Table 5.5 that there are some differences in terms of the scale at which polycentric ideas are being applied within these super/mega city regions. In some cases, namely Guangzhou, Nanjing and Hangzhou, it has been applied at all three spatial scales. Only in Beijing and Tianjin has it been applied at one spatial scale, and then only at the city regional scale. From a temporal perspective, the picture, in terms of whether polycentricity is continuously a prominent policy narrative is a little mixed, but only in Wuhan has the policy principle applied from the central city scale to the intermediate or metropolitan scale, and in Guangzhou its metropolitan area has the same scope as its entire city region. The next sections look at the way that polycentricity as an idea has been articulated at the three spatial scales or levels outlined above.

5.3.3 At the city regional scale

The evaluation in Table 5.6 highlights how polycentricity has been applied at a city regional level in the latest round of master plans in Shanghai, Beijing, Tianjin and Hangzhou, and both rounds of master plans for Guangzhou and Nanjing, with the broad approaches being similar. A more detailed analysis of each of the master plans shows that the application of polycentricity is based on three distinct but interconnected aspects: the spatial structure, settlement system and settlements exhibiting an internal polycentric structure. Details of these characteristics are illustrated in Table 5.6.

The application at this level, in relation to either the existing or prospective spatial structure, includes four inter-connected elements. A 'point' usually refers to the core of the whole region and other centres/towns within each level. A 'line' refers to the axes, belts or corridors which connect different centres/towns and which are also designed to promote the wider regional development and outward expansion of the region as a whole, not just the core city. 'Zones' refers to the key areas of influence which surround the core and centres, with the former dependant on the latter. Such an approach is also used to emphasise, at the same time, integrated urban-rural development.

The 'settlement system' usually describes the hierarchy of urban centres and rural towns within the city regional scale. Whilst such terms are not really explicitly used, in some cases functional interdependency, especially between new towns and the rest of the settlement hierarchy, suggests that the application of polycentricity at the city regional scale remains valid both within the core city and also between the core city and other satellite centres within the wider city region.

Table 5. 6 The application of polycentricity at the city regional level

Super/mega city regions		City regional level		
		Spatial structure	Settlement system	Settlements exhibiting an internal polycentric structure
Shanghai	1999-2020	Multi-axes, multi-levels, multi-cores	Central city, new towns (including counties), central towns, general towns	Multi-level urban areas/towns
Beijing	2004-2020	Two axes - two belts - multi-centres	Central city, new towns, general towns	Multi-centres within city region
Guang zhou	2001-2010	A multi-level, constellation-style spatial structure, with the central urban area as core centre and balanced distributed urban areas/towns at each level	Central urban area, central district areas, central towns, general towns	Multi-level urban areas/towns
	2011-2020	Polycentric, clustered and networked structure	Central urban area, sub-centres, satellite towns, small towns	Sub-centres and satellite towns within city region
Tianjin	2005-2020	One axis-two belts-three zones	Centre and sub-centre, new towns, central towns, general towns	New towns
Nanjing	2001-2010	'Cross-shaped' pattern	Central city, new urban district, new towns, central towns, general towns	New towns
	2011-2020	Two belts-one axis	Central city, new towns, lower tier new towns (*xinshizhen*)	New towns
Hangzhou	2001-2020	One core-two circles, three axes-two corridors, one ring-multi-centres	Central city, central towns in counties or city regions, central towns or urban clusters, general towns	Multi-level urban areas/towns

Sources: The City Master Plans of six super/mega city regions, collected from Urban Planning Bureaus or their official websites.

As for polycentric nodes, multi-level urban areas/towns were all included within a polycentric spatial structure, including general towns which were dependent on, or attached to, central towns/new towns in most cases. This was evident in the *1999 Shanghai Master Plan*, *2001 Guangzhou Master Plan* and *2001 Hangzhou Master Plan*. This clearly went against the basic nature of polycentricity, as functional interdependent centres/towns are supposed to serve as polycentric nodes. Another specific case was Beijing. Beijing planned multi-centres[3] as polycentric nodes within the *2004 Beijing Master Plan* for the city region, although the planned connectivity of these centres was expected to extend well beyond the city region. These were intended to be functional centres, expected to provide services to the whole nation, provide spaces for global co-operation and respond to global risks, thereby promoting the centrality and competitiveness of the city region as a whole. However, many of these urban functional centres surround the city core were not balanced or evenly distributed across the city region as a whole. Therefore, it is argued that in applying polycentricity (multi-centres) in Beijing, the scale can only, in reality, be regarded as being focused on the central city scale, not as stated in its master plan to cover the whole city region. Its polycentric development strategies are primarily aimed to promote central city's competitiveness, not the balanced development of the whole city region.

5.3.4 At the metropolitan scale

Moving down in scale and focusing on the metropolitan scale, polycentric development practices within master planning can be examined from two aspects: first, the overall spatial development strategies of respective metropolitan areas and, secondly, the spatial layouts of cities/towns. The latter are the main components within the spatial structures. Table 5.7 shows where polycentric development practices at the metropolitan level have occurred. The evidence is drawn from both

[3] Multi-centres include the core area of Zhongguan Village High-tech Park, Olympic central area, the central business district (CBD), Technology Innovation Centre behind Haidian Mountains, Shunyi modern manufacturing base, Tongzhou comprehensive service centre, Yizhuang high-tech industries development centre and Shijingshan comprehensive service centre, and so on.

rounds of master plans. It was really only applied to the earliest round of master planning in Guangzhou, and was not explicitly considered during the second phase of master planning. In Chongqing and Nanjing, polycentricity as a concept has been applied in both rounds of master planning, but was really only applied to the spatial structure. In both Wuhan and Hangzhou during the most recent round of master planning, polycentricity has been used to create a network of balanced growth and emphasise the connectivity between centres, sometimes emphasising the role of growth corridors along transport routes (e.g Nanjing) but equally placing a strong emphasis on managing and maintaining the natural environment as the context for growth (Guangzhou, Nanjing and Hangzhou).

Table 5. 7 The application of polycentricity at the metropolitan level

Super/mega city regions		Metropolitan level	
		Spatial structure	Spatial layout of cities/towns
Chongqing	1996-2020	Polycentric and clustering spatial structure	Be divided into main urban area (three districts and twelve clusters) and periphery clusters
	2007-2020	Polycentric and clustering spatial structure	Two parts: main urban area (central, northern, southern, western and eastern districts) and suburban area
Guangzhou	2001-2010	Polycentric, clustered and networked spatial structure based on the natural patterns of mountains, rivers/lakes, cities, fields and sea, and mainly developed along the Pearl River	——
Wuhan	2010-2020	Multi-axes, multi-centred open spatial structure with main city as urban core	Axial extension and clustered organisation
Nanjing	2001-2010	A polycentric and open spatial structure with the Yangtze River as the main axis and the main city as the urban core	Central city, new urban districts, new towns
	2011-2020	With the main city as urban core, radial transport corridors as development axes, ecological space as the green wedge, a polycentric open spatial structure with axial clusters developing along the river	One belt- five axes
Hangzhou	2001-2020	One major core - three sub-centres, two centres two axes, six clusters and six ecological belts	——

Sources: The City Master Plans of five super/mega city regions, collected from Urban Planning Bureaus or their official websites.

5.3.5 At the central city scale

Focusing in still further, at the core urban agglomeration within the metropolitan or city regional scale, several core cities, Shanghai, Guangzhou, Wuhan, Nanjing and Hangzhou have also applied polycentricity in their master planning to highlight the importance of the internal structure of the city (see Table 5.8). Paralleling the practices at the metropolitan level, two particular aspects can be highlighted. One is

strategic recognition of the spatial layouts of these central cities, often highlighting the importance of sub-centres. This is then translated into something more specific and concrete in the urban development framework, where the core areas and sub-centres are often explicitly identified, as well as the actual and envisioned relationships and connections between urban core and sub-centres.

Table 5. 8 Application of polycentricity at the central city level

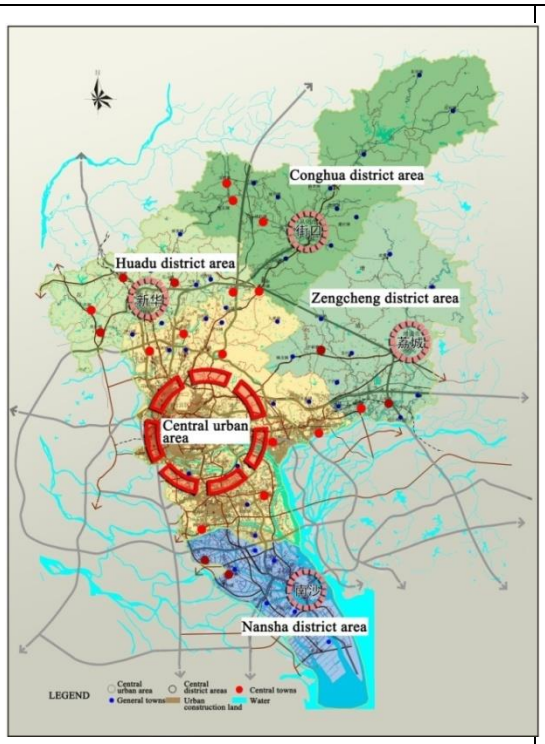
Super/mega city regions		Central city level	
		Spatial structure	Urban development framework
Shanghai	1999-2020	Multi-centreed and open	CBD and main public activity centres (one city level centre and four city level sub-centres)
Guangzhou	2001-2010	Multi-clustered and semi-networked	Three developing areas with several clusters in each of them: urban central area, east-wing urban developing area, north-wing urban developing area
	2011-2020	Polycentric and networked spatial structure with new central axis as the urban core	Zhujiang New Town- Yuan village area, Pazhou area, Bai'ertan area, Baiyun New Town, southern area of the central axis, and so on
Wuhan	1996-2020	Polycentric and clustered spatial structure following balanced development strategy	Two core areas (Wuchang and Hankou), ten central districts and 10 comprehensive clusters
Nanjing	2001-2010	One city - three districts	——
	2011-2020	One major core - three sub-centres	Major city and three sub-cities (Dongshan, Xianlin and Jiangbei)
Hangzhou	2001-2020	One major core - three sub-centres	Major city and three sub-cities (Jiangnan city, Linping city and Xiasha city)

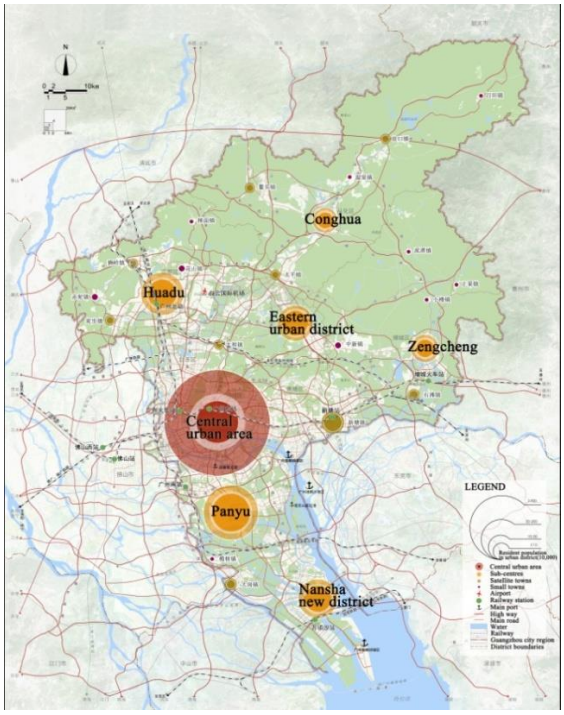
Sources: The City Master Plans of five super/mega city regions, collected from Urban Planning Bureaus or their official websites.

5.4 Major planning adjustments in polycentric development practices in Guangzhou and Nanjing

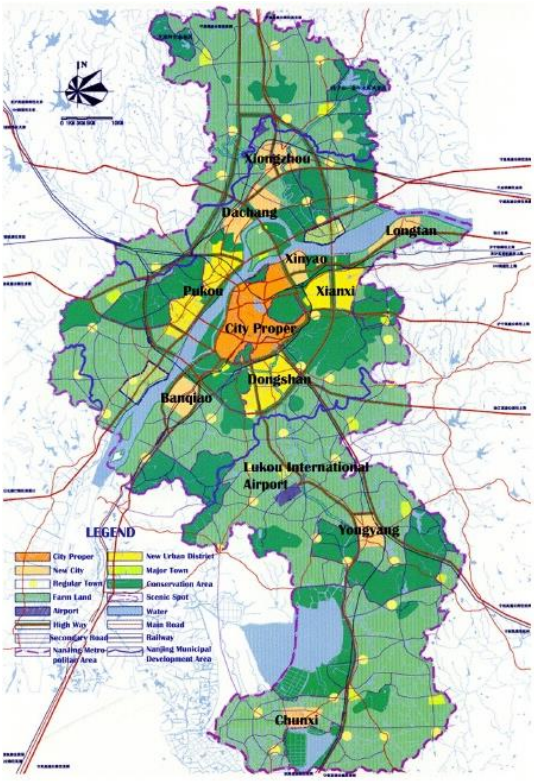
Of the eight selected super/mega city regions, Chongqing, Guangzhou, Wuhan and Nanjing have all applied polycentricity to both rounds of their latest master plans,

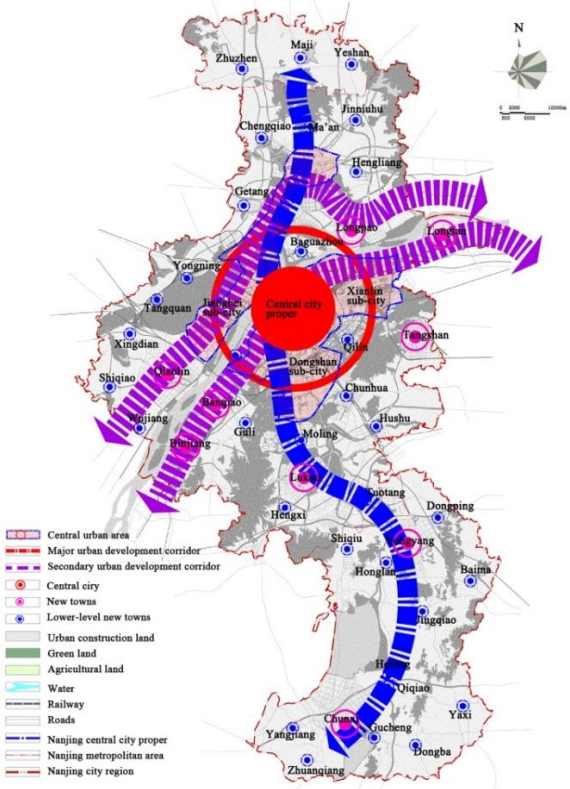
although only Guangzhou and Nanjing have explicitly applied polycentricity narratives and strategic thinking at the city regional level. Hence, polycentric development practices at the city regional scale in Guangzhou and Nanjing are selected as particular cases to discuss these ideas further. This section provides an overview of their polycentric development practices, before detailed evaluating and comparing them in the next chapter. By comparing the spatial structures, settlement systems and polycentric nodes of Guangzhou and Nanjing city regions over time, changes in the way polycentricity has been conceptualised can be examined (see Figure 5.3).





2001 Guangzhou City Master Plan | 2011 Guangzhou City Master Plan





2001 Nanjing City Master Plan | 2011 Nanjing City Master Plan

Figure 5. 3 Spatial structures/urban (town) systems of Guangzhou and Nanjing city regions in the master planning

Sources: Guangzhou Municipal Planning Bureau (2005; 2012); Nanjing Municipal Planning Bureau (2001; 2016); Qian (2013). Adapted by the author.

5.4.1 Guangzhou

Guangzhou applied polycentric development strategies in both of its city master plans in 2001 and 2011. In a document called an *Outline of Guangzhou City Overall Strategic and Concept Plan* (Guangzhou Municipal Government, 2000), a break with Guangzhou's previous monocentric spatial structure was made. This clearly stated its spatial development strategies were composed of southward expansion, northward optimisation, eastward extension, westward combination (Guangzhou Municipal Government, 2000). At the same time there was some administrative reorganisation, with Panyu and Huadu cities losing some of their independent status by becoming districts. Subsequently the *2001 Guangzhou City Master Plan* reiterated this eight-word spatial development strategy advocating a polycentric, clustered and networked spatial structure. It should be acknowledged that at this stage the polycentric spatial structure largely referred to the metropolitan area of Guangzhou (rather than the city region of Guangzhou) which included Panyu and Huadu within the central cluster, but excluded two county-level cities, Zengcheng and Conghua. Meanwhile, a multi-level, constellation-style spatial structure was planned at the city regional level. This envisioned establishing thirteen central towns as major growth centres primarily aimed at promoting urban-rural integration and more balanced development across the whole of the Guangzhou city region. However, functional interdependent centres were not highlighted and promoted as polycentric nodes in the *2001 Guangzhou City Master Plan*.

Later, in 2007, a 'central adjustment' strategy was proposed at the Guangzhou's 10th Party Congress. This added to the original eight-word development strategy by promoting ongoing transformative development, away from market segmentation to regional integration across the whole of the Pearl River Delta region. In 2010, Guangzhou's new spatial vision, 'one metropolitan area, two new towns, three peripheral urban areas', was proposed as part of Guangzhou's strategic planning and master planning framework. This ten-word strategy based on the so-called 'Integration Principles' was adopted as part of the city master plan in 2011. Hence,

from 2011 onwards, the Guangzhou master plan has adopted a polycentric, clustered and networked spatial structure covering the whole region, focused around six sub-centres and nine satellite towns which collectively can help to form a polycentric city region.

It is also worth noting that, sitting alongside the core idea of outward sub regional expansion and more balanced development within the whole city region, with planned improvements to each of the key sub-centres and satellite towns, was an explicit recognition for the need of investment and renewal of Guangzhou's central city. Hence, despite the rhetoric of balanced integrated development, the leading role of the central city was still pre-eminent. Table 5.9 illustrates both the continuities and differences in applying the concept of polycentricity in both rounds of Guangzhou city master plans.

Table 5. 9 The application of polycentricity in both rounds of Guangzhou city master plans

	The earlier round of master plan (2001-2010)	Latest round of master plan (2011-2020)
Spatial development strategy	Southward expansion, northward optimisation, eastward extension, westward combination	Southward expansion, northward optimisation, eastward extension, westward combination, central adjustment
Spatial structure	A multi-level, constellation-style spatial structure, with the central urban area as core centre and balanced distributed urban areas/towns at each level	Polycentric, clustered and networked structure
Settlement system	Central urban area, central district areas, central towns, general towns	Central urban area, sub-centres, satellite towns, small towns
Polycentric node	Multi-level urban areas/towns	Sub-centres and satellite towns

Sources: Guangzhou Municipal Planning Bureau (2005; 2012).

5.4.2 Nanjing

In Nanjing's case, there have been two significant adjustments to the administrative territory covered by the Nanjing Municipal Government. In 2000, the city region consisted of ten districts and five counties. In 2007, the area for master planning comprised eleven districts and two counties and, finally, in 2014, further re-organisation saw a simplification of the administrative structure and eleven districts were created. These changes and the extension to Nanjing's municipal area provided new opportunities for urban spatial expansion and the promotion of more sustainable urban development. The *2011 Nanjing City Master Plan* created a three-tiered settlement system with nine new towns. This replaced the former five-level settlement hierarchy and accompanying seven new towns. This clearer and simpler settlement system hoped to promote better planning implementation and policy delivery. Banqiao, Longtan, Yongyang and Chunxi continued to be the four identified new towns in both the *2001* and *2011 Nanjing City Master Plans*, while Dachang, Xinyao and Xiongzhou have been replaced by Tangshan, Lukou, Binjiang and Qiaolin in the more recent plan. The reasons for the continuities with Banqiao, Longtan, Yongyang and Chunxi were because they had already become functionally interdependent centres with horizontal connections, and/or have the internal potential and external environment for this to be realised realistically in the future. These four towns lie on the primary north-south corridor (Yongyang and Chuxi) or the east-west corridor (Longton and Banqiao). In both cases, these four new towns can be considered to a certain degree successful in contributing to Nanjing's polycentric spatial structures. Most of the other five new towns envisaged as contributing further to a polycentric structure are located along these axes.

When further exploring the main characteristics of the chosen new towns, two similarities become apparent in Nanjing. One is their origins. They are largely based on the original district (county) government-based towns. The other is their functions. Future developments rely on expanding functions from the central city, new industries and major urban infrastructure construction, hence the focus on corridor

development. Furthermore, in some cases, these new towns do not just look to bolster the city regional economy, but also aim to promote regional development across administrative boundaries. For example, in the *2011 Nanjing City Master Plan*, Yongyang was planned to be a comprehensive new town not just within the Nanjing city region, but also within Ningbo-Hangzhou urban agglomeration. Furthermore, Chunxi was also expected to be a comprehensive new town providing services to the border regions of Jiangsu and Anhui Provinces. Table 5.10 illustrates both the continuities and differences in the way the concept of polycentricity has been applied in both rounds of Nanjing city master plans.

Table 5. 10 The application of polycentricity in both rounds of Nanjing city master plans

	Former round of master plan (2001-2010)	Latest round of master plan (2011-2020)
Settlement system	Central city, new urban district, new towns, central towns, general towns	Central city, new towns, lower-tier new towns (*xinshizhen*)
Polycentric node	Seven new towns: Dachang, Xinyao, Banqiao, Longtan, Xiongzhou, Yongyang, Chunxi	Nine new towns: Longtan, Tangshan, Lukou, Banqiao, Binjiang, Qiaolin, Longpao, Yongyang, Chunxi

Sources: Nanjing Municipal Planning Bureau (2001; 2016).

5.5 Discussion and conclusion

This chapter provides a broad overview of the application of polycentric development strategies in China's master planning processes. First, a conceptual framework for urban and rural planning system in China was set up, and the background and origin for polycentricity practices were elaborated. Secondly, eight super/mega city regions which have applied polycentric development strategies at various spatial scales were selected from the sixteen super/mega city regions in China and examined to explore the way that polycentric concepts have been applied at three spatial scales, namely the city regional, metropolitan and central city levels. Finally, Guangzhou and Nanjing, two city regions that applied polycentric thinking in the latest two rounds of master planning were examined. At each stage, major

changes in the polycentric application processes and polycentric nodes were emphasised. More in-depth empirical analysis of polycentricity application in Guangzhou and Nanjing city regions are elaborated in Chapter six.

Although the concept of polycentricity in China has only officially been adopted in master planning since 1999, when it first appeared in the *Shanghai City Master Plan*, it has gained widespread popularity, becoming both a planning/policy tool and strategic guidance to determine future spatial structures. Polycentric development strategies have been articulated in a number of super/mega city regions' master plans at a variety of different spatial scales across China. The advocacy argument for applying polycentric thinking is to begin to resolve the ever-increasing problems associated with unprecedented urban expansion and urbanization processes. However, in practice, any critical analysis as to whether applying polycentricity as an ideal model is still rare in China. The same is true with regards to empirical findings which seek to describe and interpret new Chinese urban realities through the lens of polycentric development (F. Li and Zhao, 2011). In general, although the concept of polycentricity is relatively new in China, it has already become a policy approach used to determine future spatial structures. Whilst is there an absence of an articulated rationality to decide whether this is (or should be) an ideal model, already it has gone beyond Western approaches of initially using polycentricity as an interpretative tool to describe urban realities. This lack of critical analysis and more of an application of a simply descriptive interpretation of polycentricity can be regarded as one of the major differences between China and Europe in its conceptual evolution and adoption. It is an idea that seems to have been applied or invoked without critical reflections.

Other differences can be illustrated from evaluations of polycentricity application in planning documents, and have been highlighted through this chapter's interpretations of the nature of polycentricity within a Chinese context. Inevitably, as an "imported" concept, polycentric development practices in China have their own characteristics, which sometimes go against the basic nature of polycentricity. In some cases (e.g.

Shanghai, Guangzhou and Hangzhou), urban areas/towns at multi-level are all regarded as polycentric nodes. There is a lack of nuanced understanding with regards to two elements that demonstrate the basic nature of polycentric nodes: functional interdependence and horizontal connectivity. On the other hand, major changes in the settlement system at the city regional scale, largely a function of unprecedented urbanisation trends, are in line with the spirit of polycentricity. Although settlement systems are still set up based on a separated classical urban (town) system hierarchical planning framework, within the emerging polycentric development structure narratives, they are now designated to deliver a more networked system, including urban centres and rural towns.

Compared to Western countries, extensive developments and constructions in suburbs or outer suburbs have not resulted in any decline in central areas of Chinese super/mega city regions. Indeed, central areas still maintain their original vitality and primacy at the city, metropolitan and city regional scales. This is because polycentric development strategies in China still place a great emphasis on the development of central cities. At all three spatial scales (city region, metropolitan area and central city), polycentricity aims to promote more sustainable and balanced development; however, this balance is still more rhetoric when compared with the Western concept.

Based on the above findings, some issues and challenges can be identified regarding the application of polycentricity in Chinese master planning. First, there is a need to rethink the rationale and timing of the introduction of the application of polycentricity in master planning in China. Instead of using the concept of polycentricity as a universal applicable approach, the different development stages and potentials of particular cities, metropolitan areas and city regions need to be considered more carefully to see whether the urban systems really need to accommodate this concept. Rather than being a kind of simplified policy narrative, polycentricity should be interpreted more in terms of the need for, and potential of, developing, still further, horizontal and vertical linkages within and between urban

centres. Secondly, with regards to the delivery and promotion of polycentric development strategies, it undoubtedly requires implementation efforts from both central and local levels of governance. There is thus a need to clarify the roles and importance of central and local stakeholders to avoid the presumption that key tasks will inadvertently be left to either scale. This might include developing planning and policy guidance under a polycentric development framework, in order to promote co-operation between different actors (at different levels) who are responsible for, or involved in, the integration of policy-making and implementation and delivery.

CHAPTER SIX

Detailed Analysis of Polycentric Development Practices in China: Evidence from Guangzhou and Nanjing City Regions

6.1 Introduction

This chapter seeks to investigate different means and ways in terms of polycentric development practices, and uncovering the challenges and difficulties in formulating the effective delivery of polycentric development strategies. Based on discussions in Chapter five, this chapter focuses on two selected city regions, Guangzhou and Nanjing. Guangzhou is located at the geographical centre of the Pearl River Delta. It is the provincial capital of Guangdong province, a pre-eminent, coastal city in south China. Nanjing, on the other hand, is one of the most important cities in the Yangtze River Delta Region, another highly developed urban agglomeration within China. It is the provincial capital of Jiangsu province, an inland city compared to Guangzhou. However, 'the city has been losing its importance under the shadow of the more dominant city of Shanghai and as a result of competition from smaller cities in the same province, such as Suzhou and Wuxi' (Z. Qian, 2013, p.78). Since the year 2000 in particular, Nanjing 'has been searching industriously for strategies to meet the challenges and survive the regional competition' (Z. Qian, 2013, p.78), and polycentric development has become one of its key development strategies.

Based on a detailed review of key planning/policy documents and interviews with critical actors at the city regional scale in both Guangzhou and Nanjing, the different processes and mechanisms in polycentric development practices over time, the

horizontal and vertical conflicts in plan-making, as well as the challenges of delivering polycentric strategies to local development are highlighted in this chapter. Challenges in delivering polycentricity are especially illustrated from the perspectives and experiences of the key actors. After this, Guangzhou city region as the context for the embedded case studies has been selected, and three Chinese edge cities are therefore identified for further exploration.

6.2 Polycentric development in planning and policy-making practices in Guangzhou

Since the 1990s, urban spatial restructuring in China has been mainly driven by price mechanisms introduced by land reform. Correspondingly, a number of metropolitan regions have been transforming themselves from single-centre, centralized structures into more polycentric spatial structures (F. Wu and Yeh, 1999). In 1984, Guangzhou proposed its first round of city master plans since China's economic reforms and opening-up policy. In this planning document, a multi-clustered (*duozutuan*) spatial structure was highlighted, focusing on the central city. The term multi-clustered can be regarded as a variation of the polycentricity terminology before the adoption of the exact term polycentricity (*duozhongxin*). Two of the interviewees also explained that 'adopting the multi-clustered structure should be the first time that the polycentric idea was introduced in Guangzhou's master planning' (GO1 and GO2, Guangzhou, 2015). The most widely accepted starting point regarding the application of the polycentricity concept in Guangzhou's spatial planning is from the *Outline of Guangzhou City Overall Strategic and Concept Plan* (Guangzhou Municipal Government, 2000). The interviews with key stakeholders at the Guangzhou city regional scale helped uncover the reasons for this application, which can be interpreted mainly through two perspectives: first, from the perspective of the core city's growth and prosperity, applying polycentricity aimed to tackle pressures from increasingly intense commuting populations and excessive land development within Guangzhou's core city. Adopting polycentricity was also considered 'a spontaneous

and inevitable action facing the environmental limitation to further expansions of Guangzhou's central city' (GO2, Guangzhou, 2015); secondly, from a policy perspective, the adoption of polycentricity was actually 'a political initiative in order to provide balanced development opportunities for each centre and attract more investments' (P1 and P3; A1, Guangzhou, 2015).

Three stages of Guangzhou's polycentric development practices based on its previous rounds of spatial plan from the year 1984 are examined in the following part of this section, including the initial spatial planning concept that emerged right after the open door policy; the original application and implementation of polycentricity in master plans; and recent adjustments to the application of polycentricity. Attention is paid to the context, process, and key participants involved in the plan-making, plan-adjustment or plan-implementation processes; the detailed contents and explanations of the polycentricity concept in plans/policies; and the driving forces facilitating the above actions. Table 6.1 provides some basic information for the Guangzhou city region from the year 2001 to 2014. Guangzhou has experienced three significant phases of expansion in terms of the population, urban area and GDP. Major increases can be witnessed in the GDP of the whole city region following administrative adjustments.

Table 6. 1 Basic information for Guangzhou city region from 2001 to 2014

Year	Administrative divisions	Total population in city region (10,000)	Resident population in urban districts (10,000)	Urban area (km²)	GDP (100 million yuan)
2001	10 districts and 2 county-level cities	712.60	576.97	3,718.50	2,685.76
2011	10 districts and 2 county-level cities	1,275.14	1,111.42	3,843.43	12,423.44
2014	11 districts	1,308.05	1,308.05	7,434.40	16,706.87

Note: In 2001, 10 districts: Dongshan, Yuexiu, Fangcun, Liwan, Panyu, Huangpu, Baiyun ,Tianhe, Haizhu and Huadu; 2 county-level cities: Zengcheng and Conghua. In 2011, 10 districts: Yuexiu, Liwan, Panyu, Nansha, Huangpu, Baiyun ,Tianhe, Luogang, Haizhu and Huadu; 2 county-level cities: Zengcheng and Conghua. In 2014, 11 districts: Yuexiu, Liwan, Panyu, Nansha, Huangpu, Baiyun, Tianhe, Haizhu, Huadu, Zengcheng and Conghua.

Sources: Guangzhou Statistical Yearbooks, Guangzhou Municipal Statistical Bureau.

6.2.1 Initial spatial planning approach after the open door policy

At the initial stage of Guangzhou's polycentric development practices, Guangzhou's very first city master plan after the open door policy in 1978 is examined here.

1984 Guangzhou City Master Plan

Guangzhou's urban development had long been restricted by topographic conditions. Urban construction had to extend along the Pearl River, forming a banding pattern, and the central urban area could only sprawl on the basis of its limited available land (Z. Li and Min, 2011). Nevertheless, 'with Hong Kong and Taiwan's investments flowing into Guangzhou after the 1978 economic reforms and opening-up policy, Guangzhou city started its rapid development' (GO1,Guangzhou, 2015). Against this background, Guangzhou Municipal Government started to compile the 14th round of *Guangzhou City Master Plan* in 1978, which was the first relatively comprehensive, systematic and thorough city master plan compared with previous ones (Guangzhou Urban Development Archives, 2005). After five years' compilation, negotiation and adjustment, in September 1984, the State Council officially approved the 14th *Guangzhou City Master Plan*, and highlighted some important issues, including the nature of the city, its size, and challenges associated with environmental protection,

transportation, urban management, and so on (Guangzhou Housing and Urban-Rural Construction Committee, 2012). Figure 6.1 illustrates the different land uses of Guangzhou city in the *1984 City Master Plan* and highlights the three clusters in Guangzhou's spatial structure within the core/central city. The spatial layout of the city was established and sought to follow the development principles:

- Develop along the north shore of Pearl River towards the east till the Huangpu area, and build a banded and clustered (*zutuanshi*) spatial structure (Guangzhou Urban Development Archives, 2005).

- The first cluster, the central urban area, was based on the old city proper. The second cluster, the Tianhe area, was designed as a scientific research, cultural and education area. The third cluster, Huangpu, was planned to integrate with the construction of the Guangzhou Economic and Technological Development Zone (ETDZ), which together was to be developed mainly as an area of industrial, port and warehouse facilities (Guangzhou Urban Development Archives, 2005).

- Additionally, Xinhua in Huaxian county and Shiqiao in Panyu county were designed as satellite towns in the regional periphery to help contain the overall size of Guangzhou city and decentralise the overly concentrated populations from the old city proper (Guangzhou Urban Development Archives, 2005).

- The size of urban construction land use was expected to be about 300 km^2; by 2000, it was intended that the total population should not exceed two million (Guangzhou Municipal Planning Bureau, 1984).

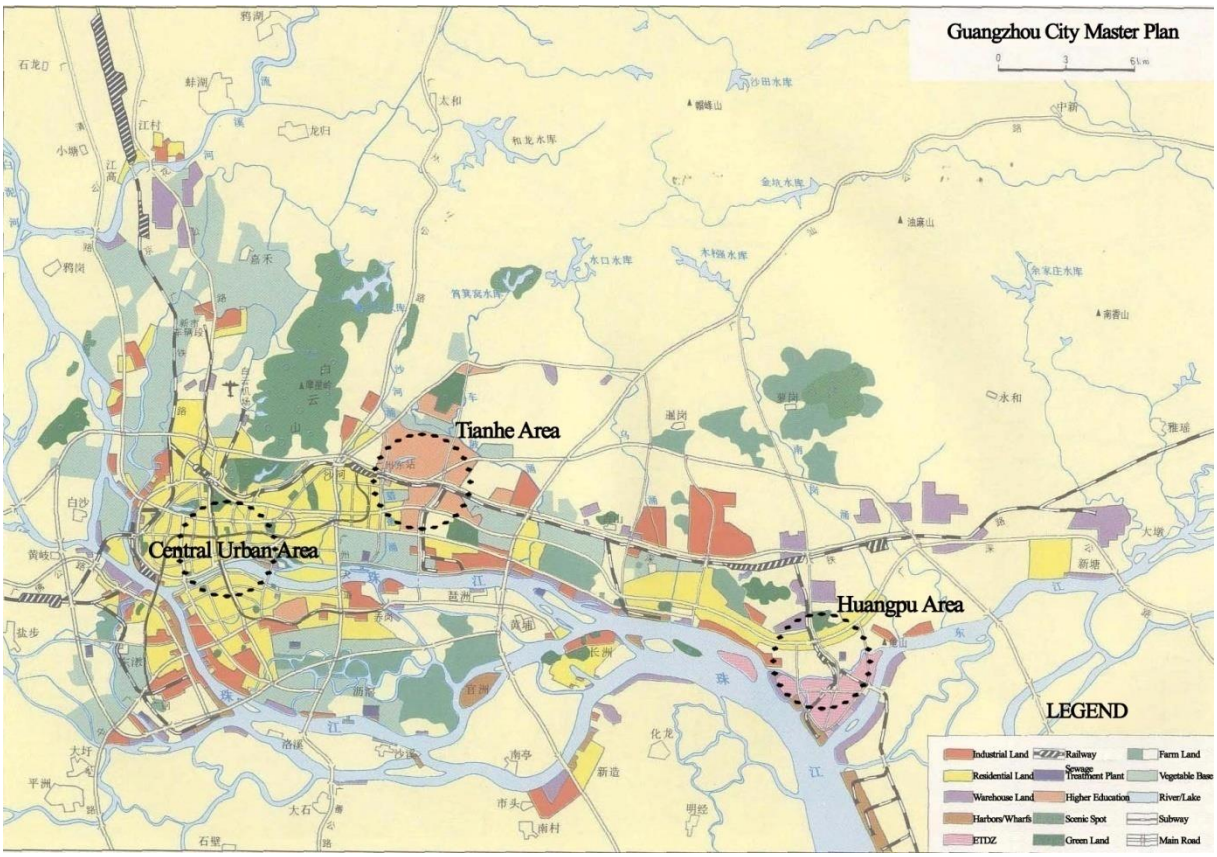


Figure 6. 1 Spatial layout and land use of Guangzhou central city in the *1984 City Master Plan*

Sources: 1984 Guangzhou City Master Plan (Guangzhou Municipal Planning Bureau, 1984).

The spatial layout of Guangzhou's core city and its periphery were developed and regulated according to the *1984 City Master Plan*. In December 1984, Guangzhou Municipal People's Congress decided to extend the scope of the central urban area to 92.7 km^2 from a previous 54.4 km^2, as well as to establish three new districts, which were Tianhe, Fangcun and Baiyun. In addition, the boundaries of eight administrative districts were re-adjusted, so that the administrative divisions of Guangzhou could be in accordance with the *1984 City Master Plan* (Guangzhou Housing and Urban-Rural Construction Committee, 2012).

It can be said that this multi-clustered development at this stage was an inevitable choice for Guangzhou central city's expansion, which was constrained by natural barriers. 'In order to avoid urban sprawl within three clusters, green belts were set up between them. These belts have already been replaced by construction and no longer

exist today' (GO1, Guangzhou, 2015). As two interviewees noted, 'this round of the city master plan was considered to be the first time that the idea of polycentricity was adopted, particularly the notion of the core/central city scale alongside three clusters' (GO1 and GO2, Guangzhou, 2015). Nevertheless, the three clusters already formed an almost continuous urban development area, especially for the central urban and Tianhe areas (see Figure 6.1) where green belts were hardly seen between them.

6.2.2 Original application and implementation of polycentricity

Moving on to the second stage of Guangzhou's polycentric development practices, Guangzhou's first strategic plan and its subsequent city master plan are examined here.

2000 Guangzhou Strategic Plan

The implementation period for Guangzhou's *1984 City Master Plan* was from 1984 till 2000. However, in practice, 'by 1991 and 1992, urban construction land already surpassed the planning limit, and a new round of planning adjustment had to be launched' (GO1, Guangzhou, 2015). Another round of city master plans started in 1989, and was approved by the Guangdong Provincial Government in 1996 before being forwarded to the State Council for final approval (S. Lin, 2013). This procedure had been set in the *1989 Urban Planning Act* (The Central People's Government of the People's Republic of China, 1989) and retained in the *2008 Urban and Rural Planning Act* (The Central People's Government of the People's Republic of China, 2008). As the provincial capital of Guangdong province, master plans for Guangzhou need two rounds of upper level examination and assessment by the Provincial Government and the State Council before they are ready to be adopted. However, during the examination period by the State Council, administrative adjustments were carried out in Guangzhou and the planning document was placed on hold until further modifications could be made based on the new and larger municipal area. Specifically, in June 2000, the cities of Panyu and Huadu became districts from previous, more independent, county-level cities. The territory under the

jurisdiction of the Guangzhou Municipal Government therefore extended to ten districts, with the area of the municipality expanding from 1443km^2 to 3718km^2, which provided new opportunities for urban spatial expansion, but needed the articulation of new urban development strategies (Q. Yuan, 2008). It was this opportunity that promoted a brand new type of spatial plan in China – strategic plans (concept plans). Unlike master plans, which are conventional statutory plans subjected to a lengthy process of approval (F. Wu and Zhang, 2007), strategic plans are more research activities with a rather flexible plan-making approach. One interviewee explained the context of the *2000 Guangzhou Strategic Plan*:

> Guangzhou is the first city to introduce a strategic plan across China. At that time, another round of master plans was on hold and waiting for approvals from the State Council. In the meantime, figuring out the direction and focus of Guangzhou's future development was an urgent priority for Guangzhou Municipal Government in order to accommodate the needs and opportunities of a larger municipal area. Under these circumstances, the *2000 Strategic Plan* was proposed in a timely manner, and implemented with no need for approval from the State Council… A strategic plan mainly focuses on the bottom line of ecological development and the most pressing problems of urban growth. It is not as comprehensive and detailed as a city master plan, but the contents of a strategic plan are enough to guide Guangzhou's future development… The *Outline of Guangzhou City Overall Strategic and Concept Plan* immediately became a model plan in China and stimulated a number of cities to produce strategic or concept plans before preparing more detailed city master plans (P2, Guangzhou, 2015).

Five institutions were invited by the Guangzhou Municipal Government to carry out consultancy work on the Guangzhou strategic plan. These included Tsinghua University, the China Academy of Urban Planning and Design, Tongji University, Sun Yat-sen University and Guangzhou Urban Planning and Design Survey Research Institute (S. Lin, 2013, p.144). No specific requirement in terms of style and format was required in compiling a strategic plan, except that the five teams should focus on the aims and objectives set by the municipal government (F. Wu and Zhang, 2007). The final planning document, the *2000 Outline of Guangzhou City Overall Strategic*

and Concept Plan was a synthesis of all of the work produced by these five institutions. Three key aspects were highlighted in the *2000 Strategic Plan*, namely the spatial structure, ecological environment and transportation network. In terms of the spatial layout, development strategies of southward expansion, northward optimisation, eastward extension, westward combination (Guangzhou Municipal Government, 2000) were clearly articulated through the development of a number of interconnected nodes within Guangzhou's metropolitan area. Based on Guangzhou's natural pattern of mountains, city, fields and ocean, a polycentric (*duozhongxin*), clustered and networked spatial structure (Guangzhou Municipal Government, 2000) was finally established. As one interviewee indicated, 'one of the most important planning ideas in the *2000 Strategic Plan* was to pursue polycentric (*duozhongxin*) and clustered (*zutuanshi*) development' (GO1, Guangzhou, 2015). Figure 6.2 illustrates the land use structure and spatial layout of the Guangzhou metropolitan area in the *2000 Strategic Plan*. The major urban development clusters were located within the whole metropolitan area, and linked by functional development axes and functional transfer axes.

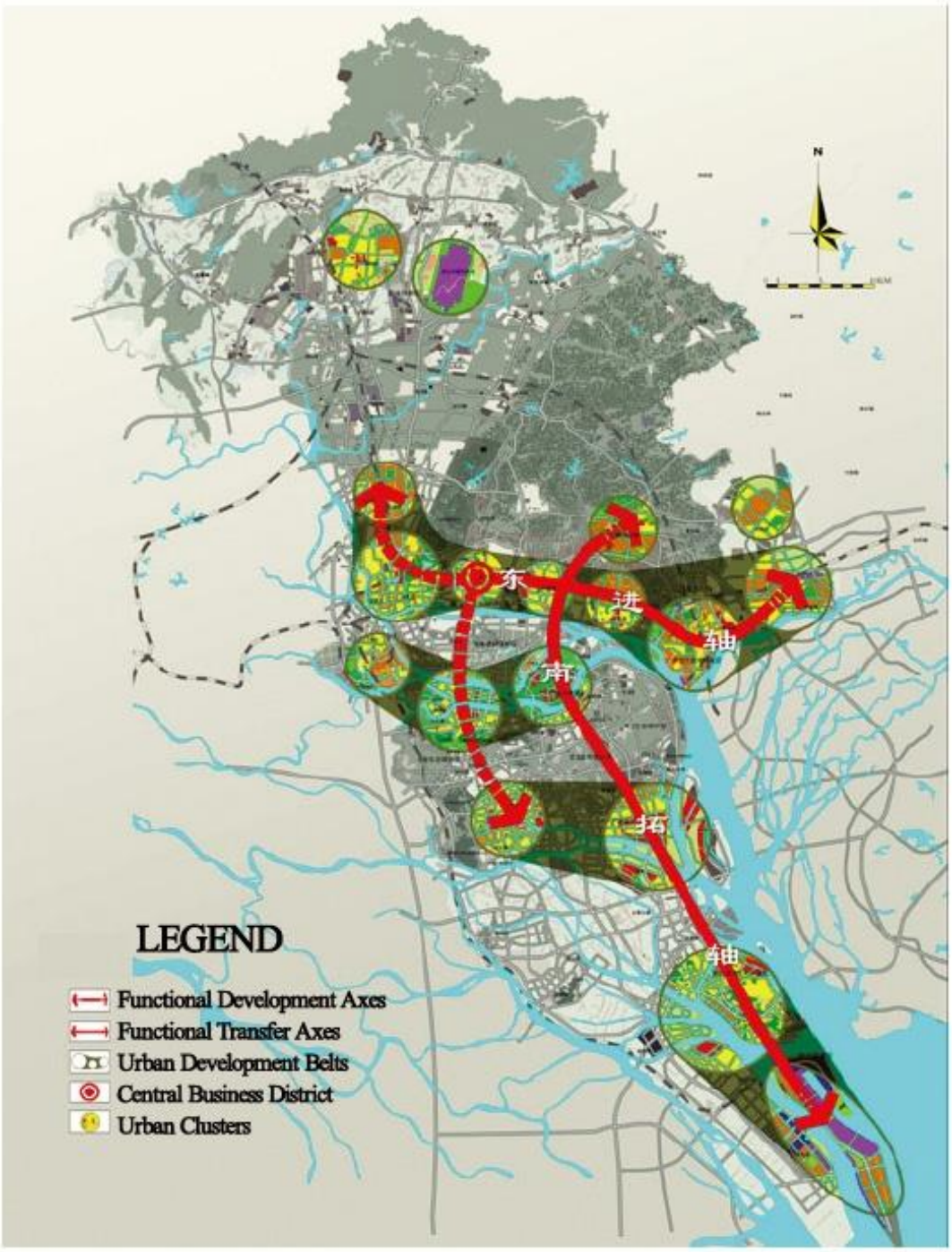


Figure 6. 2 Land use structure and spatial layout of the Guangzhou metropolitan area in the *2000 Strategic Plan*

Sources: Outline of Guangzhou City Overall Strategic and Concept Plan (Guangzhou Municipal Government, 2000).

2001 Guangzhou City Master Plan

Based on the planning framework and development strategies established in the *2000 Strategic Plan*, the *2001 Guangzhou City Master Plan* eventually completed its

adjustments and was approved by the State Council in 2005. Despite beginning in 1989, it was sixteen years before the *2001 Guangzhou City Master Plan* went into effect and actual practice. The *2001 Guangzhou City Master Plan* can be regarded as an extension and refinement of the guiding principles and key aspects from the *2000 Strategic Plan*. One interviewee explained that, according to her experience,

> Guangzhou's strategic plans guided and influenced its master plans. A strategic plan is more general and serves more as a guiding tool. If we consider a city master plan as the guiding principles of a city's future development, a strategic plan can be considered as the guiding principles of a city master plan (P2, Guangzhou, 2015).

Three levels of planning, which were the city regional level, metropolitan level and central city level, were stressed in the *2001 Guangzhou City Master Plan*. Figure 6.3 illustrates the settlement system of Guangzhou city region in the *2001 Master Plan,* including different polycentric nodes at different levels. In terms of spatial structure, the polycentric idea was applied at all three scales in the *2001 Master Plan* as follows:

- At the city regional scale, a multi-level, constellation-style spatial structure was presented, with the metropolitan area as the core and urban areas/towns at each level, balanced across the whole city region. Multi-level urban areas/towns should develop along urban highway/expressway networks and rail transportation corridors.

- At the metropolitan scale, a polycentric, clustered and networked spatial structure was proposed, which was based on natural patterns of mountains, rivers/lakes, cities, fields and the sea, and mainly developed along the Pearl River.

- At the central city scale, a multi-clustered and semi-networked spatial layout was established, based on the old central urban area, and developed along the Pearl River and main roads (Guangzhou Municipal Planning Bureau, 2005).

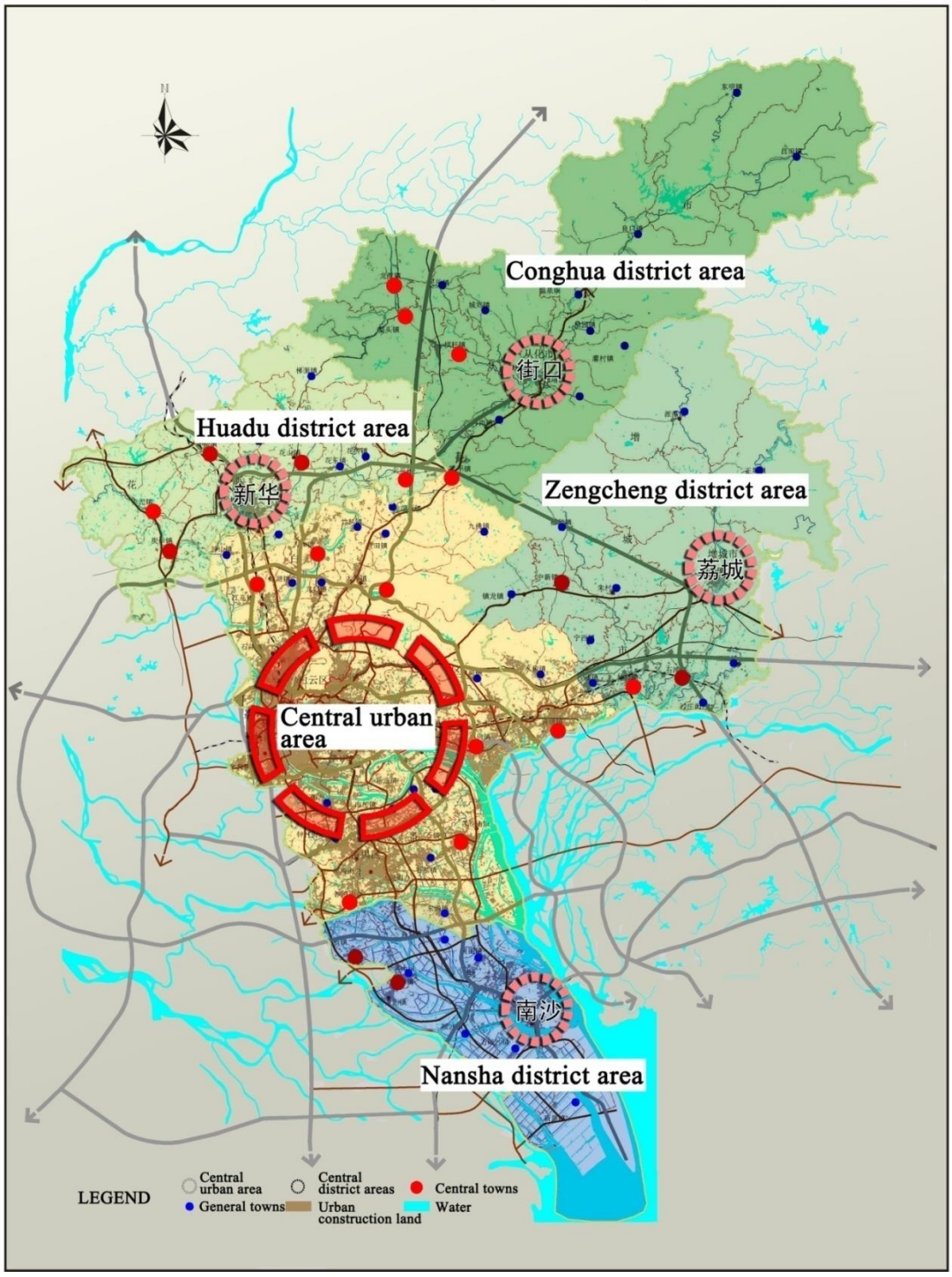


Figure 6. 3 The settlement system of Guangzhou city region in the *2001 City Master Plan*

Sources: Guangzhou City Master Plan (2001-2010) (Guangzhou Municipal Planning Bureau, 2005). Adapted by the author.

It can be seen from the above planning evidence that the polycentric idea was first clearly presented in the *2000 Outline of Guangzhou City Overall Strategic and*

Concept Plan, and then continued to be adopted in the *2001 Guangzhou City Master Plan*. This was also the first time the terminology polycentric *(duozhongxinde)* in Guangzhou's spatial planning documents was used. Looking through the plan-making process, it seemed that Guangzhou had reached a turning point in its transformation towards polycentric development. Guangzhou Municipal Government was persuaded by the arguments presented by those invited institutions and accepted the ideas from consultations to promote a polycentric and balanced spatial structure in a timely manner. The *2000 Strategic Plan* and *2001 Master Plan* were the perfect combination of both the government's thoughts and its consultations. However, it has been argued more generally that the strategic plan was in fact an assignment dominated by municipal agendas and even by the personal preferences of key leaders (Y. Q. Zhao, 2001; B. Zhang, 2002). The evidence from Guangzhou supports this perspective. Polycentric development, one of the major planning strategies in Guangzhou's spatial plans, could be considered a political initiative at this point. The logic or ultimate purpose in promoting polycentric development was to help move especially heavy populations and polluting industries out of the central city, in order to retain and enhance the central city's vitality, as well as provide more balanced development opportunities for the whole of the new city regional administrative area. As a result of this, the central city of Guangzhou still maintained a compact development mode. In fact, more people, especially those who are talented, moved to the central city, as more and high-quality public service opportunities were made available. The major motivation for developing sub-centres was to help move the industries and populations out of the core city. The purpose was actually to better promote the core city's prosperity rather than to build functional sub-centres. Two interviewees observed the problems in decentralising the central city and making sub-centres in this way:

> At the beginning of implementing the *2000 Strategic Plan*, industries were moved out of the central city to the suburban areas or designed "centres", with the purpose to provide and leave more space in the central city for developing service facilities. However, for those "centres", following the

> relocation of industries, their subsequent public service facilities failed to be effectively built. As a result, these mainly industrial-led "centres" were therefore unattractive to populations (P1, Guangzhou, 2015).

> In order to release the pressures of the central city, polluted industries and transportation hubs were moved out, but the construction of service facilities in sub-centres lagged behind. Increased populations in sub-centres did not come from the central city, but were the employment populations generated from relocated industries… A certain degree of newly increased populations were settled outside of the central city, which was a good thing. However, the population of the central city was not successfully decentralised (Centre director, Guangzhou, 2015).

On the other hand, the reason why the polycentric idea became a popular term and was applied in both the *2000 Strategic Plan* and the *2001 City Master Plan* was because it was in accordance with the development logic of the Guangzhou Municipal Government in providing seemingly equal development opportunities for each administrative area. The *2000 Strategic Plan* was not a planners' conception, but resulted from the Municipal Government's implementation logic and driving forces (Yi, 2015). Just as two interviewees argued,

> the selection of "centres" was directly relevant to administrative divisions. Actually Guangzhou has not yet achieved a real sense of a polycentric spatial structure. All the surrounding administrative areas were considered together as surrounding "centres" to form a so-called "polycentric" spatial structure… Planning in China has many political implications. In order to achieve unified administrative management, it was essential to come up with a proper saying, such as "polycentricity" (A1, Guangzhou, 2015).

> The purpose of city master plans is actually to increase available land use for municipal governments. Without a good gimmick, how could land use be increased? A large number of large cities in China have reached the limitations of core cities' growth. They have to apply modern terms to conceive or describe future development visions, and concepts like polycentricity are therefore adopted at the right moment (P3, Guangzhou, 2015).

6.2.3 Recent adjustments to the application of polycentricity

Finally, the most recent stage of Guangzhou's polycentric development practices, Guangzhou's second round of strategic plan and its subsequent city master plan, are examined here.

2010 Guangzhou Strategic Plan

The *2000 Strategic Plan* was well designed to meet the requirements of the Guangzhou Municipal Government. It successfully became a 'useful' plan for the government, as well as an 'implementation-oriented' plan (Yi, 2015). Its delivery was strongly promoted by the Municipal Government, and the construction of key projects attracted huge investments. As a result, a number of key projects were launched by the Municipal Government, such as the university town, Pearl River New Town, Nansha port, and Baiyun new airport. The *2001 City Master Plan*, on the other hand, was used as a statutory tool and a detailed land use scheme operated by the Guangzhou Municipal Government to promote urban construction. Consequently, massive construction brought a substantial increase of the total urban construction land, from 431.5 km^2 in 2000 to 940.65 km^2 in 2007. It more than doubled over the course of seven years (Guangzhou Municipal Government, 2009).

One element of a strategic plan was that its implementation was a rolling process. Through this, the strategic plan could always claim to maintain its applicability to guide urban development (Chen, Yuan and Yi, 2006). In light of the unexpected pace of urban expansions, between 2003 and 2006 Guangzhou Municipal Government chief organised two rounds of review of the *2000 Strategic Plan*. Since it had only been three years after plan adoption for the first review, the 2003 review mainly focused on how to optimise certain aspects presented in the *2000 Strategic Plan*, such as urban functional layout and spatial structure (Guangzhou Municipal Government, 2009). Meanwhile, the 2003 review affirmed that the status of Guangzhou as an international regional central city had been further promoted, and put forward suggestions on how to enhance the *2000 Strategic Plan* whilst retaining

its core attributes (C. Lv, Wu and Huang, 2010). The 2006 review, however, illustrated more implementation problems. One interviewee explained this in a little more detail:

> The 2006 review indicated that the effects of plan implementation or practice were not as ideal as expected. One of the main reasons was that industries had been moved out to planned sub-centres, but public service facilities had not been effectively built in sub-centres. Therefore it was impossible to form the so-called "centres" as, without service functions, it would be very difficult to attract populations and these sub-centres might end up being only industrial areas (P1, Guangzhou, 2015).

In 2007, a third adjustment was proposed to the *2000 Strategic Plan*, focusing only on the spatial development. At the Guangzhou's 10th Party Congress, a new spatial development strategy, 'central adjustment', was added to the spatial development strategies established in the *2000 Strategic Plan*, together making a ten-word key principle of southward expansion, northward optimisation, eastward extension, westward combination, and central adjustment (Guangzhou Municipal Government, 2000) (see Figure 6.4). Guangzhou's urban spatial development was expected to transform from outward 'expansion' to inward 'optimisation and improvement'. This change in the strategic plan is primarily due to the emergence of new and increasing problems associated with the outward 'expansion' strategy, such as inadequate regional coordination, increased urban-rural differences, and an urgent need to further improve urban functions, living environment and urban features of the central city (Guangzhou Municipal Government, 2000). Following this new key principle proposed by the Guangzhou Municipal Government, later that year, six institutions (China Academy of Urban Planning and Design, Tsinghua Urban Planning and Design Institute, Tongji University, Centre for Urban and Regional Studies in Sun Yat-sen University, Guangdong Urban and Rural Planning and Design Institute, Guangzhou Urban Planning and Design Survey Research Institute) were invited again by the Municipal Government to carry out consultancy work or detailed analysis in preparation for another round of strategic planning, to be called the *2020*

Guangzhou City Overall Development Strategic Plan. Five of the institutions (except for the Guangdong Urban and Rural Planning and Design Institute) were invited for a second time for Guangzhou's strategic plan-making. One interviewee explained the background in preparing another round:

> Based on the two rounds of review and summary of the *2000 Strategic Plan*, Guangzhou Municipal Government decided to compile a second strategic plan. In the meantime, Conghua and Zengcheng cities became districts and the area of Guangzhou municipality was expanded again from 3,843 km^2 to 7,434 km^2, nearly doubled. Guangzhou faced the same questions or challenges once again as to how to better organise its urban spatial structure with a much wider municipal area (P2, Guangzhou, 2015).

2011 Guangzhou City Master Plan

By 2014, there were eleven districts in total within Guangzhou city region. The new round of the *2010 Strategic Plan* and its follow-up, the *2011 Master Plan* therefore covered the entire area of Guangzhou city region. This was the same scope as its total municipal area. Metropolitan Guangzhou therefore covered the whole city region. The polycentric idea was again highlighted in the *2011 Guangzhou City Master Plan* at both the city regional (metropolitan) and central city scales in the following way.

- At the city regional scale, the plan continued to implement the ten-word principle of southward expansion, northward optimisation, eastward extension, westward combination, and central adjustment. Optimising and upgrading the central city, focusing on the Nansha New District and Free Trade Zone, promoting the development of the Guangzhou New Knowledge City, expanding and enhancing the development qualities of Huadu, Conghua and Zengcheng, and ultimately building a polycentric, clustered and networked spatial structure.

- At the central city scale, a polycentric and networked spatial structure with new central axis as the urban core was proposed as a spatial strategy (Guangzhou Municipal Planning Bureau, 2012).

The settlement system of one urban core, six sub-centres (Panyu, Nansha new district, Eastern urban district, Huadu, Zengcheng and Conghua) was expected to achieve a real sense of polycentric structure and balanced development among all sub-centres, particularly by promoting the interdependencies of six sub-centres as well as horizontal linkages between the core city and sub-centres (see Figure 6.5). One interviewee explained that,

> the proposed polycentric development strategies had great impacts in guiding population distributions, allocating social infrastructure, and establishing the functional positioning of sub-centres. The six sub-centres were designated with the purpose of strengthening the linkages with the urban core (P1, Guangzhou, 2015).

Figure 6.4 shows the spatial structure of Guangzhou city region in the *2010 Strategic Plan*, and Figure 6.5 illustrates how the spatial structure and settlement system of Guangzhou city region in the *2011 Master Plan* was expected to evolve.

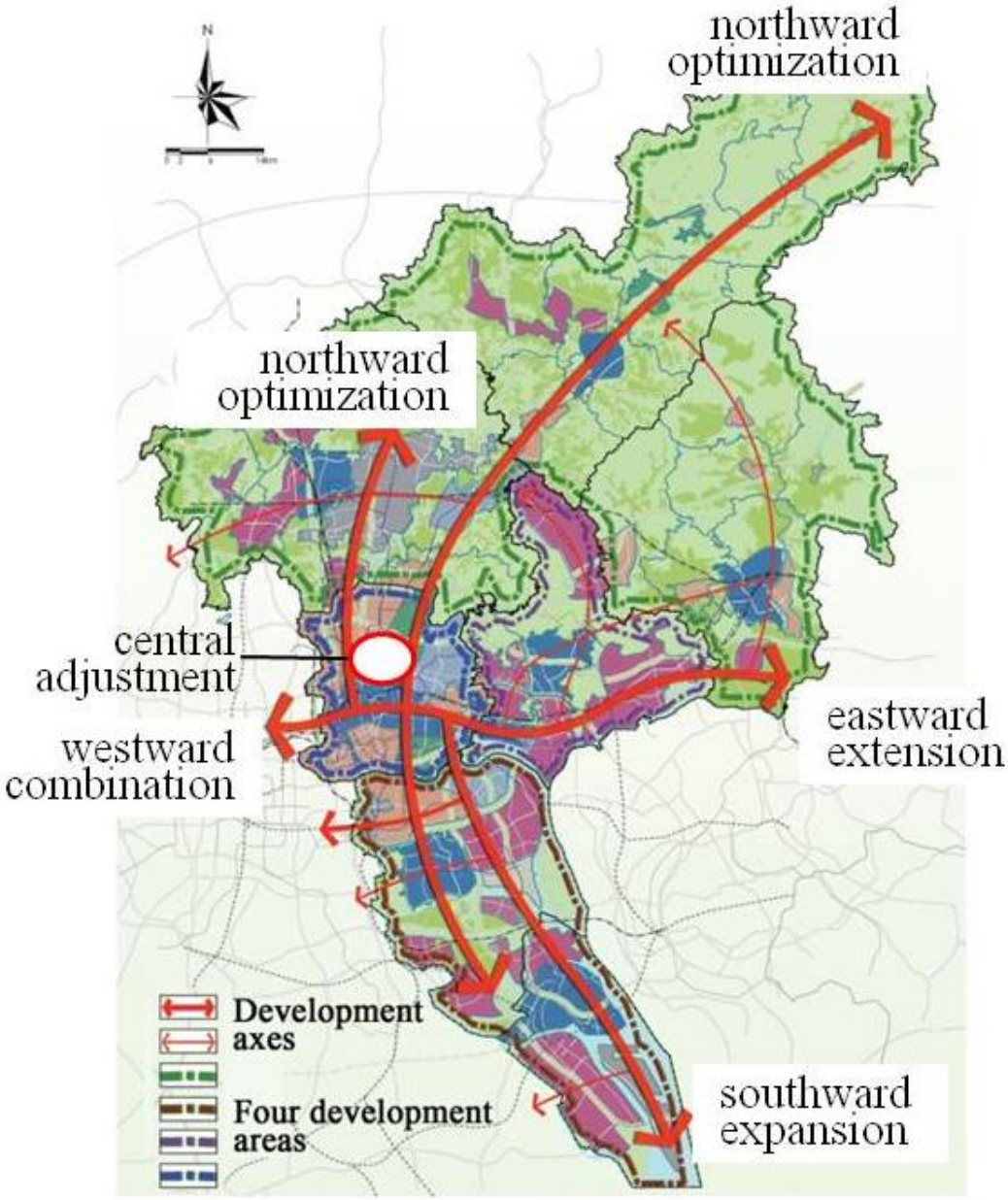


Figure 6. 4 The spatial structure of Guangzhou city region in the *2010 Strategic Plan*

Sources: 2020 Guangzhou City Overall Development Strategic Plan (2010-2020) (Guangzhou Municipal Government, 2009).

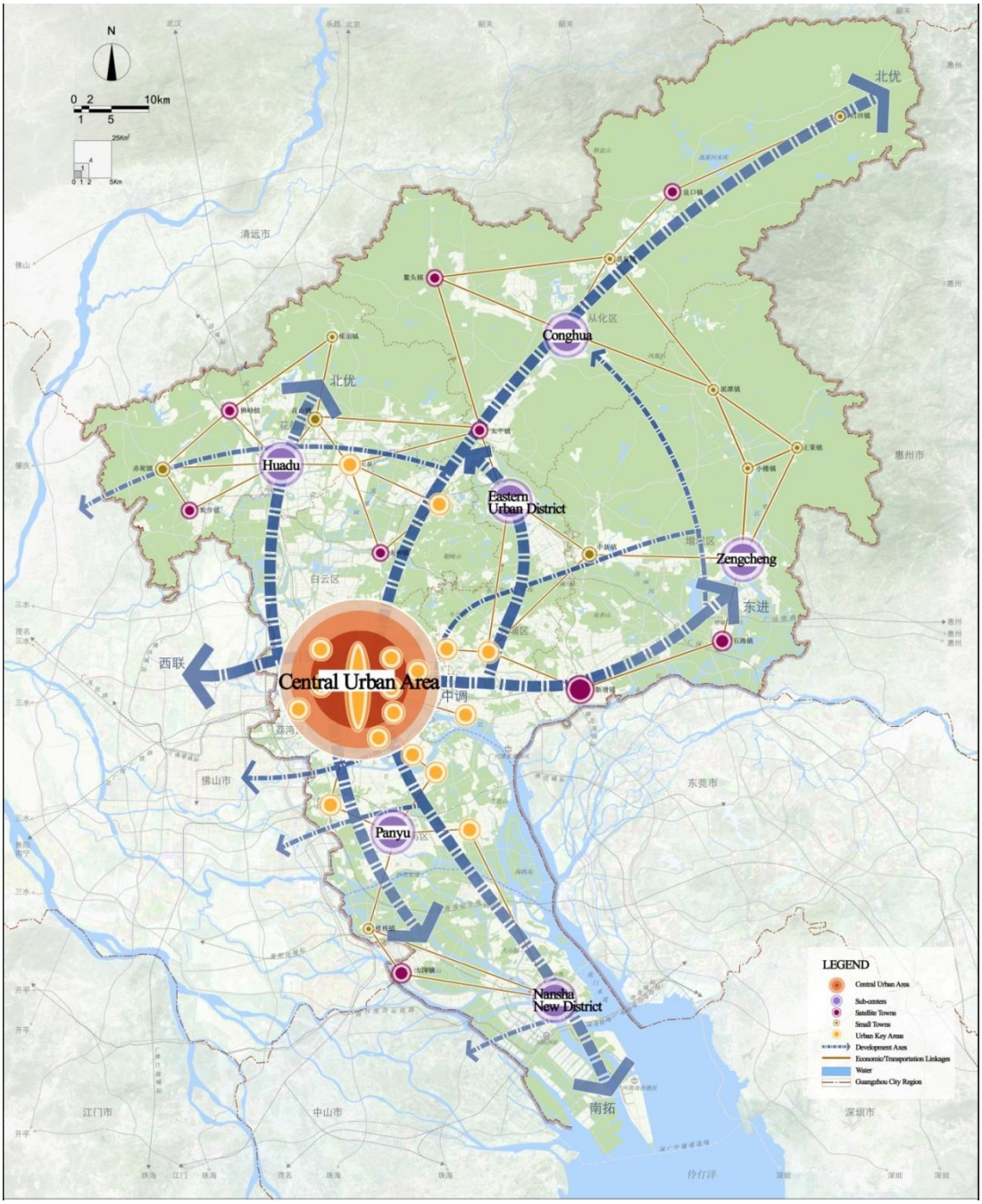


Figure 6. 5 The spatial structure and settlement system of Guangzhou city region in the *2011 Master Plan*

Sources: Guangzhou City Master Plan (2011-2020) (Guangzhou Municipal Planning Bureau, 2012).

The above discussions have provided an overview concerning the historic process of polycentric development practices in Guangzhou city region, from the early 1980s until recently. It is clear that the spatial development strategies in Guangzhou's spatial planning have experienced a process of evolution from multi-clustered

development focused on the core city growth, to polycentric development facilitated by the political initiatives of Guangzhou key leaders within the Municipal Government, to more recently a more sustainable polycentric development strategy aiming to achieve balanced development and promote interdependent sub-centres at the local scale. Table 6.2 summarises the major changes, mainly in spatial structure and the settlement system at three planning levels in Guangzhou city master plans from 1984 until now. Since the open door policy, three rounds of city master plan have been formulated and implemented in Guangzhou. The planning focus has extended from the core city to the whole city region, and a polycentric spatial structure is increasingly clear, both at the central city and city regional scales.

Table 6. 2 Guangzhou city master plans from 1984 until now

Guangzhou City Master Plans	City regional level		Metropolitan level	Central city level
	Spatial structure	Settlement system	Spatial structure	Spatial structure
1984-2000	——	——	——	A banding and clustered spatial structure
2001-2010	Multi-level, constellation-style spatial structure	Central urban area, central district areas, central towns, general towns	Polycentric, clustered and networked spatial structure based on the natural patterns of mountains, rivers/lakes, city, fields and sea, and mainly developed along the Pearl River	Multi-clustered and semi-networked spatial structure
2011-2020	Polycentric, clustered and networked structure	Central urban area, sub-centres, satellite towns, small towns	——	Polycentric and networked spatial structure

Sources: Guangzhou City Master Plan (1984-2000) (Guangzhou Municipal Planning Bureau, 1984), Guangzhou City Master Plan (2001-2010) (Guangzhou Municipal Planning Bureau, 2005), Guangzhou City Master Plan (2011-2020) (Guangzhou Municipal Planning Bureau, 2012).

The following section focuses on the other city region, Nanjing, to illustrate a similar application process of the polycentric idea in Nanjing's spatial planning but with different characteristics and dynamism at each stage.

6.3 Polycentric development in planning and policy-making practices in Nanjing

Nanjing has long been planned as a monocentric spatial structure. Around the year 2000, polycentric development strategies began to be adopted in Nanjing's spatial planning, primarily as policy guidance mainly from Nanjing Municipal Government. The decision-making of municipal government in China is a complicated and negotiated process. As one interviewee stated,

> In China, it was not planners who were inspired by the Western polycentric idea and then persuaded policy-makers to adopt polycentricity in spatial planning. Rather, it was policy-makers who intended to develop certain areas, and planners then helped to express policy-makers intentions and decisions in spatial plans through the form of a polycentric structure (A3, Nanjing, 2015).

Moreover, as well as some common problems associated with urban sprawl in large cities, adopting the polycentric idea in Nanjing was also associated with its special ecological background and complex histories. One interviewee explained:

> The natural landscape pattern and background of Nanjing were just a perfect fit for a polycentric structure… Also, Nanjing had been an ancient capital for six dynasties. City sites have been changed several times and historical remains were left at different locations. Those historical remains could also be the base in building a polycentric structure (P6, Nanjing, 2015).

The historical and cultural base of Nanjing might provide the basics in understanding and adopting the polycentric idea in spatial planning, while the polycentric idea being invoked as a policy concept was decisive for its application. Under such circumstances, until recently, the polycentric development strategy has been applied to three rounds of Nanjing's spatial plan. Another interviewee summarised the main aims in adopting polycentricity.

> Nanjing is an important and typical case to achieve integrated development between the southern and northern Yangtze River, as well as between urban

and rural areas, particularly through applying polycentric development strategies. In doing so, it is hoped to raise certain strategies and measures for Nanjing's future development, both at a strategic level and operational level (A2, Nanjing, 2015).

The remainder of this section discusses the polycentric development practices in Nanjing spatial plan-making processes from the *1980 Nanjing City Master Plan*. Similarly to Guangzhou, three stages of Nanjing's polycentric development practices are discussed, including the initial spatial planning approach after the open door policy, the original application and implementation of polycentricity, and recent adjustments to the application of polycentricity. Attention is paid to the context, the process, the key participants involved in the plan-making, plan-adjustment or plan-implementation processes; the detailed contents and explanations of the polycentricity concept in plans/policies; and the driving forces facilitating the above actions. Table 6.3 provides some basic information for the Nanjing city region from the year 2001 to 2014. Nanjing has also experienced three phases of expansion in terms of the population, urban area and GDP in the city region. A major increase can also be witnessed in these urban areas following administrative adjustments, with a correspondent increases in GDP of the whole city region.

Table 6. 3 Basic information for Nanjing city region from 2001 to 2014

Year	Administrative divisions	Total population in city region (10,000)	Resident population in urban districts (10,000)	Urban area (km^2)	GDP in city region (100 million yuan)
2001	11 districts and 4 counties	553.04	371.88	2,599.17	1,150.30
2011	11 districts and 2 counties	810.91	727.05	4,733.12	6,145.52
2014	11 districts	821.61	821.61	6,587.02	8,820.75

Note: In 2001, 11 districts: Xuanwu, Baixia, Qinhuai, Jianye, Gulou, Xiaguan, Pukou, Dachang, Qixia, Yuhuatai and Jiangning; 4 counties: Jiangpu, Liuhe, Lishui and Gaochun. In 2011, 11 districts: Xuanwu, Baixia, Qinhuai, Jianye, Gulou, Xiaguan, Pukou, Qixia, Yuhuatai, Jiangning and Liuhe; 2 counties: Lishui and Gaochun. In 2014, 11 districts: Xuanwu, Qinhuai, Jianye, Gulou, Pukou, Qixia, Yuhuatai, Jiangning, Liuhe, Lishui and Gaochun.

Sources: Nanjing Statistical Yearbooks, Nanjing Municipal Statistical Bureau.

6.3.1 Initial spatial planning approach after the open door policy

At the initial stage of Nanjing's spatial planning after the open door policy in 1978, Nanjing's first two city master plans are examined here.

1980 Nanjing City Master Plan

After the establishment of the Nanjing Municipal Planning Bureau in 1978, it began to prepare and compile the *Nanjing City Master Plan (1980-2000)* (Nanjing Municipal Planning Bureau, 1983). In November 1983, the *1980 Nanjing City Master Plan* was officially approved by the State Council, and became the first statutory planning document permitted by the State Council in Nanjing's history (C. Lv and Shi, 2014). In this planning document, the spatial layout and future development goals of Nanjing were set as follows.

The ultimate goal was to 'turn Nanjing city into a civilized, clean, beautiful and garden city'. A creative statement on Nanjing's spatial structure proposed a 'ring-layer' model, in arranging urban areas/towns as a whole. Specifically speaking, the central urban area was considered the main urban core. Surrounding it from inside to outside, the entire city region was divided into five, inter-connected ring-layers with respective functions, which were 1) the central city, 2) vegetables and non-staple food base, suburban landscape area, 3) satellite towns, 4) farmland and forests, and 5) outer suburban small towns. In short, the above layout could be summarised as 'central city – suburbs – satellite towns – villages – small towns', with the purpose to achieve 'labor divisions and co-operations among different sized towns, and interval development between urban and rural areas' (C. Lv and Shi, 2014, p.39).

It was clear that a monocentric, ring-layer spatial structure for Nanjing city region was proposed in the *1980 Nanjing City Master Plan*, mainly focusing on the development of the central city (urban core). This ring-layer model was a typical spatial development structure often promoted in the early stages of Chinese cities which were due for urban expansion.

1991 Nanjing City Master Plan

After entering the 1990s, economic reforms were deepened. In order to address the contradictions between development and protection, Nanjing started to adjust the ongoing city master plan in 1989 (C. Lv and Shi, 2014). In 1991 a new master plan emerged, which expanded the major development focus from the urban core to a wider scope, named the metropolitan circle *(dushiquan)*. One of the main ideas in the *1991 Nanjing City Master Plan* (Nanjing Municipal Planning Bureau, 1991) was 'jumping out of the central city, and tackling the development and conservation problems of Nanjing in a wider scope of metropolitan circle' (L. Zhou, 2002, p.47). It was this predictive and creative idea that enabled this round of the master plan to obtain the First Excellent Planning and Design Award in China awarded by the Ministry of Construction (L. Zhou, 2002).

Three scales of planning were proposed in the *1991 City Master Plan*: the central city, metropolitan circle and designated urban planning area. First, the central city referred to the area which was to the south of the Yangtze River and inside the city ring road. The focus was to bring out the full potential for development of the central city through enhancing financial, commercial, technological, information and service functions. Through optimising urban land use structure, the main purpose was to improve traffic conditions, accelerate infrastructure construction, and improve environmental qualities, as well as protect features from Nanjing's era as the ancient capital. Secondly, the metropolitan circle was the major planning area for this round of master planning adjustment. In the planning document, it was described as 'a highly urbanised area based on the Yangtze River covering the central city and its surrounding towns. Within the metropolitan circle, central city and its surrounding towns should keep green ecological space intervals, and be connected through convenient transportation links' (C. Lv and Shi, 2014, p.39). Thirdly, the designated urban planning area referred to the entire city region of Nanjing (Nanjing Municipal Planning Bureau, 1991). Figure 6.6 illustrates the different spatial structures of Nanjing city region in both the *1980* and *1991 City Master Plans*. In 1983, Lishui

and Gaochun counties located at the south end of current Nanjing city region were absorbed into the Nanjing administrative area. Therefore, Figure 6.6 (a) from the *1980 City Master Plan* does not include these two counties. It is clear that Nanjing remained a monocentric spatial structure in both rounds of the spatial plan, with the central urban development area extending from the urban core to a wider metropolitan circle, although the main urban development was still focused on the core city.

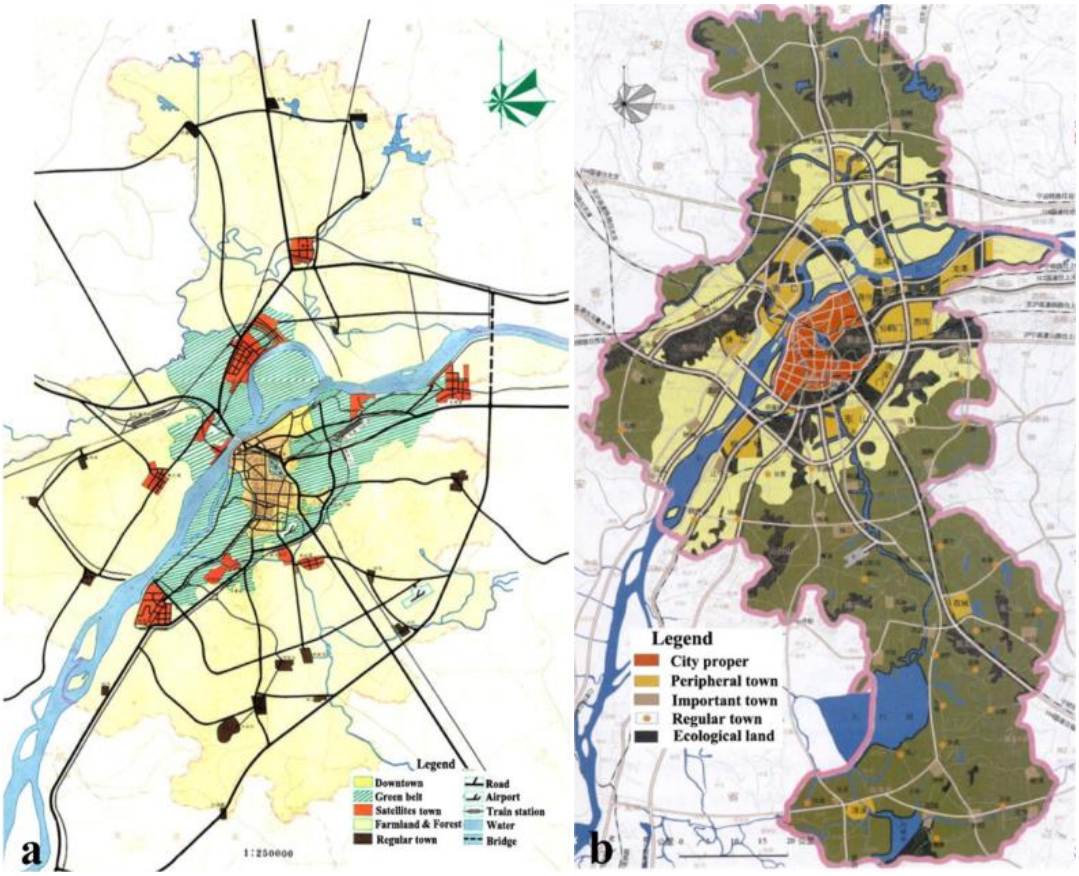


Figure 6. 6 Spatial structures and settlement systems of Nanjing city region in the *1980 Nanjing City Master Plan (1980-2000)* (a), and the *1991 Nanjing City Master Plan (1991-2010)* (b)

Sources: Yuan, Gao and Wu (2016).

6.3.2 Original application and implementation of polycentricity

Moving on to the second stage, the original application of polycentricity in Nanjing's spatial planning, Nanjing's first strategic planning research and the subsequent city master plan are examined here.

2001 Nanjing Strategic Planning Research

Under the *Fourth Wave* (Yeh et al., 2006) of China's urbanization process, dating from 2000, new town construction in Nanjing stepped into a new era of large-scale expansion (Bao et al., 2013).

> Within this massive new town construction wave, the secretary of Nanjing Municipal Committee, Yuanchao Li, proposed an urban development strategy of "one city, three districts". This policy could be considered as the initial version of Nanjing's polycentric development focused on the central city scale (A3, Nanjing, 2015).

A more explicit urban development strategy was also raised by the Municipal Government at this time, as one interviewee explained:

> The strategy of "one decentralisation, three concentrations", aimed to reorganise the spatial structure/system of new districts and new towns (A4, Nanjing, 2015).

Specifically, 'one decentralisation' indicated decentralised development from the old central city, with the aim to decentralise populations out of the central city. 'Three concentrations' indicated concentrated developments in new districts, development zones and university towns. In particular, the purpose was to promote the construction of new districts, to attract or relocate industries to these new development zones, and locate/relocate colleges and universities to university towns (Jiangsu Provincial Department of Housing and Urban-Rural Development, 2013).

Following the above political strategies promoted by the Nanjing Municipal Government, a new round of *Nanjing City Master Plan (2001-2010)* started to be compiled as an adjustment to the *1991 Nanjing City Master Plan*. During the preparation of this new round of city master planning, Guangzhou had been the first to successfully introduce strategic planning in China which became complementary to the traditional statutory city master plan. Inspired by Guangzhou's experience, in October 2000, Nanjing Municipal Planning Bureau invited the China Academy of Urban Planning and Design to carry out strategic planning research on Nanjing's

urban development. Compared with the consultancy work delivered for Guangzhou's strategic plan, the invited planners believed that Nanjing faced totally different urban and regional problems. Unlike Guangzhou, Nanjing's industrial development and layout at this time were extremely problematic, such as an over-dependency on heavy and polluting industries, a lack of emerging or new economic growth engines, and failures in forming local economic networks. Therefore, industrial development strategies became one of the most important entry points in producing Nanjing's strategic plan (B. Zhang, 2001). From Figure 6.7, it can be seen that the brown colour-blocks were illustrated as industrial land, with a focus on the central city including the core city and its surrounding built-up areas. In 2000, the spatial layout of industries was quite messy, with the majority of industrial land distributed in a disorderly manner along the Yangtze River. Alongside industrial development, the other two major aspects addressed in Nanjing's strategic plan were regional and spatial development opportunities.

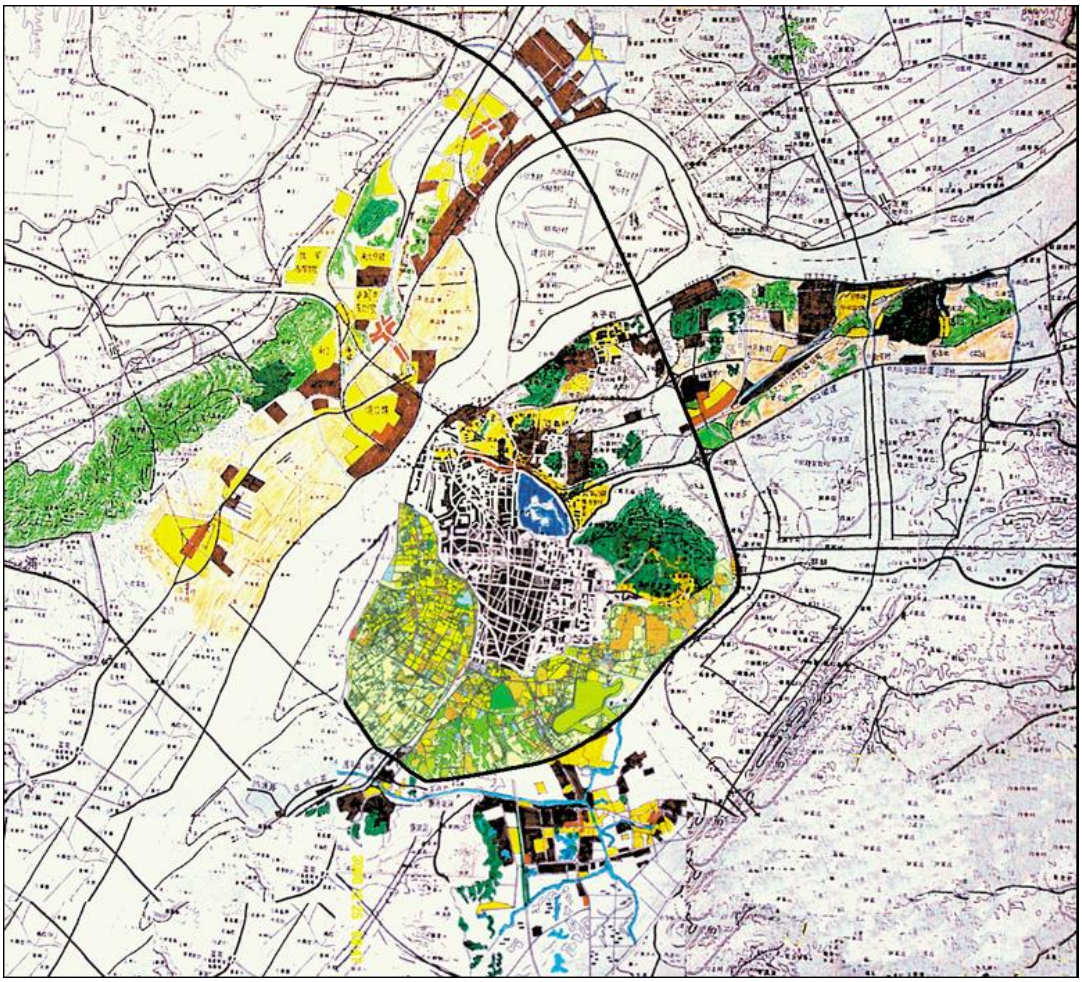


Figure 6. 7 Sketch of land use status and spatial layout of Nanjing central city in 2000

Sources: China Academy of Urban Planning and Design (2001).

The *Strategic Planning Research on Nanjing Urban Development and Spatial Structure* came out in early 2001. This report presented Nanjing's urban development strategies for 10 to 20 years and beyond, mainly focusing on three aspects: regional competition and collaboration, economic structure (especially industrial structure) and spatial structure (China Academy of Urban Planning and Design, 2001). In terms of the spatial structure, the strategic planning research aimed to transform Nanjing's development mode from a currently dispersed one to a sequent and prioritised mode. A multi-core (*duohe*), axial development mode with one central city and several clusters would replace the current monocentric spatial development mode. In terms of regional development, the document aimed to promote Nanjing's regional status, and proposed that Nanjing central city should strengthen its economic linkages with

Shanghai and enhance its leading role and influences on North Jiangsu and Anhui provinces, in order to promote co-ordination between urban spatial development and industrial/regional developments (B. Zhang, 2002). Figures 6.8 and 6.9 illustrate the two key development strategies, both at the city regional and central city scales proposed in the *Strategic Planning Research on Nanjing Urban Development and Spatial Structure* could be realised: 1) at the city regional scale, promoting urban axial development along the Yangtze River key transportation corridor (see Figure 6.8); and 2) at the central city scale, promoting the transformation towards a polycentric spatial structure from a monocentric one (see Figure 6.9). Five nodes within the polycentric structure were planned at the central city scale which were functionally interdependent, namely the central business area, central commercial area, comprehensive service centre, technology education cultural and sports centre, and logistics management centre.

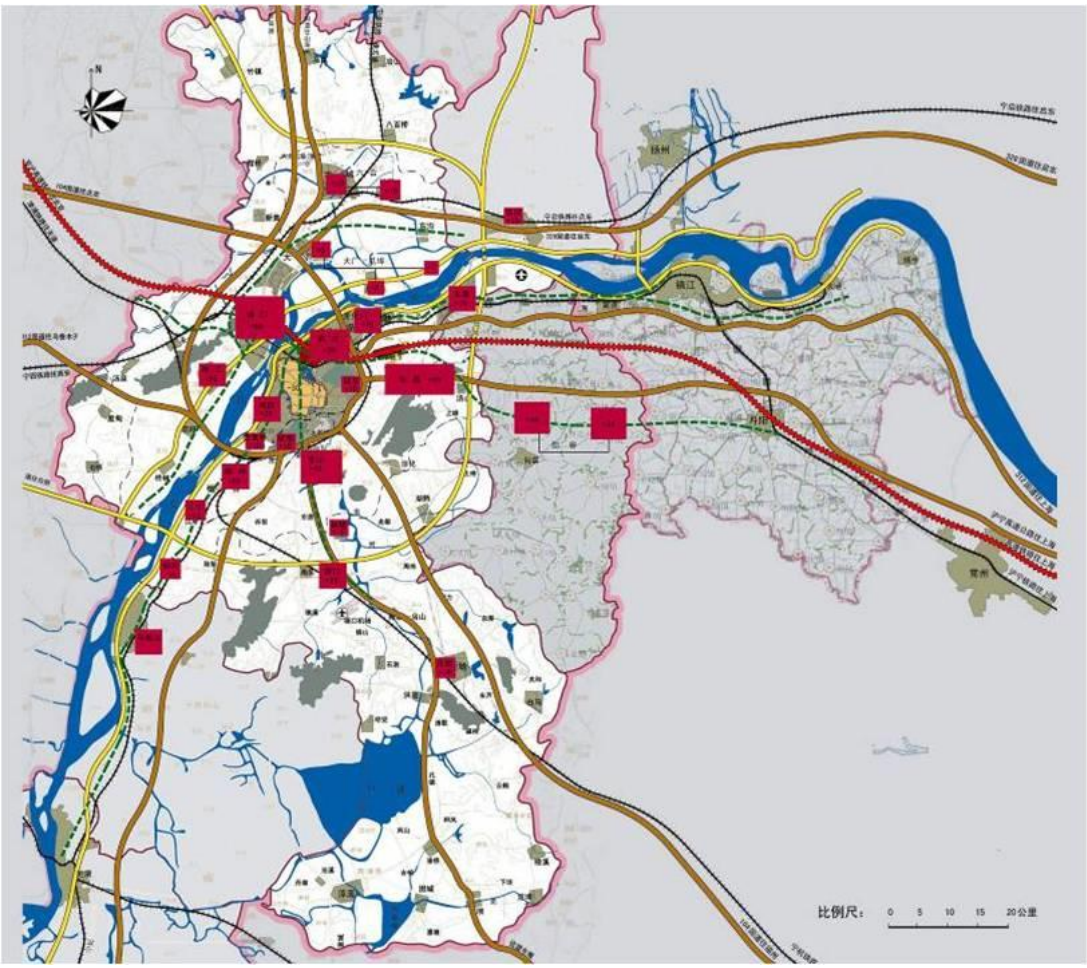


Figure 6. 8 Urban axial developments within Nanjing city region

Sources: Strategic Planning Research on Nanjing Urban Development and Spatial Structure, China Academy of Urban Planning and Design (2001).

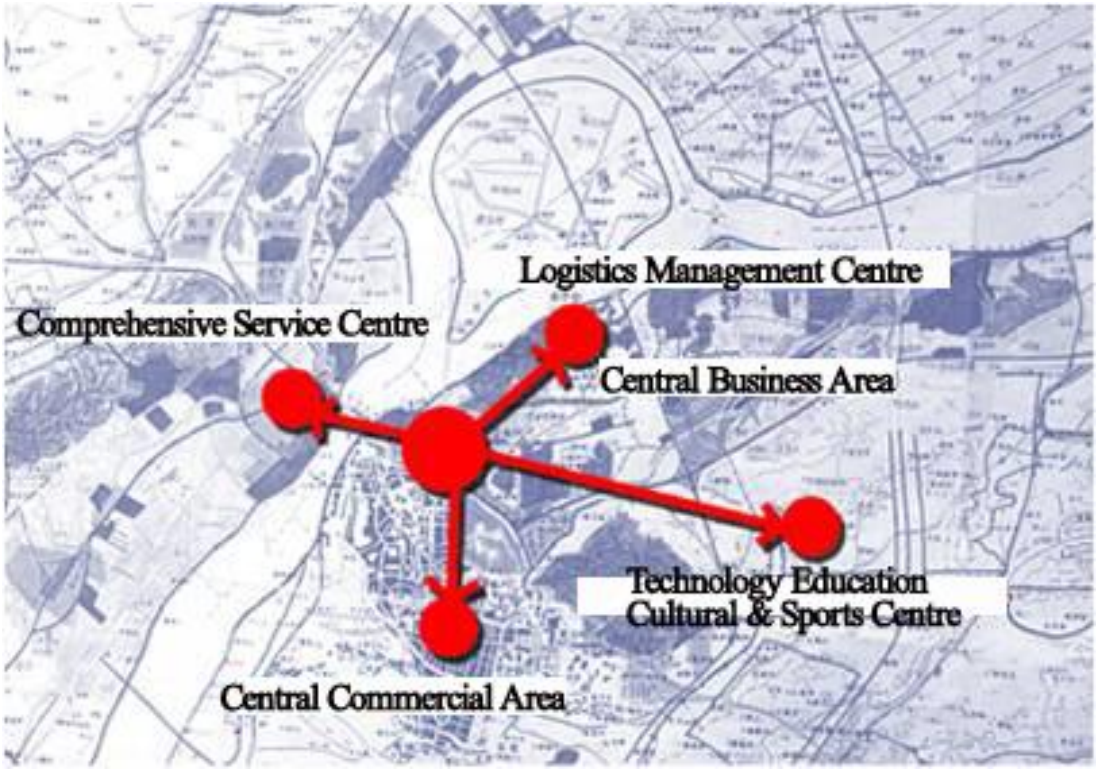


Figure 6. 9 A polycentric spatial structure in Nanjing central city

Sources: Strategic Planning Research on Nanjing Urban Development and Spatial Structure, China Academy of Urban Planning and Design (2001).

2001 Nanjing City Master Plan (revision of the 1991 Nanjing City Master Plan)

The central ideas and strategies in the *Nanjing Strategic Planning Research* greatly influenced the *2001 Nanjing City Master Plan*. In 2001, the *Nanjing City Master Plan (2001-2010)* (Nanjing Municipal Planning Bureau, 2001) was approved as the adjustment to the *1991 City Master Plan*, and this was the first time that Nanjing adopted polycentric ideas in its city master plan. A 'metropolitan development area' *(dushifazhanqu)* replaced the former 'metropolitan circle' *(dushiquan)* in the *1991 City Master Plan*, abandoning the former ring-layer and agglomeration development mode. The 'central city and its surrounding twelve urban areas/towns' within the metropolitan circle were changed to a three-level settlement hierarchy of 'central city, new urban districts, new towns' within the metropolitan development area, making a much clearer hierarchy at the metropolitan scale. The new settlement system also emphasised a functional separation and interdependency through the spatial

distribution of different economic sectors, specifically industrial projects being located in development zones and urban construction (especially housing and commercial) being located in new urban districts or new towns (F. Yuan et al., 2016). However, the horizontal connections between the central city and the three designated new urban districts were not clearly stressed. Figure 6.10 shows the spatial structure of Nanjing city region and the settlement system of urban areas/towns in the *2001 Nanjing City Master Plan*. The major changes in terms of the spatial structure and urban area/town system were:

- The urban structure at the central city scale was established as one city (Nanjing city proper) and three districts (Dongshan, Xianxi and Pukou).

- The spatial structure at the metropolitan scale (metropolitan development area) was described as a polycentric and open spatial structure, with the Yangtze River as the main axis and the central city as the urban core. The urban area/town system within the metropolitan development area consisted of the central city, new urban districts, and new towns.

- The spatial structure at the city regional scale was represented as a 'cross-shaped' pattern. The settlement system consisted of the central city, new urban districts, new towns, central towns, and general towns (Nanjing Municipal Planning Bureau, 2001).

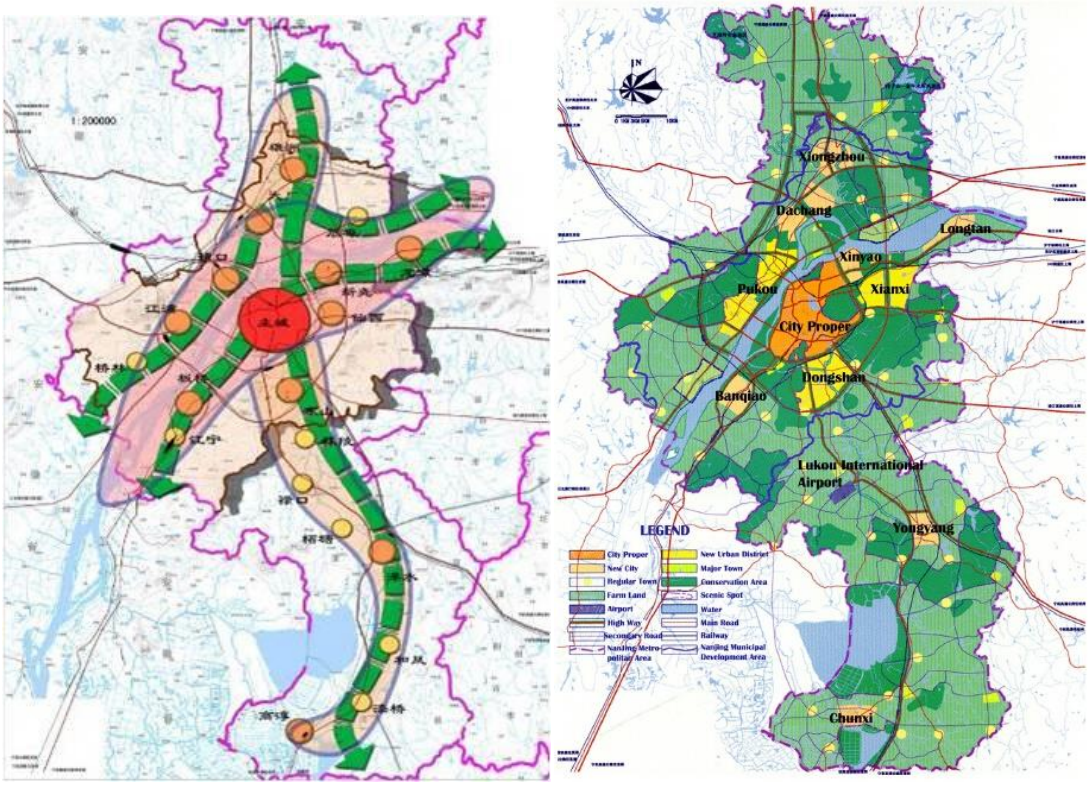


Figure 6. 10 Spatial structure and settlement system of Nanjing city region in the 2001 adjustment of the *Nanjing City Master Plan*

Sources: Nanjing Municipal Planning Bureau; Qian (2013); Yuan, Gao and Wu (2016).

6.3.3 Recent adjustments to the application of polycentricity

The most recent stages of adjustments to the application of polycentricity in Nanjing's spatial planning are examined here.

2007 Nanjing City Master Plan

The duration of the *2001 Nanjing City Master Plan* was from 2001 to 2010. Upon approaching its final year, approved by the Ministry of Construction, a new round of master plan began to be formulated in 2007 (L. Jiang and Chen, 2010). It was the first time using the term 'metropolitan area' *(dushiqu)* in Nanjing's master planning documents replacing the current 'metropolitan development area' *(dushifazhanqu)*. The metropolitan area of Nanjing was defined by functions, scale, industries, and space, as well as transportation links. The *2007 Nanjing City Master Plan* (Nanjing Municipal Planning Bureau, 2009) highlighted that, under the principles of high-efficiency, high-quality and integrated development, in 10 to 20 years, the aim

was to guide and regulate Nanjing's transformative development from a 'metropolitan development area' to a 'modern metropolitan area'. Figures 6.11 and 6.12 illustrate the spatial structures of Nanjing city region and its metropolitan area according to the *2007 City Master Plan*. The polycentric idea was presented at both the city regional and metropolitan planning levels:

- At the city regional level: The spatial structure of the city region was represented by the two belts - one axis. Two belts: development belts along the north and south of Yangtze River, namely the Jiangbei and Jiangnan development belts of urban areas/towns. One axis: a north-south development axis of urban areas/towns formed along major transportation corridors (Ning-Lian, Ning-Gao[4] expressways). The settlement system within the whole city region comprised a five-level system consisting of one major city, three sub-cities, eight new towns, 34 lower tier towns (*xinshizhen*) and smaller villages.

- At the metropolitan level: The spatial structure of the metropolitan area focused on the major city as an urban core with the radial transportation corridors as development axes and the ecological space as the green wedge. Hence a polycentric open spatial structure with axial clusters developing along the river was proposed (Nanjing Municipal Planning Bureau, 2009).

[4] Ning is the short name for Nanjing; Lian is the short name for Lianyungang, a city located in northern Jiangsu province. Ning-Gao expressway is also named as Ning-Xuan expressway, and Xuan is the short name for Xuancheng, a city located in south-eastern Anhui province.

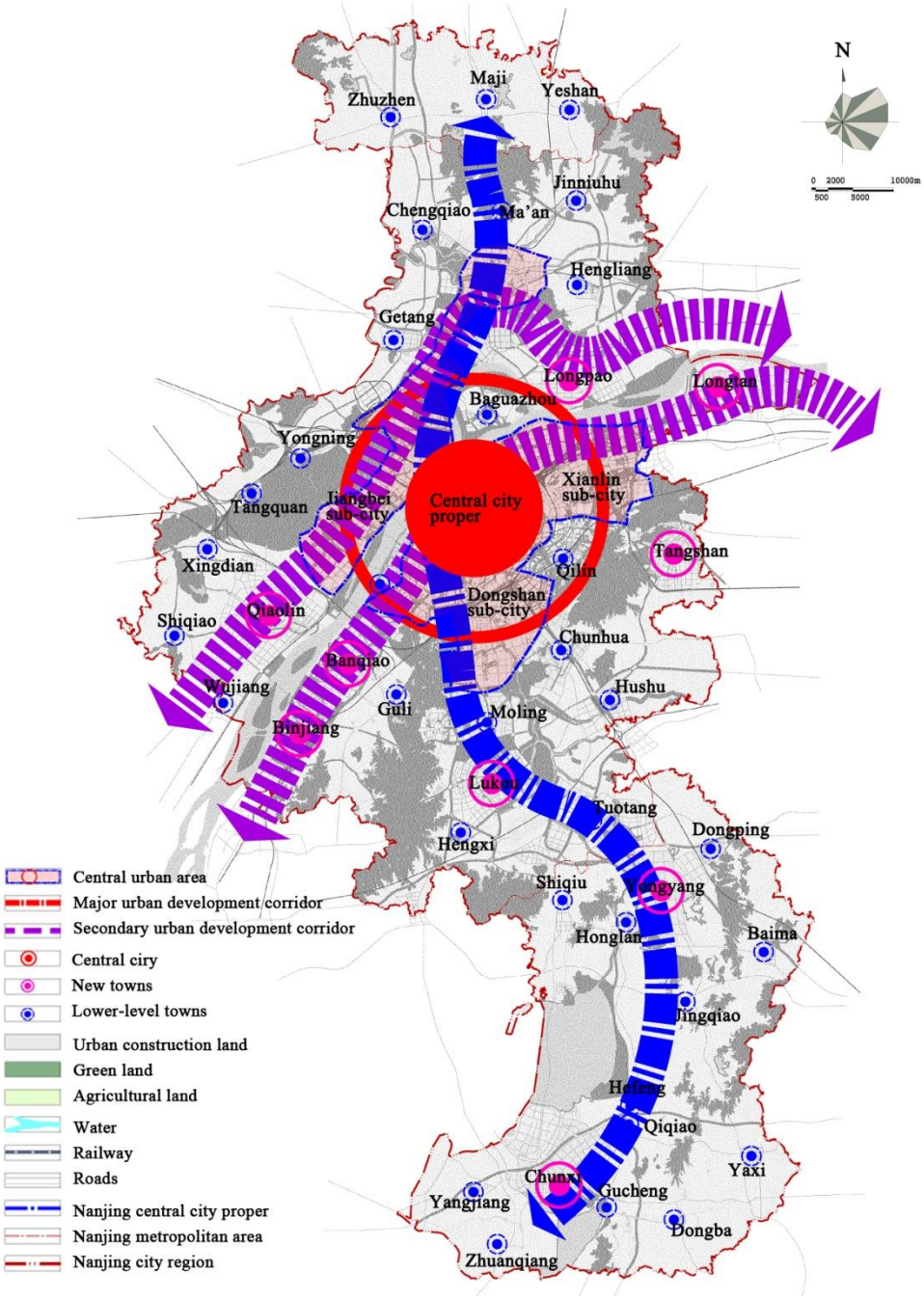


Figure 6. 11 Spatial structure of Nanjing city region in the *2007 Nanjing City Master Plan*

Sources: *Nanjing City Master Plan (2007-2020)* (Nanjing Municipal Planning Bureau, 2009). Adapted by the author.

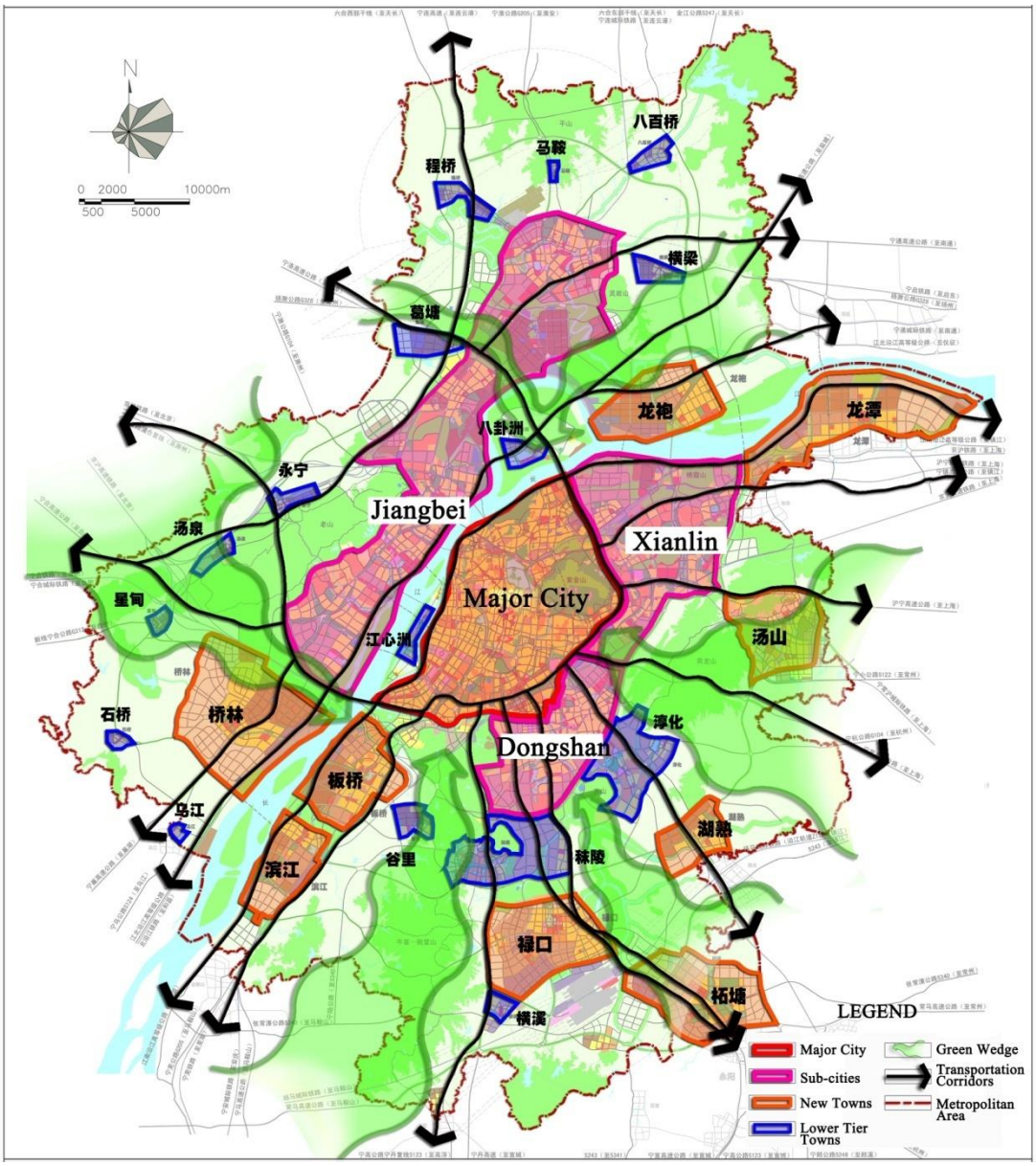


Figure 6. 12 Spatial structure of Nanjing metropolitan area in the *2007 Nanjing City Master Plan*

Sources: *Nanjing City Master Plan (2007-2020)* (Nanjing Municipal Planning Bureau, 2009). Adapted by the author.

2011 Nanjing City Master Plan

The current *Nanjing City Master Plan (2011-2020)* has continued to adopt a polycentric structure at the city regional and metropolitan scales, with minor revisions compared to the *2007 City Master Plan*. It has also applied polycentricity at the central city scale. Emphasising corridor development in order to promote the

regional economy as well as to enhance Nanjing's wider influences was especially highlighted at the metropolitan scale. The 'five axes' (see Figure 6.13) mainly focusing on Nanjing's metropolitan level offered five possibilities for future intra-city development in the immediate Nanjing city region, but also promoted cross-region integration and cooperation within the whole of the Yangtze River Delta Region. Figure 6.13 shows the spatial structure and settlement system of Nanjing city region in the *2011 City Master Plan*. The polycentric idea was presented at all three planning levels as described below:

- At the city regional level, the settlement system within the whole city region comprised a three-level system consisting of the central city, nine new towns, and 31 lower tier towns.

- At the metropolitan level, the spatial structure was described as one belt - five axes. The urban development belt lay along the north of the Yangtze River. The five development axes radiated from the central city as the core. More specifically, these were:
    1) the east urban development cluster along the Yangtze River;
    2) the urban development cluster along Shanghai-Nanjing inter-city railway;
    3) the urban development cluster along the Nanjing-Hangzhou inter-city railway;
    4) the urban development cluster along Nanjing-Gaochun highway; and
    5) the urban development cluster along the Nanjing-Wuhu railway (F. Yuan et al., 2016).

- The central city level consisted of one major city and three sub-cities (Dongshan, Xianlin and Jiangbei); Pukou is the urban core of the Jiangbei State-level New Area (*guojiaji xinqu*) (Nanjing Municipal Planning Bureau, 2016).

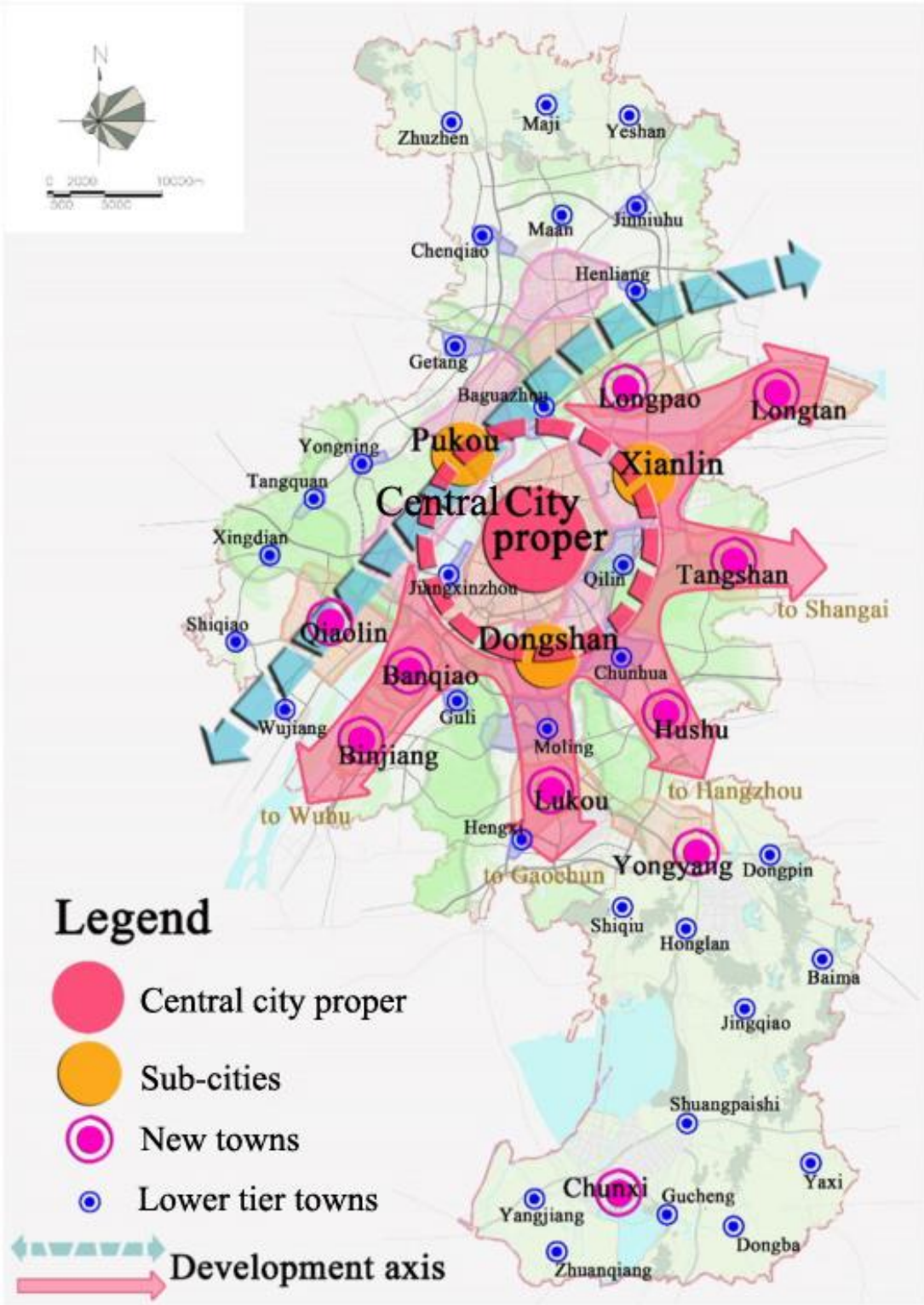


Figure 6. 13 Spatial structure and settlement system of Nanjing city region in the *2011 Nanjing City Master Plan*

Sources: Yuan, Gao and Wu (2016). Adapted by the author.

As is evident from the previous discussions, Nanjing started its polycentric development practices in spatial planning from the year 2001. However, the implementation process and planning effects have not always been as expected. As one interviewee pointed out,

> Nanjing started applying the polycentric idea early in its spatial planning. Recent rounds of the master plan all adopted the polycentric idea to Nanjing's spatial structure. However, the delivery and implementation of polycentricity were not as stated in the planning documents… The results turned out that surrounding centres gradually came together to form a continuous area, and the central city remained as concentrated as it used to be (P5, Nanjing, 2015).

As a provincial capital, Nanjing used to be one of the most important cities in the Yangtze River Delta Region. However, the city has been losing its regional competitiveness and wider influences under the shadow of Shanghai, and it 'has lost its economic leadership in the province compared with the performances of the Suzhou-Wuxi-Changzhou metropolitan area' (H. Qian and Wong, 2012, p.414). Unlike the most recent polycentric development practices in Guangzhou, which aimed to achieve a real sense of polycentric structure and balanced development mainly within Guangzhou city region, applying polycentricity in the *2011 Nanjing City Master Plan* had been used as a primary means to strengthen regional competitiveness and the integration of the core city of Nanjing. Polycentric nodes, especially with geographical advantages, were promoted as potential engines to help Nanjing integrate into wider regional development corridors. Moreover, it seems that the most recent polycentric development practices in Nanjing have not been in pursuit of balanced development, but have still been focused on the central city and certain sub-cities. Three sub-cities, Dongshan, Xianlin and Jiangbei, were top of Nanjing's priority list in terms of future urban development. Among them, the Jiangbei State-level New Area was newly approved by the State Council as a national level New Area on 27 June 2015. It became the 13th State-level New Area across China and the first New Area within Jiangsu province. Nanjing has already started to

devote great efforts in Jiangbei, with the purpose of facilitating its development into an independent centre on its own (Nanjing Municipal Planning Bureau, 2014). Table 6.4 summarises major changes mainly in the spatial structure and settlement system at three planning levels in Nanjing city master plans from 1980 until now. Since the open door policy, five rounds of city master plan have been formulated and implemented in Nanjing. With the increasing emphasis on polycentricity narratives, the settlement system at the city regional level has become simpler and more networked. Meanwhile, planning and development at the metropolitan level became more and more important, with a polycentric spatial structure being increasingly clear.

Table 6. 4 Nanjing city master plans from 1980 until now

Nanjing City Master Plans	City regional level		Metropolitan level	Central city level
	Spatial structure	Settlement system	Spatial structure	Spatial structure
1980-2000	Town group layout as ring-layers	Central city, suburbs, satellite towns, villages, small towns	——	——
1991-2010	——	City proper, peripheral towns, important towns, regular towns	Central city and its surrounding 12 cities/towns	Five areas
2001-2010 (revision of 1991 round)	Cross-shaped pattern	Central city, new urban districts, new towns, central towns, and general towns	A polycentric and open spatial structure with the Yangtze River as the main axis and the main city as the urban core	One city, three districts
2007-2020	Two belts-one axis	Major city, sub-cities, new towns, lower tier towns, villages	A polycentric open spatial structure with axial clusters developing along the river	——
2011-2020	——	Central city, new towns, lower tier towns	One belt-five axes	One major city, three sub-cities

Sources: Nanjing City Master Plan (1980-2000) (Nanjing Municipal Planning Bureau, 1983), Nanjing City Master Plan (1991-2010) (Nanjing Municipal Planning Bureau, 1991), Nanjing City Master Plan (2001-2010) (Nanjing Municipal Planning Bureau, 2001), Nanjing City Master Plan (2007-2020) (Nanjing Municipal Planning Bureau, 2009), Nanjing City Master Plan (2011-2020) (Nanjing Municipal Planning Bureau, 2016).

Now that the polycentric development practices in Guangzhou and Nanjing city regions have been discussed, the next section turns to uncover any challenges encountered during the above processes. Challenges in understanding polycentricity and delivering polycentric development strategies are examined based on the polycentric development practices of Guangzhou and Nanjing city regions, in order to consider the common problems in both cases.

6.4 Challenges of delivering polycentric development strategies: The key actors' perspectives

In order to fulfil the fourth objective of this thesis, which is to evaluate the challenges and difficulties in the making of Chinese edge cities under the delivery of polycentric development strategies at the local scale, this section mainly turns to examine the interpretation, planning and delivery of the polycentric idea at the city regional scale, in order to explore and uncover the challenges and problems in polycentric development practices in China. In doing so, this section mainly focuses on the key actors' views and experiences on the plan-making and plan-implementation processes. Although interviews were conducted only in Guangzhou and Nanjing city regions, as two typical cases which were selected from all sixteen Chinese super/mega city regions in terms of polycentricity application in spatial planning, key actors' views and perceptions could, to some extent, represent the common understandings of the polycentric idea in China. In addition, this section explores what have happened at the city regional scale. Thus this section examines the challenges of delivering polycentric development strategies particularly based on the perspective of key actors from the city regional scale. Key implementation bodies' experiences and perceptions at the local scale, as well as local development realities under polycentric development strategies, are further discussed in the local case studies.

Drawing from key stakeholders' views both in Guangzhou and Nanjing at the city regional scale, major challenges in understanding and planning polycentricity,

delivering polycentric development strategies and facilitating planning practices can be considered from four main perspectives: 1) understanding polycentricity in China as a policy tool in spatial planning; 2) understanding the horizontal conflicts in plan-making processes; 3) challenges in delivering polycentricity in the absence of an implementation framework; and 4) understanding the vertical conflicts between municipal governance and local autonomy.

Understanding polycentricity in China as a policy tool in spatial planning

Towards the end of the twentieth century, polycentricity was introduced as a new planning concept into China. However, until now, a theoretical framework for polycentricity has not been set up in a Chinese context. The concept of polycentricity has also been a fuzzy and flexible term open to different interpretations in China. On one hand, it is argued that the polycentricity concept has been one of the many Western terms introduced into China to better describe actually existing or potential urban phenomena, while very often those phenomena have already been recognised in China using different terms or concepts, but with similar meanings as polycentricity.

> I am not sure whether polycentric development strategies were actually introduced into China. It was very likely that the academic concept or terminology of polycentricity was brought from the West, as the modern and contemporary urban planning discipline was born in the Europe, and was introduced into China during a knowledge exchange between China and the West… There is no terminology as polycentricity in China's traditional urban planning framework. However, in effect, there is an ongoing and naturally emerging polycentric phenomenon in China, and we just use this "imported" Western concept to explain that reality (A4, Nanjing, 2015).

On the other hand, polycentricity has, to some extent, become a gimmick by political leaders in attracting investments to boost their local economy (see Guangzhou's case), and in further facilitating the central cities' prosperity through spatial restructuring (see the cases of Guangzhou and Nanjing). Strategic plans, in particular, have to some extent become a flexible and workable tool to help accommodate any ideas or

visions from key leaders. Interviewees expressed the ambiguous nature in applying polycentric strategies and the political negotiations behind this:

> From the spatial system perspective, polycentric development aims to promote a flat organisational spatial structure; while from the angle of political economy, the polycentric idea better integrates urban space and the decentralisation of power (A1, Guangzhou, 2015).

> Every city in a region or every centre in a city region is designated with its respective position within a polycentric structure, and in this way polycentric development could bring a kind of political rationality. Thus at this point, the polycentric idea is easy to promote in China (P1, Guangzhou, 2015).

> In most cases, polycentricity is just a concept proposed in city master plans. It is not necessary to clearly define every concept in planning documents. Planning in China is actually a political process in itself. Some of the designated sub-centres in planning documents were just planned to attract more investments through following policies (P3, Guangzhou, 2015).

Understanding the horizontal conflicts in plan-making processes

The interviews at the city regional scale generally show that major horizontal conflicts in planning and policy-making lie in the insufficient participation of governmental departments in strategic and master plan-making processes. For instance, the planning of Guangzhou's spatial plans reflects 'one of the fundamental features of Chinese planning. Planning is for growth but is weak in coordination. It is a top-down process organised by the municipal government and its development agency' (F. Wu, 2015, p.150). One interviewee involved in Guangzhou's strategic plan-making recalled that,

> From Guangzhou's strategic plan-making experience, it is true that its governmental departments or public sectors have less voice in terms of the introduction of polycentric development strategies, the establishment of development sequences and the formulation of implementation policies. However, when it comes to the implementation stage, the governmental departments act as main implementation bodies at the city regional scale. Having been ignored at previous stages would influence their decisions in producing action plans or other plans which are supposed to be based on the

> strategic plans… Each governmental department may change some details according to their respective focuses, responsibilities and needs. If certain aspects from strategic plans were well implemented by a certain department, then it would be clear that this department agreed with the strategic plan and relevant policies. If they were not well implemented, it would also be clear that the particular department did not agree with the strategic plan and relevant policies and changed them accordingly to meet their own departmental needs (P1, Guangzhou, 2015).

Meanwhile, horizontal conflicts that cross administrative boundaries under China's "administrative region economy" generally exist in planning and policy-making, as well as implementation processes. One interviewee stated rather helplessly that, based on his experiences of being involved in a number of planning projects,

> It will always end up being futile when trying to make strategic plans or designs across administrative boundaries (A2, Nanjing, 2015).

Challenges in delivering polycentricity in the absence of an implementation framework

In terms of delivering polycentricity, interviews with planners generally reflect that there is a lack of a policy framework or guidance to regulate and assess the implementation of polycentric development. The implementation framework for promoting polycentric development in China can easily be neglected under a strong, top-down municipal governance structure and interest-oriented mechanisms during the implementation stage. Here, 'planning in the public domain for the public good is replaced by planning for GDP growth. This GDP-centrism often benefits the 'real' chief planner – the political leader or mayor – and even directly contributes to their personal wealth' (F. Wu, 2015, p.187). Interviewees demonstrated this reality in practice,

> The application of polycentricity in China tends to focus more on spatial organisation and spatial morphology. So far, it is not clear what things should be done in applying polycentricity, and it also remains unclear as why to apply polycentricity and how to promote polycentric development. The

> *ESDP (European Spatial Development Perspective)* has been introduced into China for a long time, but we are still not sure how to promote polycentricity, although the concept of polycentricity has also been adopted in important regional planning documents, such as the *Urban Cluster Plan of the Yangtze River Delta Region* (P4, Nanjing, 2015).

> There were no powerful policies to support Guangzhou's polycentric development. On the contrary, industry-oriented and interest-oriented developments still maintain the dominant position in China. Because of these, nobody pays (enough) attention to long-term development. And also because of this, polycentric development will not be successful in Guangzhou (Centre director, Guangzhou, 2015).

Without effective and systematic policy guidance to regulate and facilitate the implementation of polycentric development strategies, in reality, the outcome of polycentric development practices in China have turned out to leave more development concentrated in the central cities, as well as competitive sub-centres at the local scale. Those planned "centres" at different spatial scales turned out to be unattractive to populations with insufficient public service facilities. This situation has even brought increased commuting populations from the central city to planned "centres", making traffic congestion even worse.

> "One major core, three sub-centres" was proposed in the *2001 Nanjing City Master Plan*, with the hope of decentralising the central city's population to its surrounding new urban districts. However, until now the total population of Nanjing central city almost remains unchanged. The reason behind this is that public facilities have not been effectively built in surrounding new urban districts. On one hand, polycentric development aims to decentralise populations out of the core city; while on the other hand, public service facilities in the central city are still busily being extended and built. As a result, the central city becomes increasingly concentrated and liveable, so people do not want to leave for other places (P5, Nanjing, 2015).

Through examining polycentric development practices in Guangzhou and Nanjing city regions, it can be said that the concept of polycentricity has become a strategic policy tool to facilitate economic growth, mainly through constructing and

developing new sub-centres/towns. From a policy perspective, the ultimate goal for adopting polycentricity is to achieve functional balance and spatial integration (see Chapter two); however, in effect, due to the absence of effective policy guidance, most new sub-centres/towns as polycentric nodes were either functionally dependent on central cities, or competitive with each other. Horizontal linkages among them have not been effectively established. As one interviewee noted,

> Although industries (mainly polluted ones) had been moved out of the central city to the planned "centres", these "centres" failed to evolve following the objective laws of industrial development as well as the common transformation paths from industrial areas to edge urban areas or "cities". This was probably because mainly polluted or inefficient industries had been moved from central cities to planned edge "centres". As a result, the entire city region had not actually been promoted as having the same efficiency and quality of the central city and its surrounding "centres" as a whole had not been improved… This approach of polycentric development seemingly helped to release central cities' functions (especially industrial functions for now), and in this way a polycentric spatial structure seems to be established. However, in reality, this could not be considered as polycentric development in the real sense. Functionally, the planned "centres" failed to become interdependent to the central city or complementary to each other. Competitive relationships are still remained between them (P4, Nanjing, 2015).

Understanding vertical conflicts between municipal governance and local autonomy

Although vertical conflicts between the municipal and local scales can best be revealed from the perspective of local actors and local practices, the interviews with planners and academics at the city regional scale also suggest that vertical conflicts are mainly reflected as an inadequate consideration of local demands, which represents one of the basic elements of upper-level governments (here it refers to municipal governments): municipally-controlled economies and governance. These characteristics are much more prominent in inland cities (such as Nanjing) compared with more open, coastal cities (such as Guangzhou). However, 'the local government has its own vested interest in the growth agenda' (F. Wu, 2015, p.166). As a result of

this, local governments often try their best to figure out new ways to obtain a certain degree of autonomy. As interviewees from Guangzhou explained:

> Local governments sometimes tend to act first and report afterwards. They tend first to promote the development of certain places on their own initiatives, and try to accommodate the actual construction practice to the local planning scheme and then upgrade it to the city regional level. Planning at city regional level cannot control site selection and the construction of key projects at a local level which are mainly controlled by local governments (P1, Guangzhou, 2015).

> Some of the designated sub-centres are actually more by luck rather than by planning. The planning documents failed to consider the urban (town) system as a whole. In order to increase local revenues, local governments very often act as independent entrepreneurs who try their best to attract projects and investments. This kind of local autonomy may result in the formation of some so-called sub-centres, but actually the starting point is not to build sub-centres to help form a polycentric spatial structure for the whole city region (Centre director, Guangzhou, 2015).

Examples are also evident and are still ongoing in Nanjing.

> Local governments would take initiatives to attract some projects in order to promote local development. This would probably break the development sequence and priorities set out in master or strategic planning documents. As a result, local construction land use and urban development would eventually become widespread… It is clear that from the perspective of the municipal scale, it is planned to maintain an orderly development sequence at the local scale, with certain areas being controlled and protected. However, from the local scale, municipal control over certain areas is considered a deprivation of local development autonomy. A most typical case is Jiangning in Nanjing, which is an area overlooked by the municipal government, yet it turns out to be one of the fastest growing areas within the metropolitan region, mainly promoted by the local government. (A4, Nanjing, 2015).

6.5 Summary and synthesis of polycentric development practices in Guangzhou and Nanjing city regions

This chapter mainly discusses polycentric development practices as well as the challenges in understanding, planning and delivering polycentric development in China from a strategic city regional perspective. The empirical evidence draws from two selected city regions, Guangzhou and Nanjing. Specifically, Guangzhou and Nanjing are examined respectively in terms of their application of polycentricity in strategic plans and city master plans over time. Three similar phases of applying polycentric strategies are identified both in Guangzhou and Nanjing, which are the initial spatial planning approach from the early 1980s, the original application and implementation of polycentricity from 2000, and recent adjustments to the application of polycentricity from 2010. After this, illustrated within plan-making and implementation processes, a number of challenges, both horizontal and vertical, in understanding, planning and delivering polycentric strategies are summarised, mainly from key actors' experiences and views at the city regional scale.

In general, Guangzhou applied the polycentric idea in all three rounds of their master plans after the open door policy in 1978, where polycentricity has been continuously adopted only at the central city scale. For the latest two rounds of Guangzhou master plans since 2001, polycentricity was applied at both the central city and city regional levels, with the *2001 City Master Plan* also applied at the metropolitan level. Nanjing, on the other hand, retained a monocentric development strategy until 2001. Different from Guangzhou, its latest three rounds of master plan applied the idea of polycentricity at both the city regional and metropolitan levels, with the *2001* and *2011 City Master Plans* also applied at the central city level. Table 6.5 illustrates the different levels at which polycentric development strategies have been applied in the various rounds of master planning activities in Guangzhou and Nanjing city regions.

Table 6. 5 Different levels of polycentricity application in different rounds of master plans of Guangzhou and Nanjing

Super/mega city regions		Application levels		
		City region(*shi yu*)	Metropolitan area (*shi qu*)	Central city (*zhongxinchengqu*)
Guangzhou	1984-2000			√
	2001-2010	√	√	√
	2011-2020	√		√
Nanjing	1980-2000			
	1991-2010			
	2001-2010	√	√	√
	2007-2020	√	√	
	2011-2020	√	√	√

Sources: Guangzhou City Master Plan (1984-2000), Guangzhou City Master Plan (2001-2010), Guangzhou City Master Plan (2011-2020), Nanjing City Master Plan (1980-2000), Nanjing City Master Plan (1991-2010), Nanjing City Master Plan (2001-2010), Nanjing City Master Plan (2007-2020), Nanjing City Master Plan (2011-2020).

After examining the application processes of polycentricity in both Guangzhou and Nanjing city regions, it can be said that adopting polycentric spatial development strategies in Guangzhou's spatial planning was initially considered to be an inevitable choice focusing first on the central city, then as a political initiative, and more recently as seeking a real sense of developing a metropolitan polycentric structure and balanced development. By comparison, Nanjing had long been planned as a monocentric structure, with its central area extended from an urban core to a metropolitan circle. From 2000 onwards, Nanjing started to apply polycentric ideas in its spatial planning as well. During its latest three rounds of master planning activities, the reasons for applying polycentricity changed from political strategies mainly promoted by national policies and massive new town construction trends, to primarily being a means to strengthen regional competitiveness and promote locally interdependent polycentric nodes.

In addition to the main reasons in applying polycentricity in three phases' plan-making processes, similarities and differences in polycentric development practices between Guangzhou and Nanjing can be summarised as follows, mainly in

response to the three key themes of the polycentricity concept in spatial development and spatial planning in China (see Chapter two). First, polycentricity is recognised as a fuzzy concept in both city regions, which is a good thing on one hand, as it could be used in different circumstances to fulfil different purposes. However, on the other hand, the terminology, polycentricity, has therefore been taken advantage of by political leaders in promoting land-centred urban policies, with the purpose of facilitating urban expansion and boosting GDP growth. The lack of theoretical discussions and empirical analysis of polycentricity has been part of the reason for this situation. Secondly, with regards to multiple scales in polycentricity application, the *1984 Guangzhou City Master Plan* was considered the first one to adopt the polycentric idea at this stage, only focusing on the central city scale. Later, Guangzhou applied polycentricity both in the *2000 Strategic Plan* and its subsequent *2001 City Master Plan* at all three spatial scales: the central city, metropolitan and city regional scales. More recently, with Guangzhou's new round adjustment of administrative divisions, metropolitan Guangzhou covers the whole municipality, the same area as Guangzhou city region. Therefore, in this round of strategic planning and city master planning, polycentricity was applied at both the central city and city regional (metropolitan) scales. Nanjing has applied polycentricity in the three rounds of plan-making processes until now. A polycentric spatial structure was adopted at the central city, metropolitan and city regional scales in the *2001 Strategic Plan* and *2001 City Master Plan*, as well as the recent *2011 City Master Plan*. Thirdly, multi-level governance under a polycentric framework was raised as a new understanding of polycentricity in Guangzhou. In the recent round of the strategic and master plans, the Guangzhou Municipal Government applied polycentricity to promote a flat organisational spatial structure and provide balanced development opportunities for each district, which in reality might overlook local needs to some extent and also deprive certain local governments of their autonomy. The interconnections and conflicts between municipal governance and local autonomy, as well as the emerging multi-level governance in Chinese super/mega city regions, are further examined in the analysis of local scale case studies. Moreover, another

similarity regarding polycentricity application can be noted both in Guangzhou and Nanjing at the city regional scale. Similar to what have already been discussed in Chapter five with eight super/mega city regions across China, in Guangzhou and Nanjing's case, the emerging polycentric development structure narratives have also been integrated with the classical hierarchical urban (town) system planning framework. The hierarchical urban (town) system is still being adopted in planning. However, with a polycentric framework, at each level within the system it is now planned to promote a more balanced and networked spatial structure, including all designated sub-centres or towns.

The term polycentricity originally emerged in the West. More recently, with regards to the growing popularity of this term amongst urban planners and policy-makers, it can be argued that the concept of polycentricity is increasingly being applied both as a strategic planning tool and as a political framework in the Western context. In China, although the terminology of polycentricity is relatively new, it has already become a popular term used to describe and explain future spatial structures as well as a strategic policy tool to balance development opportunities. However, there has not yet been a theoretical framework to figure out important issues regarding polycentricity within the Chinese context; nor has effective policy guidance regulating the implementation of polycentricity yet been developed. Both horizontally and vertically, conflicts make the delivery of polycentric development strategies hard to achieve. This chapter examines challenges which have hindered the understanding, planning and delivering of polycentric development observed from key actors at the city regional scale. To reflect and illustrate the challenges more fully, evidence during the formation of local polycentric nodes (Chinese edge cities) should also be taken into account. The following chapters on local case study analysis in Guangzhou city region describe the development realities at selected polycentric nodes. They focus on the formation of Chinese edge cities under polycentric development practices, and the challenges and difficulties in the making and remaking of them.

6.6 Selection of case studies

Based on the methodology discussed in Chapter four and using criteria established in Chapters three, five and six, the selection of the embedded case studies for this research will be explained in this section before Chapters seven to nine. Case studies have been chosen to cover the three types of Chinese edge cities – integrated, organic and newly planned edge cities at three spatial scales within city regions – central city; metropolitan; and, city regional scales. The different terms used in spatial plans for these nodal points at the three spatial scales are urban key areas for the central city scale; sub-districts for the metropolitan scale; and, central/satellite towns for the city regional scale. Based on these two criteria, in theory the number of potential options in choosing case studies is nine; and that is to say, three types of Chinese edge cities from three spatial scales respectively (see Table 6.6).

Table 6. 6 Potential options of case studies based on the two criteria, types and spatial scales

	Integrated edge city	Organic edge city	Planned edge city
Central city scale (Urban key areas)	✓	✓	✓
Metropolitan scale (Sub-districts)	✓	✓	✓
City regional scale (Central/satellite towns)	✓	✓	✓

In Chapter six, it was noted, that compared with Nanjing, the most recent application of a polycentric spatial development strategy in Guangzhou sought to proactively create a functional metropolitan polycentric structure characterised by balanced development. The functional interdependencies of sub-centres (or settlements) and the horizontal linkages between the core city and the sub-centres were highlighted as policy priorities. On this basis Guangzhou was selected as the polycentric context within which the embedded case studies would be located.

The case studies were selected from the nine potential options listed in Table 6.6, based on the content of the Guangzhou city master plans, interviews with municipal

key actors from Guangzhou, and the locations of Chinese edge cities (at the edge). In Guangzhou's case, at the central city scale, a case study was supposed to be chosen specifically from all the eighteen planned urban key areas in the *2011 Guangzhou City Master Plan* (see Figure 6.5). At the metropolitan scale, a case study was supposed to be selected from the planned clusters/sub-centres in both the *2001 Guangzhou City Master Plan* and the *2011 Guangzhou City Master Plan* (see Table 6.7). Panyu, Nansha and Huadu stood out because they were designated in both planning documents. Finally at the city regional scale, a case study was selected from the planned central/satellite towns in both the *2001 Guangzhou City Master Plan* and the *2011 Guangzhou City Master Plan*.

Table 6. 7 Clusters/sub-centres in the *Guangzhou City Master Plans*

Designated clusters/sub-centres at the metropolitan scale	Sources of information
Central cluster, **Panyu cluster (including Nansha)**, **Huadu cluster**	Guangzhou City Master Plan (2001-2010)
Panyu, **Nansha new district**, Eastern urban district, **Huadu**, Zengcheng, Conghua	Guangzhou City Master Plan (2011-2020)

Sources: Guangzhou Municipal Planning Bureau (2005; 2012).

During interviews, informal questions were asked relating to the selection of case studies, e.g. *"At certain spatial scales, which urban key areas/sub-districts/central or satellite towns would you consider as being or are emerging as Chinese edge cities?"*, *"Which types those recognised edge cities belong to?"*, *"Which one is the most representative in each type?"*. The case studies at the central city and the metropolitan scales were relatively easy to identify based on recommendations from interviewees. At the central city scale, the Guangzhou High-speed Railway (HSR) New Town was selected as the planned case study. It is being developed based around major infrastructure constructions (Guangzhou High-speed Railway Station), and is characterised as developing comprehensive urban functions. At the metropolitan scale, Nansha district was chosen as an integrated case study. This area is developing based on a previous national development zone designation. This is

because it has been identified as one of the key nodes/sub-centres in both rounds of Guangzhou's spatial planning activities. It has experienced several cycles of development and redevelopment and now can be characterised as a Chinese edge city within Guangzhou's overall polycentric development framework. It has been transformed from a suburban residential town, into a national development zone, and more recently into a multi-functional new urban district. National and provincial planning policies have played an important role in its development. For the third case study, an organic edge city was identified at the city regional scale, chosen from the designated central/satellite towns from the Guangzhou city master plans. Central/satellite towns have undergone some changes in terms of their meanings and functions. The case study was selected based on its continuous designation in the two rounds of Guangzhou's city master planning. Table 6.8 indicates the changes in meanings of central/satellite towns in the Guangzhou city master plans, and identifies the potential eight options (highlighted in bold) from which the case study could be chosen.

Table 6. 8 Central/satellite towns in the Guangzhou city master plans

Settlement system of the city region	Explanations of central/satellite towns	Designated central/satellite towns	Sources of information
Central urban area, central district areas, **central towns**, general towns	Select a number of certain sized towns within the whole city region, which are reasonably distributed, in superior geographic conditions and with better economic development; meanwhile, they normally rely on industries or infrastructure investments to develop into small cities.	Jianggao, **Shiling**, **Taiping**, **Shitan**, Shawan, **Tanbu**, **Aotou**, **Taihe**, **Xintang** (Nangang), **Dagang**, Shilou, Lanhe, Zhongxin	Guangzhou City Master Plan (2001-2010)
Central urban area, sub-centres, **satellite towns**, small towns	Major clustering areas at urban periphery for industries and populations during urbanization process; important service centres at rural areas which mainly develop specialised industries according to regional conditions and as an effective supplement for urban functions; critical nodes and the key focus to help promote the development of certain areas and achieve urban-rural integrated development.	**Xintang**, **Taiping**, **Aotou**, **Shiling**, **Tanbu**, **Dagang**, **Taihe**, Liangkou, **Shitan**	Guangzhou City Master Plan (2011-2020)

Sources: Guangzhou Municipal Planning Bureau (2005; 2012).

Central towns and satellite towns within Guangzhou city region have been systematically identified in both rounds of Guangzhou's city master planning. From the explanations of central/satellite towns within a polycentric spatial structure in Guangzhou they were identified based on two key criteria. First was origin. Their development was based on the original size of towns, or concentrated areas, within the city region. The other was function. Their further developments relied on industrial development and urbanization, with urban service functions increasingly becoming one of their future development priorities.

At the city regional scale, Xintang has been identified as the organic case study. It was selected based on its designation in the last two rounds of the *Guangzhou City Master Plan* and also recommendations from key actors. In 2001 Xintang was identified as one of the thirteen central towns in the *Guangzhou City Master Plan*

(Guangzhou Municipal Planning Bureau, 2005), and in 2011 was identified as one of the nine satellite cities in the *Guangzhou City Master Plan* (Guangzhou Municipal Planning Bureau, 2012). It was originally developed as an economic centre mainly based on self-organised economy, before the closer involvement of municipal and district level governments which in turn had helped to accelerate its growth towards a Chinese edge city. Table 6.9 illustrates the three selected case studies from the two perspectives, spatial scales and types of Chinese edge cities. Figure 6.14 shows the locations of these case studies within Guangzhou city region.

Table 6. 9 Selected three case studies in Guangzhou city region

	Integrated edge city	Organic edge city	Planned edge city
Central city scale (Urban key areas)			Guangzhou High-speed Railway New Town
Metropolitan scale (Sub-districts)	Nansha district		
City regional scale (Central/satellite towns)		Xintang	

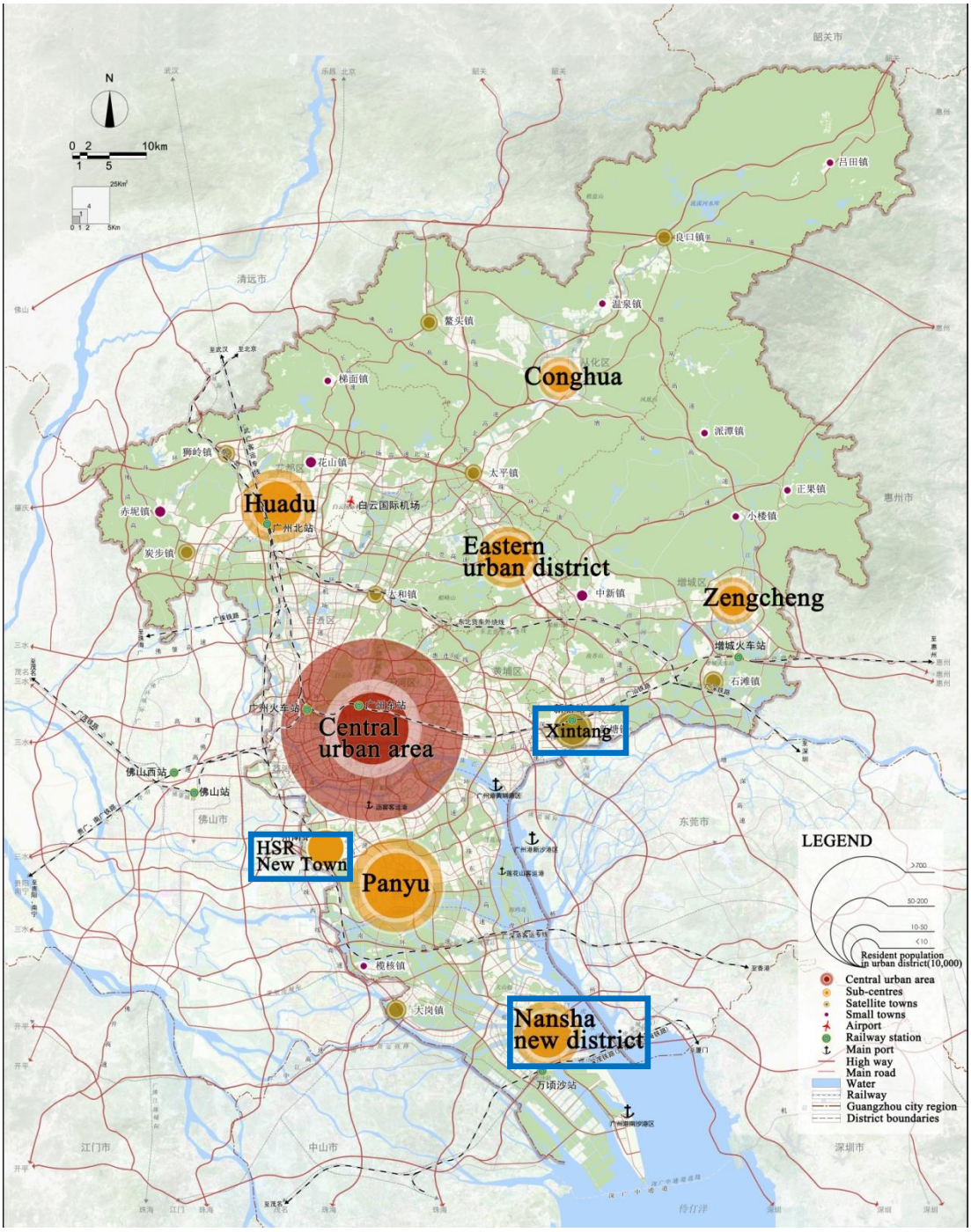


Figure 6. 14 Locations of three case studies in Guangzhou city region, China

Sources: Guangzhou Municipal Planning Bureau (2012). Adapted by the author.

CHAPTER SEVEN

Polycentric Development and the Making of an Integrated Edge City: The Case of Nansha

7.1 Introduction

Chapters seven to nine focus on each case study in turn, and seek to explore their different development trajectories in terms of three elements: spatial form, functional identity and governance arrangements, in order to understand how Chinese edge cities have been developed and redeveloped to help form a more integrated polycentric spatial structure. Some of the major challenges in effectively delivering polycentric development strategies are also revealed. This chapter focuses on Nansha district, which was planned as a sub-centre within Guangzhou's polycentric spatial development structure. The key issues used in exploring Chinese edge cities within a polycentric framework, including spatial location and spatial linkages; functions; and governance have been identified in Chapter three (see section 3.6.2). Nansha was originally an outer suburban town of Guangzhou city, with a landscape characteristic of numerous rural villages in southern China (see Figure 7.1), before it was designated as a national development zone, but it has subsequently experienced several cycles of redevelopment associated with further reorientations in function and governance since then. From spatial, functional, and governance perspectives, it can be concluded that Nansha district is emerging as a Chinese edge city moving away from a mono-functional national development zone by developing more comprehensive and integrated city functions. Challenges that may have hindered its development are also highlighted in this discussion. These mainly arise from

conflicts between municipal and local governance, the transformation of its economic structure and the inadequate level of general service provision.

Figure 7. 1 Rivers and houses of Nansha Island in the 1990s

Sources: Fok Ying Tung Foundation.

7.2 Spatial location and spatial linkages

With regards to the spatial characteristics of Nansha, two prominent aspects need to be discussed, its spatial location and linkages with Guangzhou's core city. Figure 7.2 illustrates the administrative divisions of Guangzhou city region including eleven districts and the specific location of Nansha district. Guangzhou's core city, or the central urban area of Guangzhou city region, incorporates the four whole districts of Tianhe, Haizhu, Liwan and Yuexiu, part of the southern Baiyun district, and the middle and southern parts of Huangpu district (Guangzhou Municipal Planning Bureau, 2012). Nansha district is located at the southern end of Guangzhou city region, and was originally an outer suburban town governed by Panyu county.

Figure 7. 2 Locations of Guangzhou city in China, and Nansha district within Guangzhou city region with its administrative boundary since 2012

From a geographical perspective, Nansha district is situated in the geographic centre of the Pearl River Delta. It is 38 sea miles away from Hong Kong, 41 sea miles away from Macao, and within 100 km from its geographical centre eleven city regions (or parts of the city regions) of the Pearl River Delta are located. Figure 7.3 shows the location of Nansha district within the Pearl River Delta. This primary gateway location had long been ignored by Guangzhou when it followed a more mono-centric development trajectory. After the Panyu county was absorbed into the administrative districts of Guangzhou city region, in 2000 (Nansha was a town within the Panyu district at that time), Guangzhou city region became a coastal city region with direct access to the South China Sea. Following this administrative re-organisation, the master planning for Guangzhou city region started to acknowledge and promote a polycentric spatial development structure (Guangzhou Municipal Planning Bureau, 2005; 2012). Nansha became a sub-centre within Guangzhou city region, partly attributable to its locational advantages. With its increasingly important role in Guangzhou city region, Nansha's location advantages also open doors to possible

horizontal connections with surrounding cities within the Pearl River Delta.

Figure 7. 3 Location of Nansha district in the Pearl River Delta, China

Sources: Nansha Government (2017b).

Nansha has experienced several changes in terms of administrative organisations. Figure 7.4 illustrates the different administrative areas of Nansha through its historical growth. From 2000 to 2005, Nansha was a town situated within Panyu district. In 2005, Nansha became an administrative district of Guangzhou city region, directly governed by Guangzhou Municipal Government. In 2012, Nansha district absorbed another three towns (Dongchong, Lanhe and Dagang) from Panyu district, and its total area became 803 km^2.

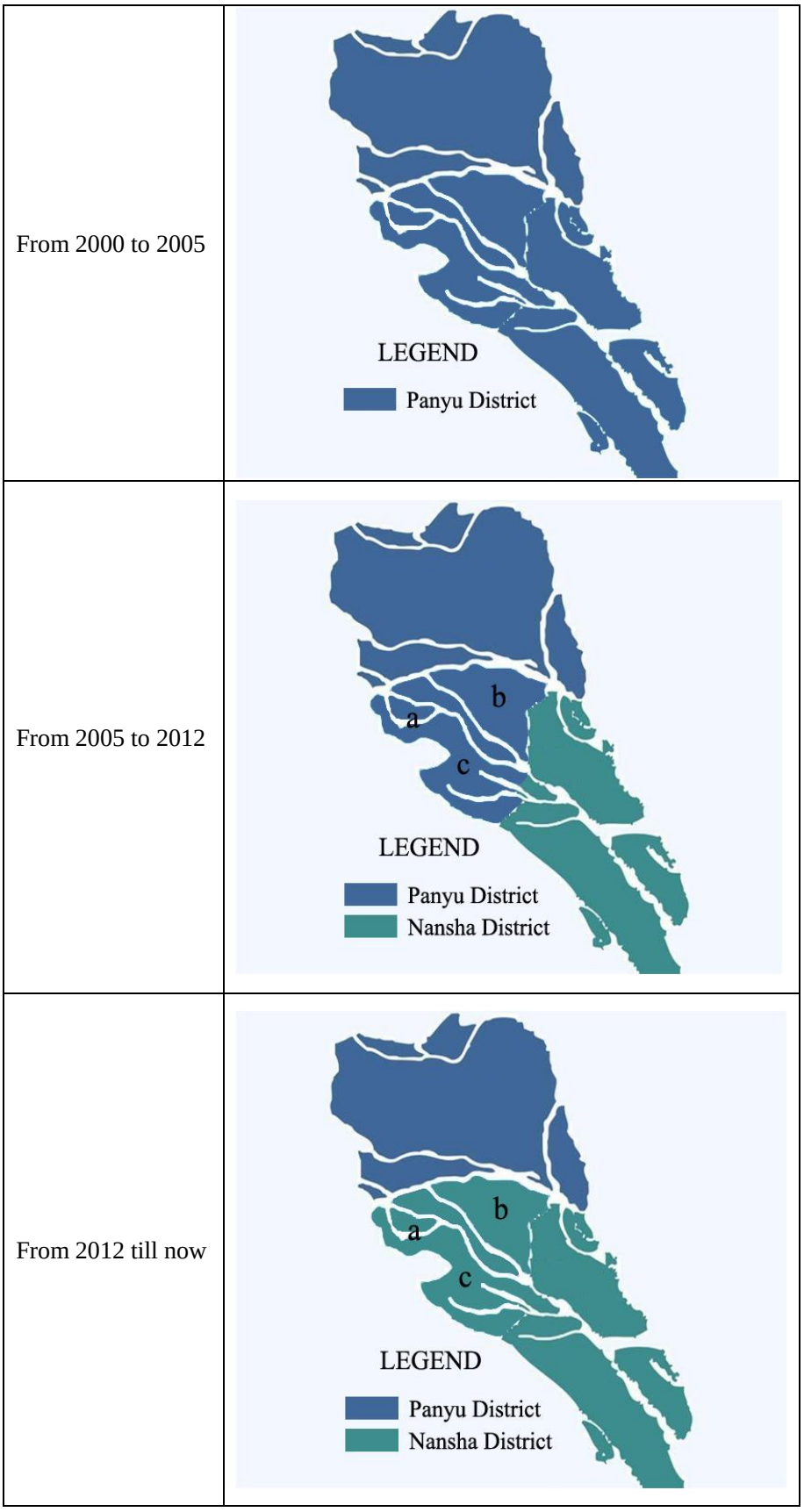


Figure 7. 4 Changes of administrative areas of Panyu and Nansha districts from 2000 until now

Notes: The three towns absorbed by Nansha district in 2012 are Lanhe town (a), Dongchong town (b), and Dagang town (c).

In terms of spatial linkages Nansha has established, or has planned to establish, various transportation links with the core city of Guangzhou, as well as other cities within the wider Pearl River Delta region. Nansha has convenient intra metro links with Guangzhou's core city: Line 4 connects the core area of Nansha with Guangzhou's core city; Line 18 and 22 have completed their planning phases and have been reported to the national level for approval before implementations (People's Government of Nansha District, Guangzhou City, 2017). Line 18 connects Guangzhou East Railway Station in Tianhe district and Wanqingsha in the southern part of Nansha district. Line 22 is planned as a fast metro line, which will connect Liwan district and Wanqingsha in Nansha. In addition, a total 169 km expressway has been completed in Nansha. The most important of which is the Nansha Port Expressway connecting the Nansha port area with Guangzhou's core city. The Guangzhou Municipal Development and Reform Commission is mainly responsible for the planning and coordinating the implementation of the city's infrastructure development strategies and plans (Guangzhou Municipal Development and Reform Commission, 2017).

Regarding the external links with Nansha's surrounding city regions, more efficient transportation links are also being developed. On July 1st 2017, a framework agreement on *Deepening the Co-operations between Guangdong-Hong Kong-Macao to Promote Constructions of the Greater Bay Area* was officially signed. From a spatial perspective, Nansha is establishing 'a half-hour traffic circle' with the key areas of eleven city regions within the Guangdong-Hong Kong-Macao (GHM) Greater Bay Area, aiming to transform its position into the geographical centre of a regional transportation hub within the Greater Bay Area (Southern Daily, 2017). Figure 7.5 shows the central location of Nansha district within the eleven city regions which constitute the GHM Greater Bay Area.

Figure 7. 5 Location of Nansha district in the Guangdong-Hong Kong-Macao Greater Bay Area, China

Sources: PwC (2017, p.5). Adapted by the author.

Nansha is a typical and interesting case in that different spatial entities within the area have established different connections with Guangzhou because of the development history of Nansha. Through its development trajectory, several spatial entities have existed with the name 'Nansha' but with different geographical, functional and governance arrangements. Before 1988 Nansha had been a typical outer suburban residential town under the jurisdiction of Panyu county, within Guangzhou city region. Since then the town has experienced several re-organisational cycles and the name 'Nansha' has related to different spatial entities (see Table 7.1). These have included 'Small Nansha' (S. Lin, 2013, p.473), 'Nansha National Economic-Technological Development Zone (NETDZ)', 'Nansha administrative district', 'Nansha State-level New Area (*guojiaji xinqu*)' (National Development and Reform Commission, 2012), and 'China (Guangdong) Pilot Free

Trade Zone Nansha Area of Guangzhou'. The administrative and governance organisations formed and responsible for these areas are significantly different. They include a planned coastal new city along the eastern bay (Small Nansha); a national development zone (Nansha NETDZ); a designated administrative district within Guangzhou city region (Nansha administrative district); a national level area with comprehensive functions charged with undertaking major national strategic tasks (National Development and Reform Commission, 2016); and, a significant part of China (Guangdong) Pilot Free Trade Zone (China (Guangdong) Pilot Free Trade Zone Nansha Area of Guangzhou).

First, 'Small Nansha' needs to be distinguished from 'Big Nansha' which became common terminology from 2001. The initial development of Nansha, since 1988, was promoted by the Fok Ying Tung Foundation, and only covered an area of 22 km^2. It was a long narrow area strip of development land along the eastern bay. This is the so-called 'Small Nansha' (S. Lin, 2013, p.473). According to the private investor, Mr. Fok Ying Tung, this 'Small Nansha' was expected and planned as a backyard garden to Hong Kong (S. Lin, 2013, p.479), designed mainly with service functions in mind for living, recreation and holidays. During the initial stages of Nansha's development, the main support and resources were provided by pre-eminent Chinese businessman based in Hong Kong. Mr. Fok Ying Tung, hoped to use his wealth and influnce to strengthen cultural ties between Hong Kong and mainland China. It is important to acknowledge that the hometown of Mr. Fok Ying Tung is Panyu (includes Nansha at this time).

The Nansha National Economic-Technological Development Zone (NETDZ) was officially approved by the State Council in 1993. Ten years later, in March 2004, Nansha NETDZ extended its spatial extent from 9.9 km^2 to 27.6 km^2, which provided Nansha much more space for further development (Guangzhou Municipal Planning Bureau, 2004).

Since 2012, Nansha district includes three streets and six towns, which are Nansha

street, Zhujiang street, Longxue street, Dongchong town, Lanhe town, Dagang town, Huangge town, Hengli town and Wanqingsha town. Here, streets and towns both represent the lowest geographical level at which census data are collected and released in China. Beneath the city are districts, and below the districts are streets and towns. The difference between streets and towns is that streets are always urban, while towns can describe a place within an urban district but also in a rural county (F. Wu and Phelps, 2011).

The Nansha State-level New Area covers the same area as the Nansha administrative district. In September 2012, the State Council officially approved the *Nansha State-level New Area Development Plan (2012-2025)* (National Development and Reform Commission, 2012). Nansha, therefore, became the sixth State-level New Area across China, and the only State-level New Area in the Pearl River Delta. This indicates that Nansha was designated as a nationally strategic area, with a significant status not only within Guangzhou city region, but within the wider Pearl River Delta as well.

At the end of 2014, the national State Council also approved the establishment of China (Guangdong) Pilot Free Trade Zones (FTZs), and Nansha was one of the three zones in Guangdong province. A 60 km^2 pilot free trade zone was established in Nansha district, which includes three major areas (central area, Qingsheng area, dock area), consisting of seven blocks in total. Figure 7.6 shows the locations of seven blocks within Nansha district, which together compose the Nansha FTZ. The industrial development of Nansha FTZ is intended to be focused on producer services such as shipping, logistics, international business, finance; and high-end manufacturing industries. More recently, Nansha has been designated as an important strategic cooperation node to help promote the One Belt One Road Initiative designed to reconnect China to many new and existing global markets following the ideas of the ‘Silk Road’. In May 2017, two nationally strategic platforms for the One Belt One Road Initiative were established in Nansha FTZ:

1) the One Belt One Road Initiative Research Institute, a part of the National Development and Reform Commission International Cooperation Centre, and

2) the Southern China International Production Capacity and Technology Cooperation Centre.

These aim to better attract international investments, promote technical collaborations and provide innovation and entrepreneurship services (Guangzhou Municipal Government, 2017).

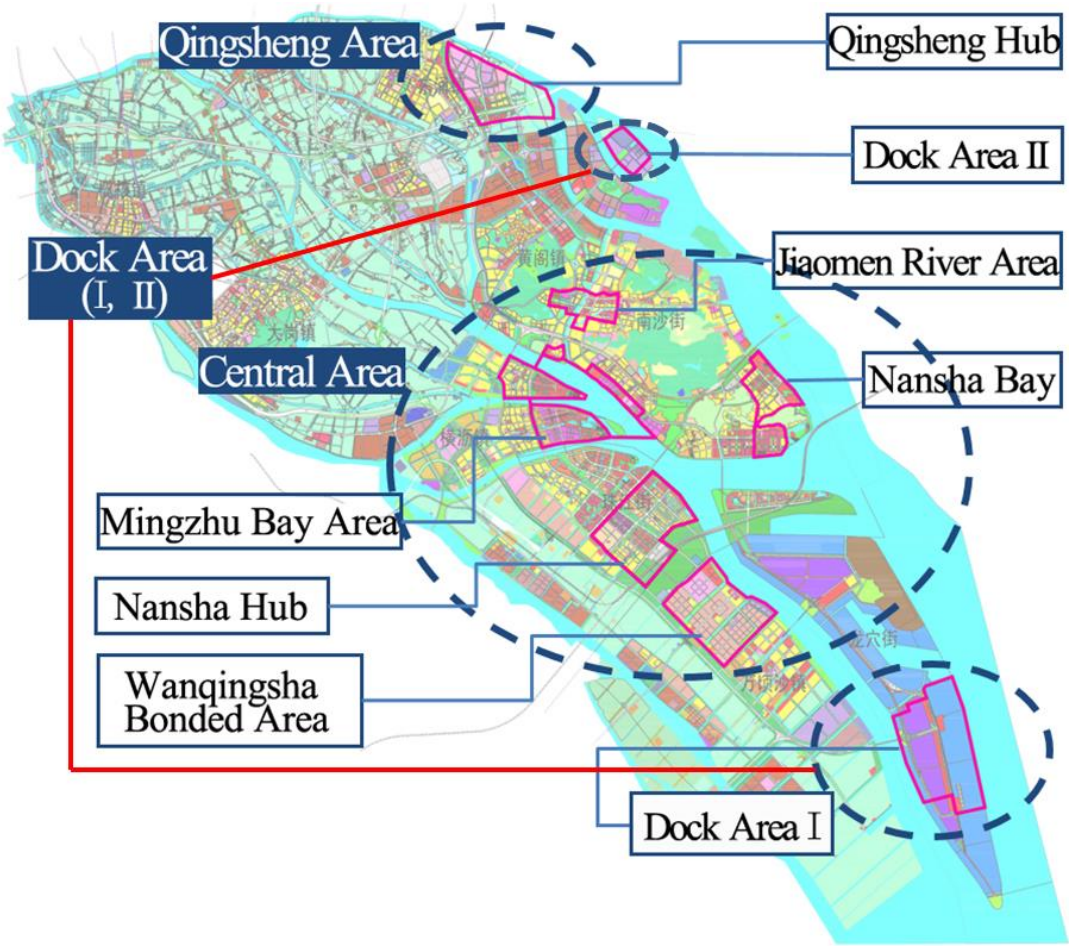


Figure 7. 6 Locations of seven blocks in Nansha district belonging to China (Guangdong) Pilot Free Trade Zone

Sources: China (Guangdong) Pilot Free Trade Zone Nansha Area of Guangzhou (2015).

To summarise, 'Small Nansha' was principally initiated and promoted by private investors. It provided the earliest development vision for Nansha, but had relatively weak linkages with Guangzhou's core city. Nansha NETDZ was the second phase of

Nansha's development within the Guangzhou city region and was promoted under the administration of Guangzhou Municipality. It was designated primarily as a means of developing a large employment node, with the aim of decentralising the industries away from Guangzhou's core city. The Nansha State-level New Area and Nansha FTZ became nationally designated areas aimed at fulfilling national development strategies, which would also help to improve the regional status of Guangzhou city region as a whole.

Table 7.1 summarises the changes in administrative organisations with the different identities for Nansha. These changing development spaces and strategic roles, granted Nansha with different identities and functions, and envisaged that it would develop co-operations not only with its neighbouring cities, but also with many potential partners in a globalising world. As one interviewee noted, 'a number of national strategies and important roles given by the State to Guangzhou, are actually delivered, or fulfilled, by Nansha. These include the State-level New Area, FTZ, and so on' (GO2, Nansha, 2015).

Table 7. 1 Changes of administrative organisations with different identities in Nansha

	'Small Nansha'	National Economic-Technological Development Zone		Administrative District		State-level New Area	Free Trade Area
			Extend the scope		Include three towns from Panyu		
Starting year	1988	1993	2004	2005	2012	2012	2014
Total area (km²)	22	9.90	27.60	544.12	803	803	60
Relationships with Guangzhou	Being neglected by Guangzhou	Passively accepting the expanding and relocating industries and population		One of the sub-centres within Guangzhou city region		Helping fulfil nationally strategic tasks for Guangzhou city region	

Sources: Li (2007); Guangzhou Municipal Planning Bureau (2004); Guangzhou Municipal Planning Bureau Nansha Planning Branch (2012).

7.3 Functions

To examine to what extent Nansha has become an edge city within Guangzhou's polycentric structure, in this section the *functions* of Nansha will be discussed, mainly focusing on two aspects, the major functions of Nansha and its functional connections with Guangzhou's core city.

7.3.1 Major functions

From a planning perspective it is evident from the two rounds of the Guangzhou city master plan (see Table 7.2), two major trends can be observed in Nansha's major functions: 1) port-related industry continues to be designated as the main functional focus for Nansha, and 2) the other functional focus has changed from processing industry and agriculture to the modern services as the new strategic priority. In Nansha's local plans, continuities and differences can both be observed, both overtime, and in comparison to the city regional Guangzhou city master plans. Nansha's local plans have followed the functional positioning established by the Guangzhou city master plans, in terms of port-related industry, logistics, and services. In addition, both rounds of local plans have also identified the equipment manufacturing industry and new technology industries as industrial activities to be promoted as part of its functional focuses.

Table 7. 2 Major functions established from the Guangzhou city master plans and Nansha local plans

Guangzhou City Master Plans	Major functions	Nansha local plans	Major functions
Guangzhou City Master Plan (2001-2010)	• **Port-related industry** • Export-oriented processing industry • High-yield, high-quality and high-return agriculture	2004 Nansha Area Development Plan	• **Modern logistics** • **Port-related industry** • Equipment manufacturing industry • High and new technology industries • **Comprehensive services**
Guangzhou City Master Plan (2011-2020)	• **Modern services** • **Port-related advanced manufacturing industry**	Comprehensive Planning of Nansha New City (2012-2025)	• A State-level New Area promoting co-operations between Guangdong, Hong Kong and Macao • An experimental area exploring the new urbanization • **Regional high-end modern services** • **International shipping and modern logistics** • National science and technology and innovation industries • Marine industry and equipment manufacturing industry

Sources: Guangzhou Municipal Planning Bureau (2005); Guangzhou Municipal Planning Bureau (2012); Guangzhou Municipal Planning Bureau (2004); Guangzhou Municipal Planning Bureau Nansha Planning Branch (2012).

In practice, Nansha's economic structure has long been characterised with an emphasis on the secondary sector. From Table 7.3 it can be seen that the proportion of Nansha's secondary sector remained around 70% to 80%, from 2009 to 2015, much higher compared with that of the primary and tertiary sectors. Moreover, compared to the Guangzhou city region as a whole, Nansha's secondary sector as proportion of GDP is much more significant. Table 7.4 shows that at 69.82% it has the highest proportion of the eleven districts and countries and generally the secondary sector is two times as significant as the whole of Guangzhou city region. On the other hand, a significant decrease can be witnessed in the proportion of

Nansha's second sector in GDP, from 2009 to 2015. In 2012, Nansha absorbed another three towns from Panyu district, so the proportion of the secondary sector dropped by almost 8%. Till 2015, the proportion has dropped nearly 10% compared with that in 2009. Therefore, a transformation in Nansha's economic structure has been taking place, especially from the secondary to tertiary sectors.

Table 7. 3 The composition of GDP in Nansha, 2009-2015 (%)

	2009	2010	2011	2012	2013	2014	2015
Primary sector	3.1	2.8	2.6	5.1	5.1	4.7	4.5
Secondary sector	79.6	80.6	80.6	73.0	74.3	73.7	69.8
Industry	73.8	76.5	76.2	69.7	71.2	70.6	65.3
Construction	5.8	4.1	4.4	3.3	3.1	3.1	4.5
Tertiary sector	17.3	16.6	16.8	21.9	20.6	21.6	25.7
Transport, logistics and postal services	5.0	2.9	2.7	3.4	—	2.6	2.6
Wholesale and retail	4.1	3.2	3.0	4.2	—	5.1	6.4
Hotel and catering	0.9	1.0	0.9	1.6	—	1.5	1.4
Real estate	2.5	2.0	2.8	4.2	—	4.9	5.9
Other services	4.9	7.5	7.4	8.6	—	7.5	9.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Nansha Statistical Bureau (2010-2016).

Table 7.3 also implies that Nansha's tertiary sector has experienced a sharp increase. The proportion of its tertiary sector rose from 16.8% in 2011 to 25.7% in 2015, an increase of 52.98%. Among all of the activities in the tertiary sector, the development of wholesale and retail, and real estate contributed most, each increased by 113.33% and 110.71% respectively. This manifests that during this initial period of Nansha's economic transformation, the wholesale and retail, especially real estate has been its development priorities. Figure 7.7 shows the fast development of the real estate projects in Nansha.

Table 7. 4 The composition of GDP in Guangzhou city region and its district/counties, 2015

	GDP (100 million yuan)	Proportion of primary sector in GDP, %	Proportion of secondary sector in GDP, %	Proportion of tertiary sector in GDP, %
Guangzhou city region	18,100.41	1.25	31.64	67.11
Liwan	1,015.79	0.48	21.29	78.23
Yuexiu	2,699.63	0	2.01	97.99
Haizhu	1,422.97	0.16	13.98	85.86
Tianhe	3,438.65	0.04	12.13	87.83
Baiyun	1,534.97	2.14	21.57	76.29
Huangpu	2,874.07	0.24	66.66	33.10
Panyu	1,604.22	1.63	34.89	63.48
Huadu	1,080.21	2.79	55.24	41.97
Nansha	**1,139.19**	**4.50**	**69.82**	**25.68**
Conghua	349.12	6.80	44.34	48.87
Zengcheng	941.60	5.02	51.62	43.36

Sources: Guangzhou Statistical Bureau (2016a).

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Figure 7. 7 The existing and emerging real estate communities in Nansha

Sources: Photo taken by the author.

Regarding the spatial distribution of Nansha's three economic sectors, it can be seen from Figure 7.8 that in 2012 there were about seven major industries across Nansha, including logistics, processing and manufacturing industry, petrochemical industry, equipment manufacturing industry, grain industry, steel industry, and high and new technology industry. Among them, processing and manufacturing, and equipment manufacturing industries were pillar industries, taking up the largest space compared with others, and dispersed across the whole district. The increase in auto-assembly and automotive parts manufacturing, in particular, accounted for 52.05% of the total growth of secondary sector in 2012 (Guangzhou Municipal Planning Bureau Nansha Planning Branch, 2012). While newly rising industrial sectors like high and new technology industries have only emerged recently, and have been concentrated in relatively small areas.

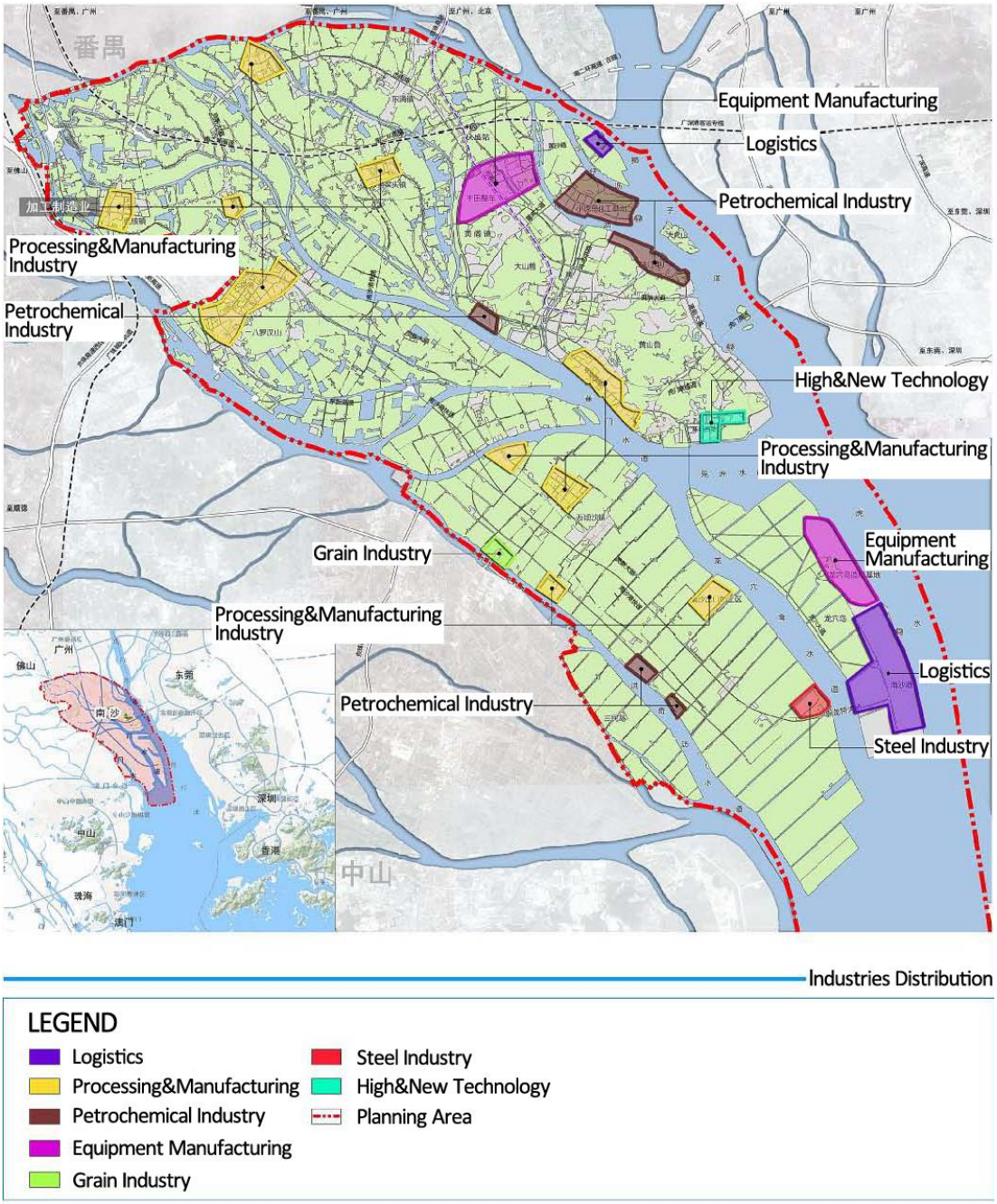

Figure 7. 8 The distribution of different industries in Nansha district, 2012

Sources: *Comprehensive Planning of Nansha New City (2012-2025)* (Guangzhou Municipal Planning Bureau Nansha Planning Branch, 2012).

Therefore, it is clear that Nansha's major economic function is still focused upon an industrial-oriented economic secondary sector. This is primarily because Nansha's initial industrial development focus was to act as a replacement location to realise the displacement and expansion needs of heavy industries from Guangzhou central areas,

and thereby to help fulfil Guangzhou's 'moderately heavy' industrial development strategies. The subsequent 'big industry, big logistics and big transportation' idea contained in the *2004 Nansha Area Development Plan* (Guangzhou Municipal Planning Bureau, 2004) guided the following 10 years of Nansha's economic development. More recently, as a newly established State-level New Area, (and a significant part of Guangdong Pilot Free Trade Zone), Nansha's economic focus had been changed from secondary to tertiary sectors, as an increase in Nansha's tertiary sector between 2009 and 2015 can be evidenced from Table 7.3. Especially the focus has been placed on logistics, high and new technology, and modern services industrial sectors. These are highlighted and promoted both in the *Guangzhou City Master Plans* (Guangzhou Municipal Planning Bureau, 2005; 2012) and the Nansha local plans (Guangzhou Municipal Planning Bureau, 2004; 2012).

7.3.2 Functional connections

After examining the major functions of Nansha, this section considers the functional connections or linkages between Nansha and the core city of Guangzhou, in order to explore whether it has or is becoming functionally connected with the core city to help form a polycentric spatial structure.

At present, Nansha's functional connections with Guangzhou as a core city are predominantly evident as a global gateway through port logistics, and more locally in connecting Guangzhou's core city with Hong Kong and Macao. Table 7.5 shows a comparison of cargo throughput between Nansha port and Guangzhou port from 2009 to 2015. Guangzhou port consists of four port areas in total, including its inner port, Huangpu port, Xinsha port and Nansha port. In 2014, the Guangzhou port as a whole was ranked fifth of all Chinese major ports, based on cargo throughput. The percentage of Nansha' cargo throughput as a proportion of Guangzhou's total cargo throughput saw a significant increase from 35.1% in 2009, to 57.4% in 2015. This indicates that Nansha as a port has not only increased significantly as a unique feature compared to other districts in Guangzhou city region, but has also established

strong functional linkages with Guangzhou urban core through port logistics. Moreover, recently, in 2015, this functional connection was further enhanced, with the Guangzhou Shipping Trading Limited Company being located to Nansha (People's Government of Nansha District, Guangzhou City, 2016), with the purpose of helping to promote Guangzhou as both an international shipping centre, and also an innovate shipping centre based on e-commerce as the new development model for Guangzhou's port logistics (Guangzhou Shipping Trading Limited Company, 2017).

Table 7. 5 The cargo throughput of Nansha port and Guangzhou port from 2009 to 2015

		2009	2010	2011	2012	2013	2014	2015
Cargo Throughput (100 million ton)	Nansha port	1.28	1.43	1.64	2.00	2.38	2.57	2.87
	Guangzhou port	3.64	4.11	4.31	4.35	4.55	4.82	5.00
Proportion, %		35.16	34.79	38.05	45.98	52.31	53.32	57.4

Sources: Nansha statistical year book (2014), official website of Nansha government; Shanghai International Shipping Institute (2015); Guangzhou Statistical Bureau (2016c); People's Government of Nansha District, Guangzhou City (2015); Nansha Statistical Bureau (2016).

In terms of Nansha's intermediary role for connecting Guangzhou (or Guangdong province as a whole) with Hong Kong and Macao, in 2011 Nansha State-level New Area was designated as one of three key centres for strengthening Guangdong-Hong Kong-Macao co-operation as articulated in the *12th Five-year Plan for National Economic and Social Development*. The other two key hubs are Qianhai, in Shenzhen, and Hengqin, in Zhuhai.

More recently, new collaborative opportunities associated with big data have been established. For instance, the Guangzhou Supercomputing Centre Nansha Branch was completed in 2016 (People's Government of Nansha District, Guangzhou City, 2017), which is the first leading platform across China connecting the mainland

China and Hong Kong in collecting, analysing big data, and providing data support for the development and transformation of scientific research (GD.CHINANEWS, 2014). Furthermore, in 2007, Hong Kong University of Science and Technology (HKUST) Fok Ying Tung Research Institute was established in Nansha and is intended to be a research and education base of excellence in the Pearl River Delta, and promote knowledge exchanges between Guangdong, Hong Kong and Macao. In 2015, the research institute was upgraded and designated as an International Science and Technology Cooperation Base (People's Government of Nansha District, Guangzhou City, 2016). Moreover, in September 2017, Nansha district, Oxford University and the Ally Bridge Group jointly established the Oxford (Guangzhou) Innovation and Development Centre. This was located in Nansha district. According to the strategic framework agreement, 'institutes, universities and enterprises from home and aboard as well as governmental departments will be involved, aiming to make the centre a high-end international organisation specialising in the Guangdong-Hong Kong-Macao Greater Bay Area' (NEWS GD, 2017, para.2).

In summary, at least from a functional perspective, Nansha has started its transformation towards a comprehensive high-tech, new-tech and modern services industrial growth node. Meanwhile, functional connections with Guangzhou's core city have notably been established in Nansha district, globally through port logistics and locally mainly through a series of newly established cooperation centres or institutions.

7.4 Governance

This section moves on to the third issue, governance changes in Nansha, with the main aim to explore its emerging multi-level governance arrangements. Three periods of evolution for Nansha will be explored in this section primarily based on the governance changes which also coincide with the three stages of Guangzhou's polycentric development practices. More specifically, these relate to:

1) the county-level governance as a port area and the initial national development zone, which can be contextualised against the background of Guangzhou's initial spatial planning efforts after the open door policy;

2) the municipal-level governance under Guangzhou's original polycentric framework, coming with Guangzhou's original application and implementation of polycentricity; and,

3) the multi-level governance with greater local autonomy, which is associated against a background of recent adjustments to the application of polycentricity in Guangzhou city region.

7.4.1 County-level governance as a port area and national development zone

In 1988, the preparatory group on promoting integrated development of Nansha and Shajiao areas in Panyu county held its first meeting with the Hong Kong Chinese General Chamber of Commerce. Fok Ying Tung was appointed as the head of the preparatory group at this meeting (Nansha Chronicles Office, 2011). This preparatory group especially Fok Ying Tung, played a huge role in Nansha's initial construction and development. Until 1990, Nansha's development was a common concern of Guangdong province and Guangzhou city. In this year Nansha was identified, as a key development area following the nationally important 'Open door policy'. Nansha's Economic Zone Management Committee (*jingjiqu guanweihui*) was therefore established as a county-level unit, and governed by the Panyu County Government (Nansha Chronicles Office, 2011). Since then, Nansha's development has been recognised as being highly significant at the national level, and national leaders visited Nansha three times during the next three years. In 1992, the State Council approved Nansha port as a foreign trade port. In the following year, a National Economic and Technological Development Zone (NETDZ) was established by the State Council, which was the second NETDZ in the Guangzhou city region. The Management Committee of Nansha Economic and Technological Development Zone was established closely aligned to the former Economic Zone Management

Committee, which, at the time, was also an agency of the Panyu County Government. Later, in 2000, with Panyu county changing into Panyu district, Nansha also became part of the Guanzhou municipality. Meanwhile, the 'moderately heavy' industrial development strategy was proposed for Guangzhou (China Economic Net, 2011), and Nansha began to accept the expanding and relocating industries from Guangzhou's central areas.

7.4.2 Municipal-level governance

In 2000, the *Outline of Guangzhou City Overall Strategic and Concept Plan* (Guangzhou Municipal Government, 2000) proposed an urban spatial structure that could be summarised by a set of eight-word principles: 'southward expansion, northward optimisation, eastward extension, westward combination'. Nansha became one of the key nodes for Guangzhou's polycentric development strategies, and the core area of Guangzhou's southward spatial and industrial extension. The Nansha Development Zone Construction Headquarters (*kaifaqu jianshe zhihuibu*) was officially established in 2001. This body was to be solely in charge of the planning, construction and management of the development zone. This organisation was given the same authority (approval rights and management privileges) as the Guangzhou Municipal Government (Nansha Chronicles Office, 2011), and going beyond the previous county-level governance powers and responsibilities. Since then, Nansha's leading construction and development body changed from Nansha Development Zone Management Committee whose power was given by Panyu district, to the Nansha Development Zone Construction Headquarters which gained authority from the Guangzhou Municipality. Meanwhile, the main investment body changed from Fok Ying Tung Foundation which belonged to social/private investments into governmental investments (T. Wen, 2010). In the same year, the Guangzhou Municipal Government held a site meeting in Nansha with the purpose of promoting Nansha's development, which has subsequently been regarded as the prelude to the 'Big Nansha' development (Nansha Chronicles Office, 2011). The main developmental focus of the new Nansha Development Zone was to follow an

industrial-driven and project-oriented model, which in fact aimed to build a centre of heavy industry for the Pearl River Delta (S. Lin, 2013). Against this background, the construction of the Nansha Development Zone entered a new stage. A series of heavy industrial projects were attracted to, and located in Nansha, mainly focusing on automotive, shipbuilding, petrochemical, steel, and heavy equipment manufacturing (S. Lin, 2013). As one interviewee explained, 'the "Big Nansha" development, at that time, aimed at developing four main industries, steel, logistics, port and petrochemical industries. Nansha's positioning during the early "Big Nansha" period was just industrial development' (P6, Nansha, 2015).

The *2004 Nansha Area Development Plan*, compiled by the Guangzhou Municipal Planning Bureau, is the first programmatic planning document in Nansha's history. It established the leading development idea of 'big industry, big logistics and big transportation'. 'The *2004 Nansha Area Development Plan* at this time treated Nansha as an independent city. Thus comprehensive considerations were given to its future development. This plan indeed provided effective guidance for nearly a decade' (P7, Nansha, 2015).With the acceleration of industrialisation, Nansha's cultivated land continued to decline as the area designated as a construction area, and was subsequently developed dramatically. Land available for development increased seven fold between 1990 and 2006 (Q. Zhou et al., 2009). It is clear that Nansha's initial development relied on locally based development opportunities, and then, under central government-led investments and the guidance of city regional level polycentric development strategies, it experienced rapid industrial development and rapid infrastructure construction during this period.

In 2005, the administrative divisions of Guangzhou city region were adjusted again and Nansha district was officially established, with a total area of 544.12 km^2 (K. Li, 2007). In 2008, the governing body of the Nansha Development Zone was changed back to Nansha Development Zone Management Committee, which took over the management privileges of the Nansha Development Zone Construction Headquarters (Southern Daily, 2008). 'The development focus of Nansha turned away from simply

focusing on economic development into a more comprehensive construction of Nansha, including economy, environment, living qualities, public services, and so on.'(P7, Nansha, 2015) Nevertheless at this point, Nansha's industrial development strategy still followed the previous heavy industrial-oriented development mode. This can be illustrated by Table 7.3 where, in 2009, the proportion of the secondary sector in GDP was 79.6%. The driving force behind this was the strong support of national and municipal governmental policies.

7.4.3 Multi-level governance

Since 2010, Nansha's development has attracted more and more attention, associated with its more prominent economic and strategic position in Guangzhou. Under the recent adjustments to the application of the polycentric planning principles in Guangzhou city region, aiming to seek a real sense of developing a polycentric city regional structure and balanced development, Nansha has become one of the six sub-centres in the *Guangzhou City Master Plan (2011-2020)* (Guangzhou Municipal Planning Bureau, 2012). In 2011, with the release of *12th Five-year Plan for National Economic and Social Development*, the development of Nansha has been recognised as being of nationally significance as it was explicitly recognised as being an integral part of national strategies. Later in 2012, Nansha became the sixth State-level New Area. Nansha was designated with comprehensive planning and development functions in order to help promote co-operation between Guangdong, Hong Kong and Macao, and was planned as an important economic pole within southern China. Part of this function includes being a regional centre for ecological, transportation and the construction of public services (Guangzhou Municipal Planning Bureau Nansha Planning Branch, 2012). These state-level strategies created Nansha as a significant platform in representing Guangzhou city region, Guangdong province and even the whole nation by participating in international competitions and co-operations.

With these changes in its position and role, the governing bodies and governance

structure of Nansha also changed. Unlike other district governments, the governance of Nansha started to involve different levels of government as well as various non-governmental actors. Meanwhile, Nansha's local government was given the same degree independence as the Guangzhou Municipal Government. These powers and responsibilities were decentralised to Nansha by the Guangdong Provincial Government.

The origins of multi-level governance arguably started from studies of practice across the EU. It is generally accepted that Gary Marks (1992) first used this phrase multi-level governance to capture developments in EU structural policy following major reforms in 1988 (Jordan, 2001; Bache and Flinders, 2004; Roe, 2009). Marks (1993, p.392) defines the multi-level governance in the EU as:

> A system of continuous negotiation among nested governments at several territorial tiers – supranational, national, regional, and local – as the result of a broad process of institutional creation and decisional reallocation.

Following Marks, Bache and Flinders (2004, p.3) explain the concept of multi-level governance in the book *Multi-level Governance* as follows:

> The multi-level governance concept thus contained both vertical and horizontal dimensions. 'Multi-level' referred to the increased interdependence of governments operating at different territorial levels, while 'governance' signalled the growing interdependence between governments and non-governmental actors at various territorial levels.

Based on the above explanations, for Nansha, the emergence of multi-level governance can be elaborated through two further perspectives: first, it is a complex but coherent governance structure; and second, the decentralised power and autonomy from Guangzhou Municipal Government. For the first perspective, along with Nansha's various functional identities, it is governed by multi-level governments and non-governmental actors at national, regional (especially the Guangdong-Hong Kong-Macao Greater Bay Area), municipal (Guangzhou) and local (Nansha) levels.

First, at the national level, as a National Economic and Technological Development Zone, a State-level New Area, and part of the China (Guangdong) Pilot Free Trade Zone, Nansha has been designated with significant national economic and social development objectives through a series of national policy guidance documents. Secondly, at the regional level, more recently, a number of non-governmental platforms have been established with the aim of promoting the integration between the eleven city regions within the Guangdong-Hong Kong-Macao (GHM) Greater Bay Area. These include for example, GHM Cooperation Forum, GHM Bay Area Quality Forum, and so on. Governmental officials from Guangdong, Hong Kong, and Macao, academics and professionals, as well as entrepreneurs gather together to help address regional and cross-regional problems through discussions and negotiations. Thirdly, at the municipal level, as a sub-centre of Guangzhou city region, planning and policies at the municipal level provide direct guidance and support to Nansha's future development. Finally, at the local level, Nansha is co-governed by the Nansha Development Zone Management Committee and Nansha District Government. Despite the fact that 'Small Nansha' was initiated by private investors, Nansha NETDZ and Nansha FTZ are governed by the same agency, Nansha Development Zone Management Committee. Nansha administrative district and Nansha State-level New Area are under the direct governance of the Nansha District Government (see Table 7.6).

Table 7. 6 Changes of administrative organisations with direct governing bodies in Nansha

	'Small Nansha'	National Economic and Technological Development Zone		Administrative District		State-level New Area	Free Trade Area
Starting year	1988	1993	2004	2005	2012	2012	2014
Total area (km²)	22	9.90	27.60	544.12	803	803	60
Direct governing bodies	Private investor	Development Zone Management Committee		District Government		District Government	Development Zone Management Committee

In early 2016, the composition of the Management Committee was further adjusted. Members of leading groups and functional responsibilities of the Management Committee and the District Government were reorganised and separated. Specifically, the Management Committee now focuses on economic development, while the District Government focuses on social management, urban construction, public services, and so on (Southern Metropolis Daily, 2016a). Nevertheless, whilst the official website of Nansha Government shows that nine functional bureaus still follows the previous organisation model (Nansha Government, 2017a). This means that these nine bureaus are governed both by the Management Committee and by the District Government, and they shoulder the responsibilities for the development of Nansha NETDZ, Nansha FTZ and Nansha administrative district as a whole (see Table 7.7). Besides these functional bureaus listed in Table 7.7, there are around twenty other bureaus or offices at the district level which are only under the direct governance of the Nansha District Government and will not be discussed in detail here. On the one hand, the Nansha Development Zone Management Committee has a significant degree of autonomy within the area under its jurisdiction. It has been given municipal-level approval rights and management privileges, and it has some unique functional bureaus, including the Financial Affairs Bureau, the Investment and Trade Promotion Bureau, the Industrial Park Development Office, the Port Affairs Office, and the Mingzhu Bay Area Development and Construction Office. On the other hand, some of the functional bureaus are governed by both the Management Committee and the District Government, indicating that these two governing bodies share, to some extent, nested and integrated governance arrangements.

Table 7. 7 Functional bureaus in Nansha under different governing bodies

	Nansha Development Zone Management Committee	District Government
Finance Bureau	✓	✓
Industry and Technology Information Bureau	✓	✓
Land Resources and Planning Bureau	✓	✓
Land Development Centre	✓	✓
Supervision Bureau	✓	✓
Development and Reform Bureau	✓	✓
Environmental Protection and Water Affairs Bureau	✓	✓
Market and Quality Supervision Bureau	✓	✓
Construction and Transportation Bureau	✓	✓
Financial Affairs Bureau	✓	
Investment and Trade Promotion Bureau	✓	
Industrial Park Development Office	✓	
Port Affairs Office	✓	
Mingzhu Bay Area Development and Construction Office	✓	

Sources: Nansha Government (2017a).

As can be seen from the above discussions, this kind of multi-level governance indicates an important feature of Chinese edge cites in helping to create a polycentric structure, as it emphasises interdependencies both between governments from different levels, and between governments and non-governmental actors.

Regarding the decentralisation of power to Nansha State-level New Area, in 2013, the Guangdong Provincial Government announced the *Order No.180 of the People's Government of Guangdong Province* for Nansha's implementing management privilege and opening the "green channel" for the Nansha State-level New Area (People's Government of Guangdong Province, 2013). This policy bonus covered a number of approval rights on enterprise investment projects, land use, construction projects; and management privileges on education, medical care, tourism, and so on. Similar to the Nansha Development Zone Management Committee, which has the same authority as Guangzhou Municipal Government, Nansha State-level New Area, was empowered with a series of municipal-level approval rights and management

privileges which have been decentralised by the Guangdong Provincial Government as listed above. One interviewee expressed great optimism on this decentralisation of power for Nansha's future. 'Nansha could exercise part of municipal-level approval right before, and now, part of provincial-level approval authority has also been decentralised. Nansha's approval rights on certain aspects will go beyond Guangzhou's in future.' (P6, Nansha, 2015)

7.5 Challenges in the formation of a Chinese edge city

Nansha has been transforming in various respects into a Chinese edge city within Guangzhou's polycentric structure. A number of challenges are recognised during this process, particularly from the key actors' perspectives. First, Nansha has experienced significant changes in positioning which reflects the conflicts between upper level governance and Nansha's local needs and aspirations. At an early stage, like many other industrial development zones in China, Nansha followed a project-oriented development model. As one of Guangzhou's outer suburbs, Nansha was only considered as a place for industrial relocation under Guangzhou's mono-centric development. Since 2000, Nansha has undergone several shifts and repositioning in its provincial and municipal governance arrangements. As one interviewee elaborated,

> The industrial positioning of Nansha has changed fundamentally. From the large-scale heavy industry relocations at the very beginning to more recent emphasis on advanced manufacturing, producer services, and so on, significant adjustments in the developmental priorities have occurred. As a result, local plans have to be adjusted to accommodate these changes (P6, Nansha, 2015).

Projects were planned under the heavy industrial relocation strategy, but were never built, largely because of changing the emphasis and prioritisation for the area from upper level governments. Some ambiguous negotiations and conflicts during the re-defining of these project objectives were articulated through the interviews with Nansha's local planners.

> For example, the Kuwait Oil Refinery was once planned as the largest project throughout Nansha's history, but it was not built in the end. What's more, the Wanqingsha area and Mingzhu Industrial Park (in Nansha district) were both initially planned to develop industries, but now their positionings have changed fundamentally as Wanqingsha is now a duty-bonded port area and Mingzhu Bay Area has become the urban core of Nansha (P6, Nansha, 2015).

Secondly, the economic development of Nansha focuses on the secondary sector. The heavy-industrial development model has left Nansha a series of historical problems in terms of the messy spatial layout of industrial areas, management challenges, and the need to adapt to market changes. Two interviewees explained the historical formation of industrial areas and parks in Nansha.

> Some of the existing industrial parks are actual industrial parks, while others are just an organic clustering of some enterprises. For example, some of them were clustered randomly in the original villages. Initially, once a project was endorsed, it would be built immediately without any co-ordination within and between existing projects. As a result, many previously built projects were very messy. Because of this, some of the (industrial) parks are located in villages, and some in towns. The scales and distribution patterns of these (industrial) parks across Nansha are quite different as well (GO1, Nansha, 2015).

> Nansha Development Zone was originally managed by Panyu, which only covered the area of Nansha Island. Up to now Nansha's development has gone through several different stages, and the management means and development strategies for each stage were different (GO2, Nansha, 2015).

Another challenge which exists is Nansha's dependence on some large-scale industries, which undoubtedly weakens Nansha's potential to adapt to market changes. Therefore, there is an urgent need for Nansha to adjust, upgrade and diversify its industrial structure in order to achieve economic sustainability. One interviewee noted,

> The overall industrial output value of Nansha for 2014 is around 220 billion yuan, which has reached a certain scale. However, Nansha's economic

> development is too heavily dependent on the secondary sector, especially the automotive assembling and associated industries. If the automotive market is not good, it will have a huge impact on Nansha's economy. (GO2, Nansha, 2015).

Thirdly, emphasising too much on developing the international shipping centre could, to some extent, ignores Nansha's basic function as a city. Nansha's significance to Guangzhou largely rests upon its premier location as a shipping hub, which helps to enhance the competitiveness advantages of Guangzhou city region as a whole. As an important channel to realise Guangzhou's shipping strategy and port economy, Guangzhou started to invest heavily in developing Nansha's port logistics. However, this has undoubtedly reduced the resources and financial support from the Guangzhou Municipal Government in fulfilling its basic functions as a city. Nansha still lacks an attractive range of living facilities, such as urban service facilities and local amenities. Two interviewees complained, 'Quite a number of people work in Nansha, but live in Guangzhou's central city or Panyu district' (GO3, Nansha, 2015). 'Nansha is still under transition. More people tend to work in Nansha and live in Guangzhou city. This is because there are a number of large industrial projects in Nansha, whereas urban services are relatively deficient and unattractive' (P6, Nansha, 2015). An entrepreneur indicated the difficulties in attracting talents to work and live in Nansha, 'It is difficult to recruit people, especially talented individuals, as there is a serious shortage of services here' (E1, Nansha, 2015). Figure 7.9 also highlights this dilemma for Nansha. Although the resident population in Nanshan district increased significantly in 2012 based on the absorption of the three towns from Panyu, it has almost stayed the same since then.

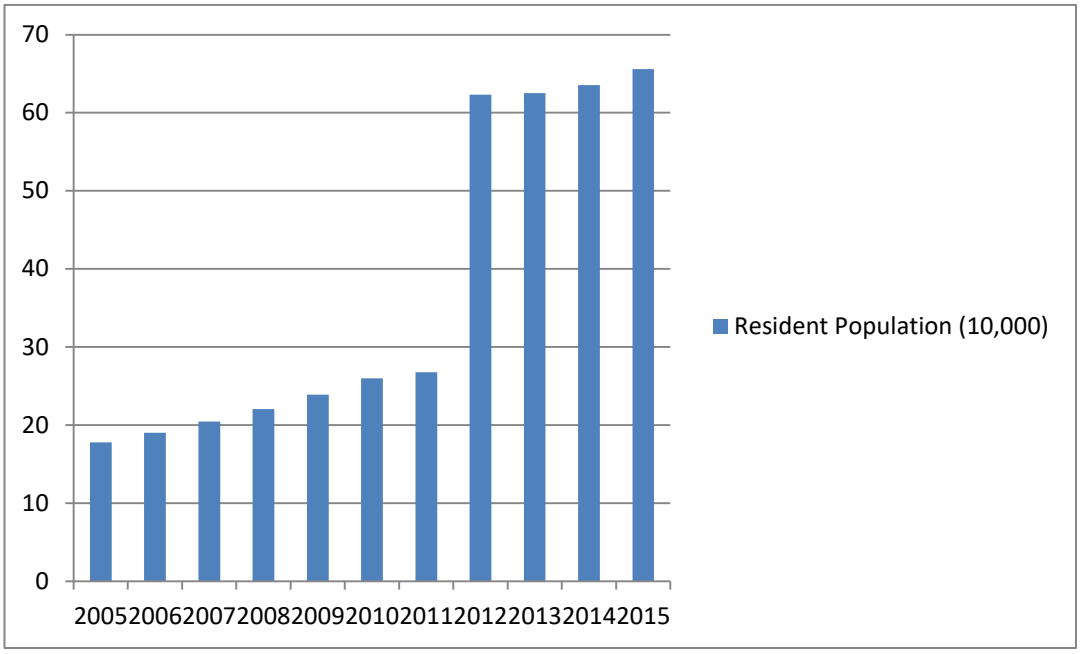

Figure 7. 9 Changes of the resident population in Nansha district, 2005-2015

Sources: Guangzhou Statistical Bureau (2016b).

7.6 Summary

Nansha was originally a suburban town on the outer suburbs of Guangzhou city. It has experienced several shifts in its relative positioning in the metropolitan and wider region and this has resulted in significant changes to its planning approach and governance arrangements. It has gone through a process from a suburban town on Guangzhou's outer suburbs, to a National Economic and Technological Development Zone, to one of the administrative districts of Guangzhou city region, and more recently to a State-level New Area and part of Guangdong's Pilot Free Trade Zone. In terms of Nansha's functions, its positioning has more recently changed fundamentally from heavy industrial orientation towards a more balanced and comprehensive set of functions, with Nansha port as its dominant feature.

Nansha has been recognised and consciously developed as part of the polycentric spatial structure of Guangzhou city region, both in Guangzhou's original application and implementation of polycentricity from 2000, and its more recent adjustments, since 2010. The positioning of Nansha in the two rounds of Guangzhou's polycentric

development strategies has changed fundamentally. In 2000, Nansha was the core area of Guangzhou's southward spatial and industrial extension, and one of its major roles was to accommodate expanding and relocating industries from the central city of Guangzhou. In 2010, Nansha was designated as one of the six sub-centres within Guangzhou city region and its development focus therefore changed to fulfil more comprehensive and holistic city functions. Through exploring the key themes of Chinese edge cities development, it can be said that Nansha is emerging as a Chinese edge city within Guangzhou's polycentric spatial structure with a unique development trajectory. It is an integrated edge city whose evolution has been aided by its national development zone status (see Table 7.12).

Table 7. 8 Key themes explored in Nansha as an integrated Chinese edge city

Key themes	Explanations of the key themes	Nansha
Spatial location and spatial linkages	Spatial location	Located to the south end of Guangzhou city region; Situated in the geographic centre of the Pearl River Delta
	Spatial linkages with the core city	Transportation links (metro and expressway); Interconnections through various functional spaces
Functions	Major functions	Secondary sector, especially industries
	Functional connections with the core city	A gateway through port logistics; A media or platform for connecting Guangzhou's core city with Hong Kong, Macao or even the world
Governance	Changes of governing bodies	County-level governance to municipal-level governance, and to the emerging multi-level governance
	Governance structure	Four levels: National – Regional – Municipal – Local

CHAPTER EIGHT

Polycentric Development and the Making of an Organic Edge City: The Case of Xintang

8.1 Introduction

This chapter focuses on a central/satellite town at the city regional scale, in order to explore the second type of Chinese edge cities – organic edge cities. Xintang has been selected as the case study. The aims of this chapter are to explore its development trajectory in terms of spatial linkages, functional connections and governance changes, and to see whether, how and why it has become an organic edge city as part of Guangzhou's wider polycentric development framework. A series of opportunities, challenges and problems will thus be revealed by examining key issues in Xintang's evolving development process.

8.2 Spatial location and spatial linkages

From geographical perspective, Xintang is located on the eastern edge of the Guangzhou city region as Figure 8.1 shows. Under the jurisdiction of Zengcheng district (one of the eleven districts within Guangzhou city region), Xintang is situated to the south-western end of Zengcheng district, adjacent to Huangpu district (also within Guangzhou city region) and Dongguan city region (another city region within Guangdong province) (see Figure 8.2). Xintang, the focus of this chapter is a functional place rather than a designated administrative area in China's administrative system. This functional place, Xintang (as it is called in this chapter), is a geographical area currently including three interconnected administrative units within Zengcheng district – Xintang town, Yongning street and Xiancun town. The

geographical boundary of Xintang is illustrated in Figure 8.2. The Guangzhou city region or Guangzhou municipality previously had districts, counties and county-level cities. In 2014, all the counties or county-level cities were all amalgamated into urban districts, making eleven districts in total. In China's hierarchical administrative system an urban district, county and county-level city have the same administrative status. The major differences are that a county-level city has a higher urbanisation status and is empowered to have more preferential policies compared with a county (Zeng, Zhang and Xu, 2016), e.g. more administrative privileges, more flexibility in using special support funds from upper level governmental bodies (Xinhua Net, 2017). A county can be upgraded to a county-level city if it meets certain criteria, mainly focused on its economic development status[5]. An urban district is often perceived as a clustered urban area, in a city or city region, with more institutional control from the municipal government (Zeng et al., 2016). When an urban district is established, it loses much of its independence compared with a county or a county-level city (Fan, Li and Zhang, 2012). An urban district is under the direct control of its central city, therefore the central city is administrative more powerful regarding the district's devlopment, especially in allocating the land resources to the urban district (G. C. S. Lin, 2009; Chien, 2013).

[5] Those criteria have been established by the Ministry of Civil Affairs in 1986 and 1993 on the adjustment of the standards in establishing cities, and both were approved by the State Council (Available at http://www.urbanchina.org/n1/2016/0219/c369543-28136025.html, accessed 26 January 2018). However, both of them are regarded not being relevant anymore, and a new version of these standards are being re-formulated (Available at http://www.thepaper.cn/newsDetail_forward_1640014, accessed 26 January 2018).

Figure 8. 1 Location of Xintang in Guangzhou city region, China

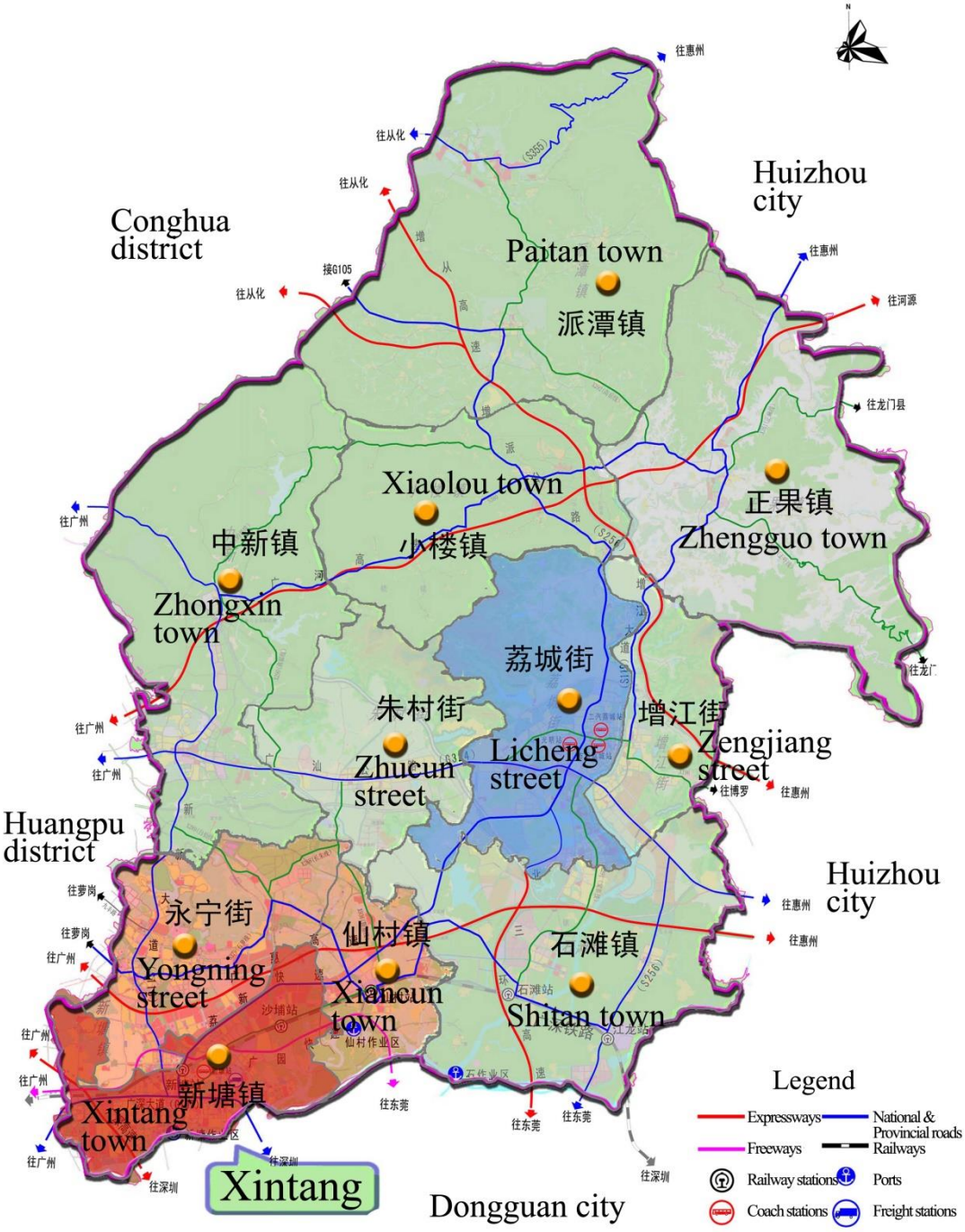

Figure 8. 2 Location of Xintang in Zengcheng district with its geographical boundary

Sources: Xintang People's Government and Architectural Design and Research Institute of SCUT (2014).

Xintang has experienced several periods of administrative re-adjustments, reflecting its changes in its spatial status that have taken place. From 1990 to 2003, Xintang town was located in the southwestern edge of Zengcheng county with its surrounding

four towns (Yonghe, Ningxi, Shapu and Xiancun) (see Figure 8.3A). During this time, Zengcheng county was upgraded to a county-level city in 1993. This was approved by the State Council. Secondly, in 2004, Xintang town with the other four towns within Zengcheng county-level city (Yonghe, Ningxi, Shapu, and Xiancun) were administratively integrated together as Xintang town, the so-called 'Big Xintang' (see Figure 8.3B). Thirdly, in 2005, four rural villages located in Xintang town were re-allocated to Luogang district (which subsequently became part of Huangpu district in Guangzhou city region). Therefore, the boundary of Big Xintang was further re-adjusted to include five areas: Xintang, Yonghe, Shapu, Xiancun and Ningxi, with a total area of 245.88 km^2 (see Figure 8.3C). Finally, Figure 8.3D shows how more recently, in 2013, the administrative divisions of Xintang were re-adjusted yet again, and 'Big Xintang' was divided into three administrative units, including Xintang town (in this research called 'Small Xintang'), Yongning street and Xiancun town. The Xintang town alone has a total area of 86.32 km^2. The main reasons behind these administrative re-organisations of Xintang are discussed in section 8.4.2.

An initial round of the *Comprehensive Planning for Xintang Town* was produced by Xintang People's Government and the Architectural Design and Research Institute of South China University of Technology (SCUT) (2013). Its planning focus was 'Big Xintang'. Because of the administrative reorganisations, this plan was quickly superseded and a new plan focusing on the new administrative area, 'Small Xintang', the current Xintang town, was prepared in 2014. This is the *Comprehensive Planning for Xintang Town* (Xintang People's Government and Architectural Design and Research Institute of SCUT, 2014), with the aim to figure out new development aspirations of the 'Small Xintang' after the administrative reorganisations.

In this thesis, the functional place chosen as the Chinese edge city (the case study) refers to the adjusted 'Big Xintang', which, as Figure 8.3D shows, currently includes three adjacent administrative units within Zengcheng district: Xintang town, Yongning street and Xiancun town. The reason for identifying this functional place as the study area was that this area as a whole has gone through an integrated

development process as a functional place, alongside Guangzhou launching its polycentric spatial development strategies in both rounds of its master planning activities. Despite these changes of administrative organisations that happened in Xintang in 2013, the functional area had already established internal linkages through its historical growth. In order to clearly differentiate the different terms, which all include the name 'Xintang', in this research, Xintang is used to represent the research subject, the same area as the adjusted 'Big Xintang'. 'Small Xintang', on the other hand, represents the administrative area within Zengcheng district from 2013, which is also the current Xintang town.

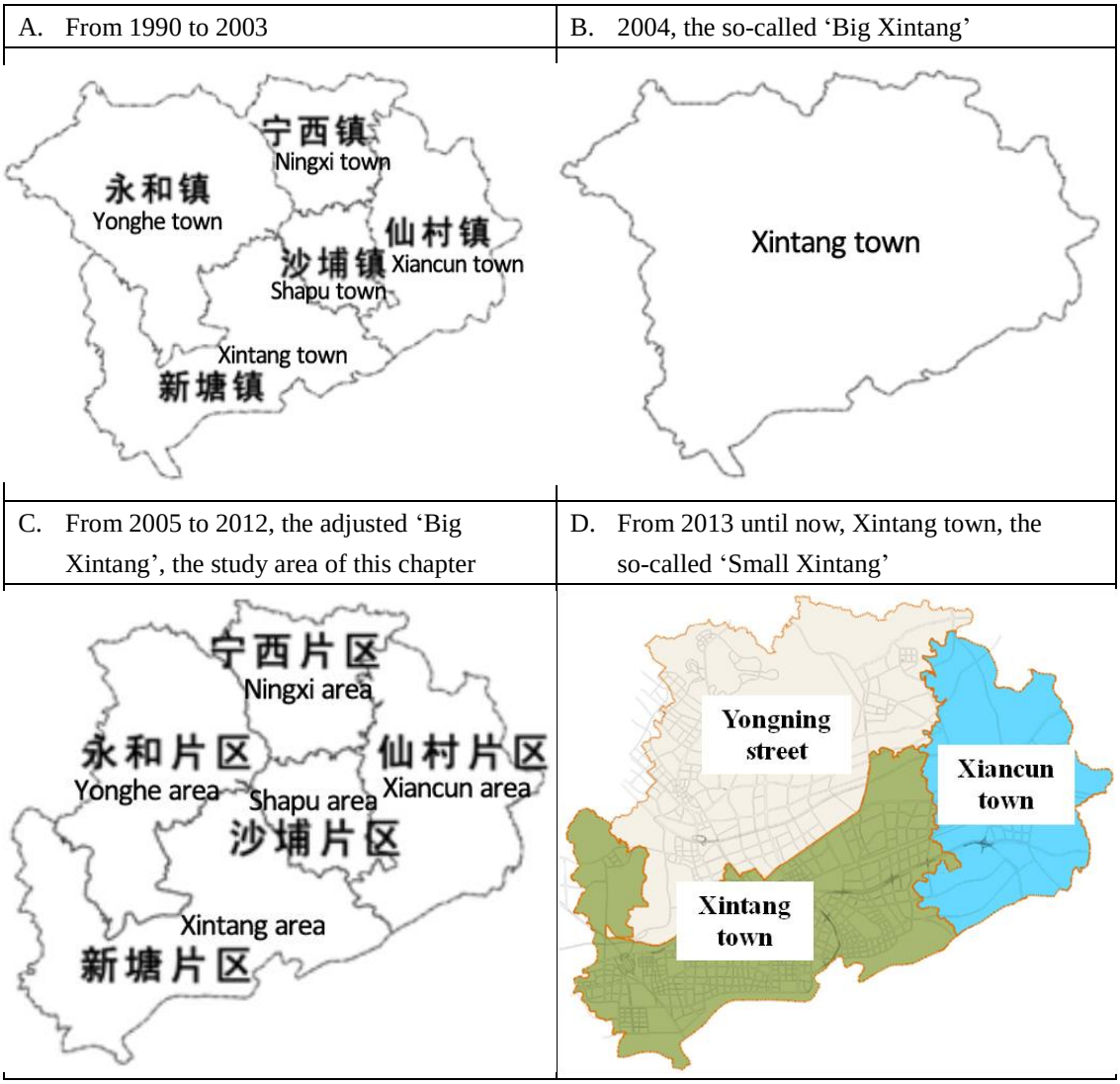

Figure 8. 3 The adjustments of Xintang administrative area through the history

Sources: Wang (2012); Xintang People's Government and Architectural Design and Research Institute of SCUT (2014). Adapted by the author.

Regarding the spatial linkages with Guangzhou's core city, currently, the most important and fastest link between Xintang and Guangzhou's central city is the Guangyuan freeway, which links to the Guang-Shen expressway. This further connects Guangzhou city with Dongguan and Shenzhen city regions, and Xintang is at the intersection of these two fast road transportation links. It is worth noting that the Guangyuan freeway does not go to Licheng, the urban core of Zengcheng district. This results in decreased connectivity between Licheng and Guangzhou's central city, but helps to improve the relative connectivity between Xintang and Guangzhou's central city. One interviewee from the Zengcheng governmental department explained Xintang's geographical advantage, which has helped it play an important industrial role within Guangzhou city region (the industrial role will be explained further in section 8.3).

> Xintang played a significant role in fulfilling Guangzhou's eastward extension strategy, which was primarily due to its geographical advantage... It is closer to Guangzhou's core city than any of the other street/town in Zengcheng. It only takes fifteen minutes from Guangzhou city to Xintang via the Guangyuan freeway (GO4, Zengcheng, 2015).

Figure 8.4 shows the major transportation links between Xintang and the other major cities in the Pearl River Delta, especially Guangzhou, Dongguan and Shenzhen.

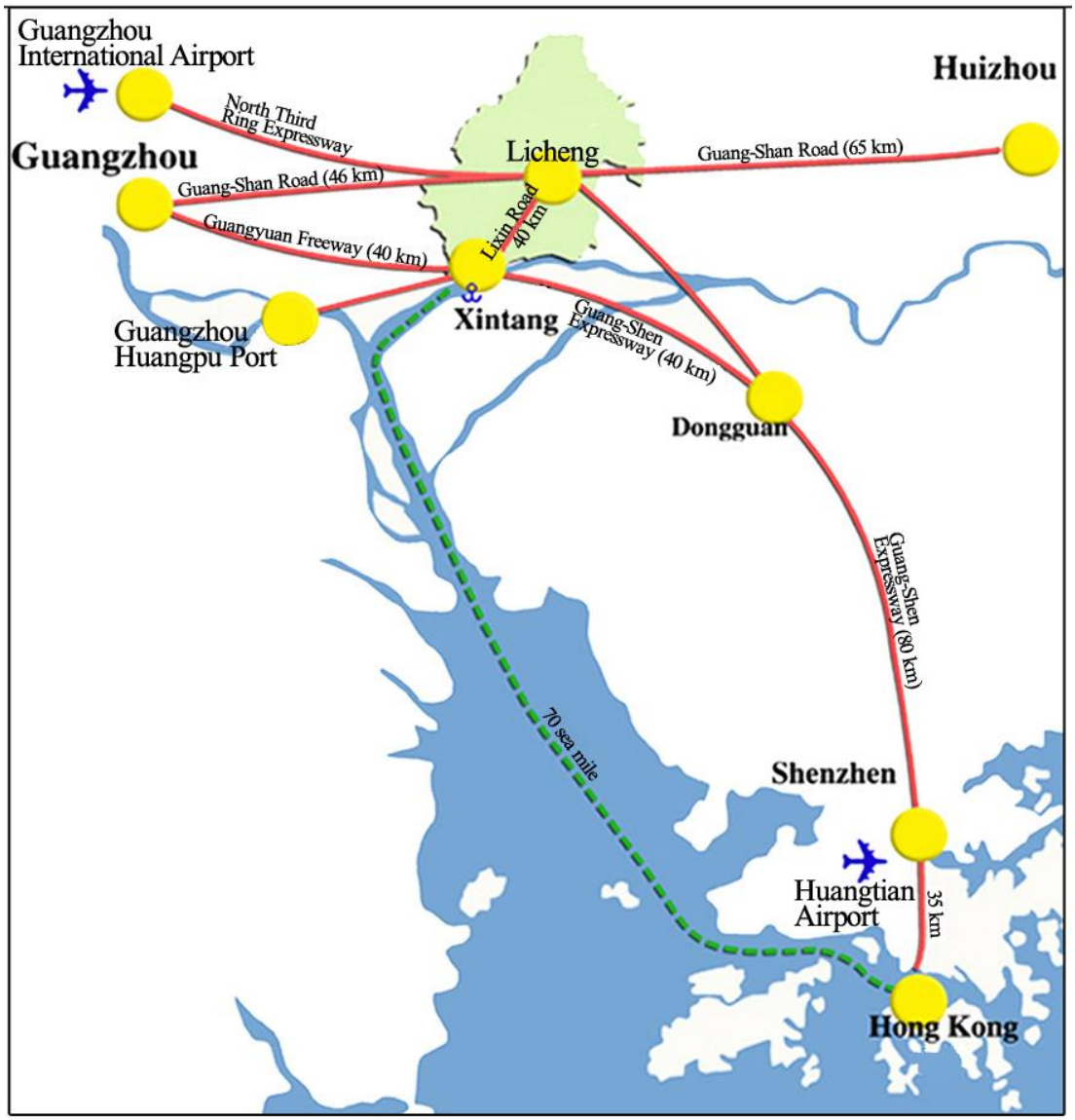

Figure 8. 4 Major transportation links between Xintang and other major cities in the Pearl River Delta

Sources: Xintang People's Government and Architectural Design and Research Institute of SCUT (2013). Adapted by the author.

In addition to the existing transportation links between Guangzhou's core city which go through Xintang to Dongguan city and Shenzhen city, the Guangzhou-Dongguan-Shenzhen intercity rail line is expected to begin operating before the end of 2018 (Shenzhen Special Zone Daily, 2017). This intercity rail line will provide the fastest link between Guangzhou, Dongguan and Shenzhen. It will be only one hour from Guangzhou city core to Shenzhen, and Xintang has been

designated as one of the important stations on this rail line. Moreover, Xintang is planned to have even faster connections and be more closely linked to Guangzhou's central city. According to a recently published planning document the *Guangzhou Eastern Public Transportation Terminal Area Planning* (Guangzhou Urban Planning and Design Survey Research Institute, 2013), a new transportation terminal will be located in Xintang. It is planned to be one of the three most important terminals within the Guangzhou city region, together with the southern transportation terminal in Panyu district and the northern transportation terminal in Huadu district.

8.3 Functions

To examine to what extent Xintang has become a Chinese edge city within Guangzhou city region, in this section the major economic functions of Xintang and its functional connections with Guangzhou core city functions will be discussed.

8.3.1 Major functions

Since 2000, Xintang's development and evolution has been intimately linked and recognised through formal planning activities, from both the Guangzhou municipal and Xintang local scale governmental activities. From a formal planning perspective, continuities can be observed in the functional position of Xintang as established by the Guangzhou city master plans, as Table 8.1 shows. Initially, Xintang had been designated as an important industrial relocation place, based on Guangzhou's eastward extension development strategy. Through this relocation process, in the *2011 Guangzhou City Master Plan* (Guangzhou Municipal Planning Bureau, 2012) it was described further, and highlighted, as an industrial oriented town and the economic centre of Zengcheng district. Moving on to Xintang local plans, continuities and differences can also be observed when compared with the Guangzhou city master plans. On the one hand, Xintang local plans have also followed the functional positioning established by the Guangzhou city master plans, especially in relation to its role as one of the locations for industrial relocation from central Guangzhou and its economic position in Zengcheng. But, in addition, the

local plans from Xintang explicitly described the types of industries that Xintang was intended to focus and specialise in, notably, denim clothing, automotive and motorcycle manufacturing industries. Meanwhile, trade, services, leisure and cultural tourism have all been identified as offering growth potential in Xintang local plans since 2010. The objective of this diversification strategy is to facilitate Xintang's transformation from an industrial oriented town towards a comprehensive growth pole.

Table 8. 1 Major functions established from the Guangzhou city master plans and Xintang local plans

Guangzhou City Master Plans	Functional position	Xintang local plans	Major economic functions
Guangzhou City Master Plan (2001-2010)	**Relocate the traditional industries** from the old Guangzhou core city to Huangpu-Xintang development belt, to form a dense industrial development belt on the eastern wing of Guangzhou city region	Comprehensive Planning for Xintang Town (2005-2020)	• **Denim clothing industry**; • **Manufacturing industry**; • **Industry relocation place**; • **Economic centre of Zengcheng** county-level city
Guangzhou City Master Plan (2011-2020)	• **Industrial development oriented town**; • **Economic centre of Zengcheng district**	Comprehensive Planning for Xintang Town (2010-2020)	• **Advanced manufacturing industry**; • Trade and logistics; • Comprehensive services; • Leisure and cultural tourism
		Comprehensive Planning for Xintang Town (2013-2020)	• **Denim clothing industry**; • Commercial and trade; • Leisure and cultural tourism

Sources: Guangzhou Municipal Planning Bureau (2005); Guangzhou Municipal Planning Bureau (2012); Xintang People's Government and Planning and Design Research Institute of Sun Yat-sen University (2010); Xintang People's Government and Architectural Design and Research Institute of SCUT (2013); Xintang People's Government and Architectural Design and Research Institute of SCUT (2014).

In practice, there is no doubt that Xintang was, and still remains, an industrial dominant area in terms of its economic output. Its total industrial output value is huge compared with its total output values from both the agricultural and tertiary sectors (see Figure 8.5). From 2007 to 2011, the total industrial output value

increased by almost 20% each year. Then it experienced a slight drop in 2012. Meanwhile, regarding the development of the tertiary sector in Xintang, the output value had grown evidently, with an almost 70% increase in 2012 compared with that in 2007. In summary, during this period, the economic development of Xintang focused on the industries, however a change had occurred in its economic structure with more emphasis on the tertiary sector.

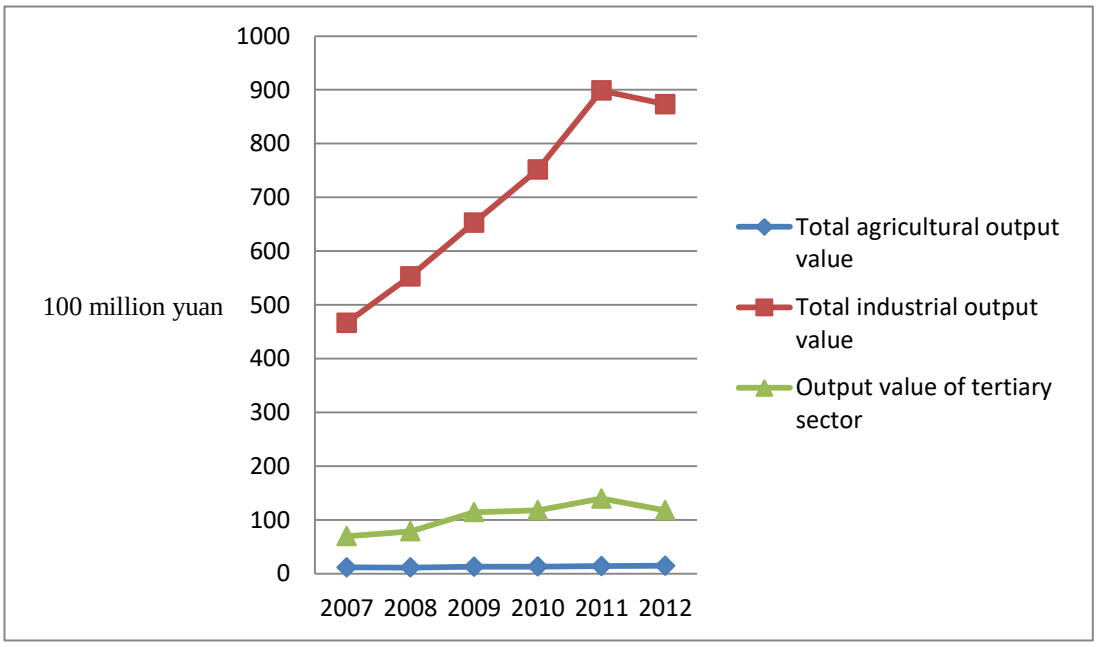

Figure 8. 5 Agricultural/industrial/tertiary output value in Xintang, 2007-2012

Sources: Xintang People's Government (2008-2012); Guangzhou Provincial Database (2013).
Note: Output value of tertiary sector for 2010/2011 only refers to retail and services; Output value of tertiary sector for 2012 only refers to retail.

When comparing the total industrial output value of enterprises above a designated size between Xintang and other streets/towns in Zengcheng, Table 8.2 shows that in 2016, Xintang accounted for 46.05%, almost half of the industrial output value of enterprises above a designated size generated in the whole of Zengcheng district. Enterprises above a designated size refer to those industrial enterprises with annual main business income of 20 million RMB or more. Table 8.3 demonstrates that in 2013, the registered population of Xintang accounted for 26.77% in the total registered population of Zengcheng. Around one fourth of the population generated nearly half of the total industrial output value. This indicates that the actual economic

development of Xintang has followed the aspirations of the Guangzhou city master plans and Xintang local plans. Xintang has evolved into the most significant economic centre within Zengcheng district.

Table 8. 2 The comparison of industrial output value in Xintang and street/towns in Zengcheng, 2016

	Total industrial output value of enterprises above a designated size (100 million yuan)	Proportion of industrial output value of enterprises above a designated size in Zengcheng
Licheng street	41	2.68%
Zengjiang street	83.51	5.46%
Zhucun street	69.28	4.53%
Shitan town	181.94	11.89%
Zhongxin town	143.59	9.38%
Paitan town	—	—
Xiaolou town	3.42	0.22%
Zhengguo town	2.23	0.15%
Zengcheng NETDZ	300.90	19.66%
Xintang	**704.83**	**46.05%**
Zengcheng district	1,530.70	100%

Source: Zengcheng People's Government (2016).

Note: Xintang refers to the study area including Xintang town, Yongning street and Xiancun town in 2016.

Table 8. 3 The comparison of registered population in Xintang and street/towns in Zengcheng, 2013

	Total registered population	Proportion of registered population in Zengcheng
Licheng street	171,795	20.11%
Zengjiang street	44,955	5.26%
Zhucun street	34,120	3.99%
Shitan town	111,275	13.02%
Zhongxin town	79,668	9.32%
Paitan town	79,718	9.33%
Xiaolou town	49,015	5.74%
Zhengguo town	55,176	6.46%
Xintang	**228,726**	**26.77%**
Zengcheng	854,448	100%

Sources: Zengcheng People's Government (2014).

Note: Xintang refers to the study area including Xintang town, Yongning street and Xiancun town in 2013.

In terms of the industrial composition of Xintang, the denim clothing industry, automotive and auto parts manufacturing, and motorcycle manufacturing are the pillar industries (Xintang People's Government and Architectural Design and Research Institute of SCUT, 2013). The automotive and motorcycle manufacturing industries are relatively new, and are mainly located in the Zengcheng National Economic and Technological Development Zone (NETDZ) in Yongning street. The denim clothing industry, by contrast is a traditional industry for Xintang, with over 3000 denim clothing enterprises employing over 80,000 people across the city (Xintang People's Government and Architectural Design and Research Institute of SCUT, 2014). Xintang has become the largest manufacturing and processing base of jeans in China. By 2010, over 70% of all the denim clothing produced across China originated from Xintang, and it also accounts for 35% of the Chinese exports of denim clothing. These jeans have been sold in dozens of countries and regions around the world including Hong Kong, Russia, America, and Europe (Xintang Chamber of Commerce, 2011). However, there are concerns regarding the longer-term sustainability of the denim clothing industry in Xintang centre because of the lack of agglomeration economies. At present, numerous smaller denim-clothing enterprises have actually focused on low-end production, due to insufficient funds and technology. There is an urgent need to promote large-scale corporations or big brands, in order to help achieve the sustainability of this traditional industry.

8.3.2 Functional connections

After examining the major economic functions of Xintang, this section focuses on the functional interconnections between Xintang and Guangzhou's core city, with the aim of exploring, whether and how Xintang is functionally connected with Guangzhou's core city, as a polycentric node.

Xintang's functional role in Guangzhou city region can be understood through three perspectives: an industrial sub-centre; a gateway in promoting the integrated

development of Guangzhou's core city, Dongguan city and Shenzhen city; and a residential sub-centre. Since 2000 Xintang was primarily regarded as a place for industrial relocation following Guangzhou's polycentric development strategy. Although before this Xintang had developed, on its own, as an industrial core of Zengcheng, mainly focused on its traditional denim clothing industry (this will be explained further in section 8.4). In 2000, the *Outline of Guangzhou City Overall Strategic and Concept Plan* (Guangzhou Municipal Government, 2000) proposed an urban spatial structure following the eight-word principles of southward expansion, northward optimisation, eastward extension, westward combination. In this vision, the eastward extension strategy referred to Zengcheng, more specifically Xintang, which was situated between Guangzhou core city and the urban core of Zengcheng (Licheng street). Xintang became one of the most important areas in Guangzhou's eastern wing, with a role of helping relocate the expanding industries and populations away from Guangzhou's core city. In this regard, its first functional inter-connection with Guangzhou's core city rests upon its designation as an industrial sub-centre within Guangzhou city region.

By the end of 2005 Xintang's industrial role entered a new stage when it became the Guangzhou Eastern Automotive Industrial Development Base (Xintang People's Government, 2006-2007). More than a dozen car, motorcycle as well as the auto-spare-part enterprises were established in the Zengcheng Industrial Park. These included Guangzhou Honda, Wuyang Honda, Haojin Motorcycle and Fuyao Glass, and so on.

Another functional connection between Guangzhou's core city and Xintang is that it acts as a gateway by strengthening the Guangzhou-Dongguan-Shenzhen integrated development corridor. As Figure 8.4 shows, Xintang links the Guangyuan freeway and the Guang-Shen expressway, which together connects the Guangzhou core city with Dongguan and Shenzhen city regions. Moreover, with the completion and operation of the Guangzhou-Dongguan-Shenzhen intercity rail line (Shenzhen Special Zone Daily, 2017), Xintang is expected to become a more important nodal

point, not just for the eastern wing of the Guangzhou city region, but within the broader region of Guangzhou, Dongguan and Shenzhen.

A third functional role that Xintang plays is as a suburban area for Guangzhou's core city in that it can provide an accessible residential location for those who work in Guangzhou's core city, but cannot afford the high prices of apartments in the core city or an alternative residential form, if they wish to live in quiet and high-quality villa complexes. These are the two main emerging types of residential development in Xintang. Both collectively have attracted a significant residential population and turned Xintang a residential sub-centre for Guangzhou. For example, 'a real estate project named "Phoenix" is a huge villa community located along the Guangyuan freeway. Almost 60,000 people live there, and most of them work in Guangzhou's core city' (GO5, Xintang, 2015). With an increasing population choosing to live in Xintang, the constructions of urban services and public transportation have also been put on the agenda. According to the *Guangzhou Eastern Public Transportation Terminal Area Planning* (Guangzhou Urban Planning and Design Survey Research Institute, 2013), Xintang is also expected to become an important transportation hub within the Guangzhou city region.

In summary, Xintang is evolving from an industrial satellite town into an emerging comprehensive edge city with increasing residential, urban services and public transportation land uses. As one interviewee succinctly summarised the situation,

> In the future, there are probably two foreseeable linkages between Xintang and Guangzhou core city. Xintang provides residential and transportation services for Guangzhou core city (GO5, Xintang, 2015).

Meanwhile, the industrial role of Xintang within Guangzhou city region will be enhanced by the development of clusters of interrelated industries. With the support for industrial development in the Zengcheng NETDZ the potential for Xintang to achieve economic sustainability is enhanced.

8.4 Governance

This sections moves on to discuss the governance changes in Xintang. These have been influenced by the polycentric spatial development strategies of Guangzhou city region since 2000. Changes in governing bodies and governance structures are explored through time. More specifically:

1) From 1978 to around 2000, the making of Xintang as an economic core of Zengcheng through local governance arrangements;

2) From 2000 to 2013, the remaking of Xintang as a Chinese edge city through the emerging multi-level governance; and,

3) From 2014 until now, the remaking of Xintang with close involvement of the governments of Guangzhou and Zengcheng.

8.4.1 The making of Xintang as an economic core of Zengcheng through local governance arrangements

From 1978 to around 2000, the study area Xintang consisted of five adjacent towns, namely Xintang town, Yonghe town, Ningxi town, Shapu town and Xiancun town (see Figure 8.3A). The initial industrial development of this whole area was mainly focused on Xintang town. This section explains the development trajectory of Xintang town during this period, as it beame the economic core of Zengcheng. In order to be coherent with the following discussions, the name Xintang is still used, but here it mainly refers to Xintang town.

The concentration of the denim clothing industry in Xintang started right after China's open door policy in 1978. Since then, it has gradually become the economic core of Zengcheng on its own. Relying on its fast access to Hong Kong through the Dong River, the first denim clothing factory was set up in Xintang by an investor from Hong Kong. This was also regarded as the first enterprise in Xintang established through a co-operation known as the 'three plus one' trading-mix. This

was the initial trading venture used in attracting and utilising foreign investments to mainland China in the early years after the open door policy was launched. It mainly focused on low-end manufacturing and processing industries. The 'three' refers to the three types of processing activities by Chinese township or village enterprises (TVEs), including 1) manufacturing from materials provided by an outside source, 2) manufacturing based on samples from outside, and 3) assembling parts supplied by investors or clients. The 'one' refers to the compensation trade model, which means these TVEs sell back all the completed products at a very low price to the foreign investors who provide materials, samples or parts. In this way those TVEs can pay for the materials, samples and equipment provided by the foreign investors (H. Zhang, 2014; L. Zhang, LeGates and Zhao, 2016). This trading partnership was soon being copied in Xintang. Through such processing and trading partnerships, Xintang started its initial development through this largely self-organised economic structure. Before long, in 1983, it was designated as one of the first important industrial satellite towns in the Pearl River Delta by Guangdong Provincial Government. More investments from Hong Kong, Taiwan and further afield rushed to Xintang. As one interviewee recalled,

> After the open door policy, Taiwan – invested in enterprises, Hong Kong – invested in enterprises and a few other foreign invested enterprises were attracted too, and set up, in Xintang. All associated with the clothing industries (GO5, Xintang, 2015).

Another interviewee highlighted the significance of the denim clothing to Xintang and its convenient access to Hong Kong, through Xintang's port.

> Xintang was indeed a denim clothing-led city... Xintang port initially opened up to cruise ships from Hong Kong in 1990s. It was initially a first-class passenger port and which subsequently became a second-class cargo port (GO6, Zengcheng, 2015).

Considering the prosperous denim clothing industry, and the geographical advantages of Xintang, in 1988, the first development zone of Zengcheng, Xintang

Industrial Processing Zone, was established in Xintang. Formally approved by the Guangzhou Municipal Government, its Management Committee was comprised of governmental officials from both Zengcheng and Xintang Governments, and was granted county-level approval rights and management privileges, the same as Zengcheng County Government at this time (Zhan, 2008). However, the development of the Xintang Industrial Processing Zone at this very early stage could largely be regarded as self-organised and self-operated by the Management Committee, with little financial support from Zengcheng Government. The key difficulty during these initial years was insufficient funds. The Zengcheng Government did not directly allocate any funds to the Xintang Industrial Processing Zone (Zhan, 2008). All the necessary funds for land acquisition, infrastructure and building construction and so on, had to be organised by the Management Committee of Xintang's Industrial Processing Zone (S. Wen, 2011). Therefore, the access standards for enterprises were very low. Any foreign investment was welcomed, regardless of the type or scale of industry that wanted to locate in Xintang (Guangdong Zengcheng CPPCC (Chinese People's Political Consultative Conference), 1995). By 1990, there were already 523 new industrial enterprises across Xintang, with a total output value of 141 million yuan (Xintang People's Government and Architectural Design and Research Institute of SCUT, 2013). In 2002, the Xintang Global Denim Clothing Textile and Shopping Mall was opened (see Figure 8.6). At this time it was the largest denim clothing mall across China. In the same year, Xintang was also designated as the Denim Clothing Town of China by the China National Textile and Apparel Council and the China National Garment Association. Xintang, therefore, had grown largely organically through local governance arrangements in its early stages to become the economic core of Zengcheng.

Figure 8. 6 Xintang Global Denim Clothing Textile and Shopping Mall

Sources: Photo taken by the author.

8.4.2 The remaking of Xintang to a Chinese edge city through the emerging multi-level governance

Since 2000, a series of plans/policies at different levels have started to become more involved in Xintang's development, with more attention being paid to Xintang both as an economic core not only within Zengcheng, but also within the Guangzhou city region as a whole, and as a gateway in facilitating the integrated development of the Guangzhou-Dongguan-Shenzhen axis. Xintang started to be re-made and re-imaged as a Chinese edge city. During the period from 2000 to 2013, with the changes in Xintang's relative position and role within the wider city region, its governing bodies and governance structures changed. Similar to Nansha, a form of multi-level governance started to emerge with the governance of Xintang also involving different levels of government actors.

As a functional area, under the jurisdiction of Zengcheng, Xintang was governed by multi-level governments' arrangements, namely national, regional, municipal, county-level city, and local levels. First, at the national level, the Zengcheng National Economic and Technological Development Zone (NETDZ) is located in the northern

part of Xintang, in Yongning street. It was designated with national economic development objectives following a series of national policy guidance documents, for example, *Opinions on Promoting the Further Development of National Economic and Technological Development Zones* (Ministry of Commerce, Ministry of Land and Resources and Ministry of Construction, 2005), the *11th Five-Year Plan of Economic and Social Development of National Economic and Technological Development Zones* (Ministry of Commerce and Ministry of Land and Resources, 2006), and *Opinions on Promoting the Transformation, Upgrading and Innovative Development of National Economic and Technological Development Zones* (The General Office of the State Council, 2014). A set of preferential policies were provided to the Zengcheng NETDZ which mainly focus on the administrative management, foreign investments, land uses, industrial development, supporting the located enterprises, attracting talents and professionals, and so on. Here it is necessary to elaborate the development and upgrading process of the Zengcheng NETDZ.

In 2000, the Xintang Industrial Processing Zone became one of the most important relocation areas for Guangzhou's eastward extension strategy. In the early 2004, Guangzhou Honda Plant located in Xintang and the Industrial Processing Zone was charged with the constructions of the automotive industrial park. This started the transformation from what had previously been fairly random and haphazard location of industries that were spatially scattered towards a more coherent strategy of industrial clustering interrelated industries. Attracted by the Guangzhou Honda Plant, a number of enterprises producing automotive spare parts were attracted to Xintang. One private entrepreneur explained the reason he chose Xintang,

> After investigations in several of Guangzhou development zones, including those in Baiyun district, Conghua and Xintang, we finally decided to come here. The regional accessibility of Xintang and the emerging industrial clustering development attracted us most (E2, Zengcheng, 2015).

Since then, industrial clusters have become an important development aspect of the

Xintang Industrial Processing Zone in being able to attract investments and establishing enterprises (Zhan, 2008). The Xintang Industrial Processing Zone was upgraded to the provincial level Guangdong Zengcheng Industrial Park in 2006. By 2010, the industrial output value in the core area of Zengcheng Industrial Park reached 3.5 billion yuan, which made it the most important growth pole in southern and central Zengcheng (W. Jiang, Deng and Xiao, 2012). In March 2010, and approved by the State Council, the Zengcheng Industrial Park was upgraded again to a National Economic and Technological Development Zone (NETDZ), the third NETDZs within Guangzhou city region[6]. It was also the first NETDZ in Guangdong province to be located in a county-level city, Zengcheng. An interviewee noted,

> Following this upgrading to a national level development zone the great reputational and policy advantages that this gave significantly enhanced the attractiveness of the Zengcheng Development Zone (GO4, Zengcheng, 2015).

Secondly, at the regional level, according to the *Coordination Planning of Pearl River Delta Urban Agglomerations (2004-2020)* (Guangdong Provincial Government, 2005), Xintang was positioned at the intersection of the northern urban functional development belt (Guangzhou core city and Zengcheng were both part of this development belt), and the Dongguan-Shenzhen expressway, with a functional role of helping to facilitate regional co-operation, especially across the Guangzhou-Dongguan-Shenzhen integrated development area.

Thirdly, at the level of Guangzhou municipality as discussed previously the Guangzhou city master plans have provided strategic guidance to Xintang's spatial and economic development. However, as lower-level administrative unit under the jurisdiction of Zengcheng county-level city, Xintang received direct governance and guidance from Zengcheng, rather than the Guangzhou Municipal Government.

Fourthly, at the level of Zengcheng county-level city (during this period), the

[6] The other two National Economic and Technological Development Zones in Guangzhou city region are Guangzhou NETDZ established in 1984 and Nansha NETDZ established in 1993.

Zengcheng NETDZ will be specifically discussed here. The Zengcheng NETDZ is a nationally granted area for the economic development, its governance arrangements are therefore different from the rest of Xintang. The administrative power of Zengcheng Government over Xintang as a whole, is elaborated together with the Xintang local governance at the local level. The main governing body of the Guangzhou Zengcheng NETDZ is its Management Committee. The Management Committee is a dispatched agency of the Guangzhou Municipal Government, which is on behalf of the Guangzhou Municipal Government and totally in charge of the planning, construction, development and management of the Zengcheng NETDZ. It has been granted approval rights and management privileges, which are same to Guangzhou municipal-level (Guangzhou Municipal Government, 2010). Although as a development zone granted by the State Council, the leading members of the Management Committee of the Zengcheng NETDZ are in fact locally based, especially from the Zengcheng Government. The composition of the Management Committee reflects its important role and relationship with the Zengcheng Government. The official website of the Zengcheng Government identifies the names, roles and responsibilities of key leaders in both the Zengcheng NETDZ and Zengcheng Government. Those leaders who comprise the Zengcheng NETDZ Management Committee also hold significant positions in the Zengcheng Government (a county-level city government at this time) (Zengcheng People's Government, 2011) (see Table 8.4). It can therefore be demonstrated that these two governing bodies share, to some extent, nested and integrated governance arrangements by virtue of the overlap in individuals involved in both.

Table 8. 4 Leaders with significant positions for both the Zengcheng NETDZ Management Committee and Zengcheng County-level City Government

Positions in NETDZ Management Committee	Positions in County-level City Government
Deputy Director of the Management Committee: Assist the Director of the Management Committee	Mayor
Deputy Director of the Management Committee: In charge of the Planning, Construction, and Environmental Protection Bureau; the Enterprise Promotion and Administration of Work Safety Bureau	Member of the Standing Committee
Deputy Director of the Management Committee: In charge of the Development, Reform and Finance Bureau; the Economic, Trade and Technology Information Bureau; the policy research and investment promotion work	Member of the Standing Committee
Director of the Economic, Trade and Technology Information Bureau	Member of the Standing Committee and Executive Deputy Mayor
Director of the Planning, Construction, and Environmental Protection Bureau	Deputy Mayor
Director of the Development, Reform and Finance Bureau	Deputy Mayor
Director of the Enterprise Promotion and Administration of Work Safety Bureau	Assistant of Mayor

Sources: Zengcheng People's Government (2011).

Finally, at the local level of Xintang, it is interesting to note that Zengcheng retains strong administrative power over Xintang, whereas Xintang itself as a place has limited urban governance powers. The most influential one to Xintang's development should be the financial system operated by Zengcheng Government, in which 'both revenue income and investment expenses are coordinated and decided by the upper level government' (C. Gu, Li and Han, 2015, p.113). The official website of Xintang Government lists the main responsibilities of Xintang Government. These primarily consist of implementing relevant planning/policies or assisting upper-level government bodies to promote economic development, enhance social management and improve public services (Xintang People's Government, 2017). This lack of autonomy is a typical situation regarding small towns and urban districts in the Chinese administrative governance system (C. Gu et al., 2015). In Xintang's case, it can be best illustrated from its two major administrative adjustments during a ten

year period from 2004 to 2013 (see Figure 8.3), both of which were initiated by Zengcheng Government. The 2004 adjustment, integrated five towns into one administrative unit, and was designed to tackle regional inequalities due to the vastly different economic growth between the northern and southern areas. The 2013 adjustment, separating 'Big Xintang' into three administrative units, was designed predominantly to help address social management problems in Xintang, which as a township level government could no longer manage a population of over 500,000, which is equivalent to a medium-sized city, at least by population.

8.4.3 The remaking of Xintang with close involvement of the governments of Guangzhou and Zengcheng

From 2014 until now, the multi-level governance arrangements for Xintang have been enhanced, especially at both the Guangzhou municipal and Zengcheng district levels. This has involved a form of bargaining process, which is still ongoing and involving both levels of government. In February 2014, and approved by the State Council, the municipal area of Guangzhou city region was extended again by transforming Zengcheng from a county-level city into Zengcheng district. Zengcheng therefore lost much of its independence. Interviewees reflected on these changes and expressed concern over this administrative re-adjustment:

> Each county-level city is like an independent kingdom... For example, Zengcheng District Planning Bureau no longer needs to seek approval from Zengcheng Government; instead, it is now directly governed by Guangzhou Municipal Planning Bureau (GO4, Zengcheng, 2015).

> After being changing into a district, the planning rights, land allocation rights and financial rights have all been taken by the Guangzhou municipality... Guangzhou municipality will alone allocate the funds to all its districts for building infrastructure. But there are eleven districts in Guangzhou city region, not everyone can be a key development area, and there must be differences in the allocation of funds among different districts (GO6, Zengcheng, 2015).

As part of Zengcheng district, Guangzhou's involvement in Xintang's development has therefore, been enhanced. A good example of this in practice is the Guangzhou

eastern public transportation terminal, which is planned as an auxiliary station within the Guangzhou railway hub network. There is little doubt that locating a city regional level transportation terminal in Xintang will significantly influence the spatial and functional connections between Xintang and Guangzhou core city. This reflects the importance granted to Xintang by Guangzhou as part of a regional development node.

At the same time, the role of Xintang within Zengcheng district has started to be highly recognised by the Zengcheng Government. The new round of strategic planning for Zengcheng district evidences this quite clearly. In early 2015, Zengcheng proposed its new position as a modern medium-sized ecological city. The new strategic layout divided Zengcheng into two parts. The northern part would be maintained for its ecological environment, and the southern part (including Xintang) aimed for developing industries and boosting the economy. Xintang, with the other towns/streets in the southern part are expected to achieve spatial and functional integration. One interviewee explained the possible reasons behind this new integration strategy of Zengcheng district as follows:

> The previous leader of Zengcheng did not care so much about Xintang. The new leader put forward the southern part integration strategy, because of concerns that Xintang might be absorbed into Huangpu district, and if so, Zengcheng would lose a strong and significant economic centre. Thus, the new leader is trying to integrate its own towns/streets together more coherently and make Zengcheng as an integrated government able to influence all its surrounding areas (P8, Guangzhou, 2015).

In the meantime, the denim clothing town of China is facing a transition. A significant number of small clothing factories are closing down, and from observations, several shops in the shopping mall had closed by summer 2015. The low costs of labour and land, which characterised Xintang in its early years of development had changed. This time of transition will be quite different from its previous ones, particularly because of Guangzhou's involvement and Zengcheng's integration strategy, the governance structure for Xintang has changed. This will

undoubtedly influence its future direction of development. As one interviewee, who has witnessed each transition in Xintang, noted,

> The business and industries in Xintang have always been highly developed. From denim clothing to cars and motorcycles, it could transform very quickly as well as naturally. The reason for this is that private capital in Xintang is very abundant. It is the same group of people who are operating all the businesses. In recent years, the traditional denim clothing industries are finding it difficult to survive. It takes much longer for the transition of Xintang's economic development this time. This is probably because more negotiations are needed with the governments of Guangzhou municipality and Zengcheng district who are now more closely involved in the development of Xintang. If it still maintains its free market approach like before, the transition could also be fast this time. Previously, personal relationships were very important in Xintang's transformation, but now it is governance that matters the most (VS1, Xintang, 2015).

In summary, the dynamisms behind Xintang's governance have been changing with more actions more recently being initiated by both the Guangzhou municipal and Zengcheng district levels governments. Xintang is increasingly being acknowledged as a significant growth centre within the polycentric spatial structure of Guangzhou city region. Meanwhile, Xintang was, and will still, be regarded as the most important economic growth pole in Zengcheng district. The multi-level governance of Xintang has actually deepened with increased collaboration between the municipal and district level governments.

8.5 Challenges in the formation of a Chinese edge city

Xintang has started its transformation towards a Chinese edge city within Guangzhou city region. A number of challenges have been noted during this process particularly from the perspective of key actors. First, Xintang's initial economic development activities were mainly led through a self-organised and project-oriented model, especially during its early stages. This manifested itself in the conflicts between planning initiatives and actual local development tendencies. The initial development

of Xintang was mainly promoted by private investments from Hong Kong and Taiwan. The Xintang local government and the Management Committee of Xintang's Industrial Processing Zone managed the development and construction activities. Whilst as a largely self-growing suburban town, a project-oriented development model was allowed, and even promoted, to actively boost Xintang's economy. This development model enabled Xintang to become the strongest economic node in Zengcheng, which in turn reinforced the development model potential, as it could stimulate development and employment opportunities. It has been a common phenomenon in Xintang that, projects are introduced and located not necessarily based on the local planning/policy guidance on land uses. Rather than following the upper level planning guidance, local planning documents have to be adjusted afterwards to accommodate the development realities. Still, the local planning of Xintang would easily be approved by the Zengcheng Government, as the project-oriented development model would bring profits and increase the total revenue income of the whole of Zengcheng. In this regard, the comprehensive planning of Xintang became the evidence for local government to explain and legalise the already approved land uses, and policy tools for the leadership to maximum profits through land allocations. Two planners from Zengcheng explained the contradictory situation between planning and development.

> The implementations of Guangzhou's polycentric development strategies indeed have some deviations. In responding to Guangzhou's strategic plans, Zengcheng compiled strategic plans to deliver the relevant strategies and ideas. Then at the next level, Xintang, its local plans are supposed to reflect all of these strategies. However, in reality, this is not always the case (P10, Zengcheng, 2015).

For example:

> One of the major problems we encountered in practice was that, when a project or an enterprise, wanted to locate in a certain area but this might be conflict with the strategic plan, quite often the leadership would approve the land use, and then local plans have to be changed to recognise and accommodate these changes. In other words, local plans are relatively idealistic, and have to be

> adjusted according to specific requirements of the projects. This situation is really common (P11, Zengcheng, 2015).

Concerns have also been raised as to how to manage this dilemma. Governmental officials from Xintang expressed worries over their perception that an effective planning framework or management system was lagging behind local development needs, aspirations and opportunities.

> The local government has to consider from the perspective of better boosting the local economy, which has resulted in a short-term interests-driven development model. Now the circumstances (in relation to the planning and development) are being reversed. First, we had projects, then, we made the plans... Our biggest drawback is that the projects come first, but there is not an effective system to regulate this situation (GO5, Xintang, 2015).

Secondly, this *ad hoc* and incremental project-oriented development has left Xintang an extremely messy spatial layout with scattered industrial land and many management challenges. The most evident proof of this is the extremely disorganised industrial land in Xintang over time. Figure 8.7 shows extensions of industrial land in Xintang between 1995 and 2010. It can be seen, that initially, Xintang's industrial development was predominantly concentrated along the Dong River (from 1995 and 2005). Then, with the construction of the National Road and the expressway, the development of industrial land tended to become more distributed along the main roads (from 2005 and 2010). All these preferences in selecting industrial locations were mainly the result of a project-oriented economy. Different land uses, especially residential and industrial land in 2010, were mixed together in a disorderly fashion, making the urban landscape of Xintang rather messy and unstructured.

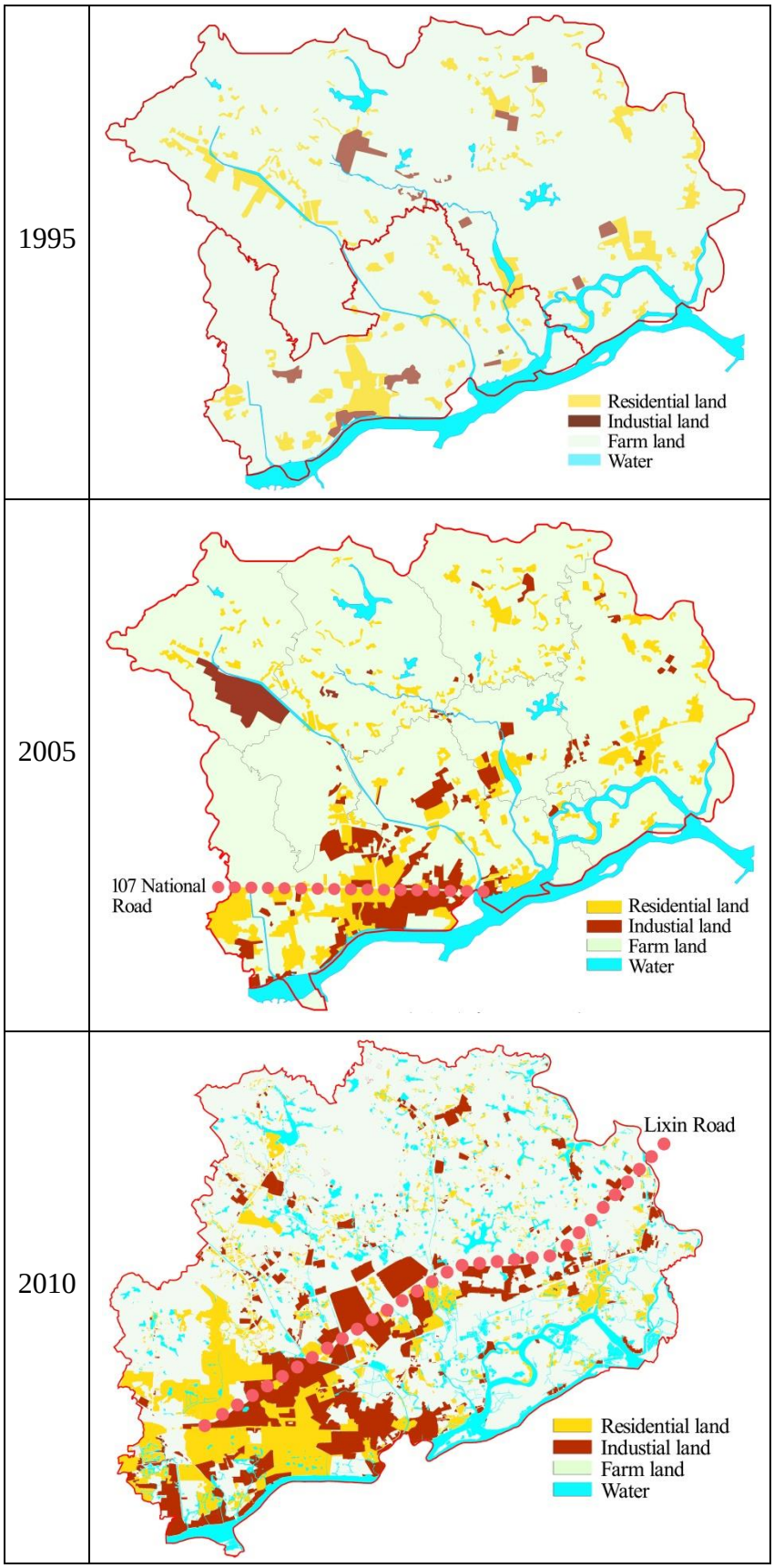

Figure 8. 7 Extension of Xintang's industrial and residential land, 1995-2010

Sources: Xintang People's Government and Architectural Design and Research Institute of SCUT (2013). Adapted by the author.

Another outcome of the project-oriented economy was the messy spatial layout of different land uses, and the acquisition and management of land resources. For example, one interviewee explained the problems associated with constructing the newly planned Guangzhou eastern transportation terminal.

> The biggest problem facing the Guangzhou eastern transportation terminal is the huge costs in the land acquisition. Around 2.69 km^2 of land is covered with scattered villages and enterprises. The estimated total cost in removing all these activities is estimated to be between 13.5 billion to 15 billion yuan (calculated according to the compensation standards of Guangzhou). Furthermore, it is also hard to integrate the new terminal with its surrounding infrastructures, as the building standards for these infrastructures are outdated (GO5, Xintang, 2015).

Thirdly, Xintang has long been prioritising its industrial development, which has unfortunately resulted in insufficient and relatively low standards of urban services. One prominent example is that there is a lack of intra-city public transportation provision. Instead, privately operated motorcycles serve as the public transportation providers (see Figure 8.8). Instead of being a coherent city, Xintang exhibits, an urban form that might be characterised as an uncontrolled suburban area, with residential, commercial, industrial functions all mixed together. Planners who were engaged in its latest comprehensive planning activities highlighted some of these dilemmas:

> When we were doing fieldwork for the new round of the Xintang comprehensive plan, we found that Xintang had very few service facilities, and there were no public centres either (P9, Guangzhou, 2015).

> Its construction phases are too messy, as private capital is so strong but uncontrolled. Furthermore, problems existed in the planning and management of Xintang, such as the lack of intra city public transportations and parking spaces (VS1, Xintang, 2015).

Figure 8. 8 Motorcycle taxis everywhere carrying passengers

Sources: Photo taken by the author.

Local entrepreneurs all expressed their concerns on the future recruitment of staff because of the inconveniences of living in Xintang.

> The most prominent difficulty for our future development is of course the recruitment of staff. The surrounding services are very poor, especially transportation links and local schools. Xintang has very few high quality schools. Also, if someone wants to come here for job interviews, they can only arrive by motorcycle taxis. There are no taxis, and no buses either. Managers like us, either live in Shenzhen city, or Guangzhou city, and a few live in the huge villa community “Phoenix” in Xintang (E3, Zengcheng, 2015).

> The technicians won’t stay long. If they have better opportunities, they’ll choose to leave. Most managers live in Guangzhou’s central city. Because it is not at all liveable here in Xintang. Life should not just be about working and having a place to sleep... There are no adequate shopping, catering or entertainment facilities in Xintang. Furthermore, what most managers are concerned with most is of course the quality of their children’s education. This is inadequate in Xintang (E2, Zengcheng, 2015).

8.6 Summary

Xintang originally consisted of five towns within Zengcheng county-level city under the jurisdiction of Guangzhou city region. In 2004, the five towns were merged together to create 'Big Xintang' through administrative re-organisation. Since then, Xintang has developed as a functional place. It evolved organically before 2000 and became an economic core within Zengcheng. Then it was recognised as an integral part of Guangzhou's polycentric development strategy through the latter's master planning activities. From 2000, the interconnections between Xintang and the Guangzhou core city have been strengthening, both from the spatial and functional perspectives.

Xintang has been developed as part of the polycentric spatial structure of Guangzhou city region. In the last two rounds of the Guangzhou's city master planning exercises it was identified and planned initially as a central town and later as a satellite town. By exploring the key themes in the development of Chinese edge cities, it can be argued that whilst it initially emerged as an independent organic economic growth core, Xintang is now emerging as a Chinese edge city within Guangzhou's polycentric spatial structure with a unique development trajectory developed from its self-growing economic core (see Table 8.5).

Table 8. 5 Key themes explored in Xintang as an integrated Chinese edge city from an economic core

Key themes	Explanations of the key themes	Xintang
Spatial location and spatial linkages	Spatial location	Located on the eastern edge of Guangzhou city region; Adjacent to Huangpu district and Dongguan city
	Spatial linkages with the core city	Transportation links (freeway/expressway, intercity rail line)
Functions	Major economic functions	Industries
	Functional connections with the core city	An industrial sub-centre within Guangzhou city region; A gateway in promoting the integrated development of Guangzhou core city, Dongguan city and Shenzhen city; A residential sub-centre with increasing urban services and public transportation land uses
Governance	Changes of governing bodies	From mainly local governance to the emerging multi-level governance arrangements
	Governance structure	Five levels: National – Regional – Municipal – County-level city/District – Local

CHAPTER NINE

Polycentric Development and the Making of a Planned Edge City: The Case of Guangzhou High-speed Railway New Town

9.1 Introduction

This chapter will move on to the third case, a planned edge city. The Guangzhou High-speed Railway New Town (Guangzhou HSR New Town) has been chosen within the Guangzhou city region. In the *2011 Guangzhou City Master Plan* (Guangzhou Municipal Planning Bureau, 2012), a spatial layout of 'two axes – one belt – multiple nodes' was proposed at the central city scale, in which multiple nodes were planned as strategic development areas to support the urban functions of Guangzhou central city. The HSR New Town was designated as one of the strategic development areas. It was planned as the area surrounding Guangzhou's Southern Station (Guangzhou High-speed Railway Station), which started operating in 2010. As it is a newly planned strategic node, the aims of this chapter are to evaluate its policy and planning documents, and to explore its potential as a Chinese edge city through spatial linkages, functional connections and governance arrangements. Challenges during its formation will be discussed briefly.

9.2 Spatial location and spatial linkages

The Guangzhou HSR New Town, or Guangzhou Southern Station Business Area (as it is known in some of the policy documents), is located at the western end of the Guangzhou city region, within the jurisdiction of the Panyu district. It is adjacent to the Foshan city region (another city region in Guangdong province) (see Figure 9.1).

The New Town is near to three urban cores. It is 17 km away from Guangzhou's central urban area, 18 km away from Foshan's central urban area, and 10 km away from the central area of Panyu district (Guangzhou Municipal Commission of Commerce, 2016).

The total planning area of the Guangzhou HSR New Town is 36.16 km^2, with a central area planned to be 4.51 km^2 (see Figure 9.1) (Guangzhou Municipal Commission of Commerce, 2016). At the core of the HSR New Town sits the Guangzhou Southern Station. The station was planned from 2004, and was finished and started operating in the early 2010. In 2015, the number of passengers travelling through the Guangzhou Southern Station had reached, on average, 250,000 per day, and on peak days 400,000 (Guangzhou Municipal Commission of Commerce, 2016). It has been developing rapidly as a transportation hub, which provides great opportunities for its surrounding new town development.

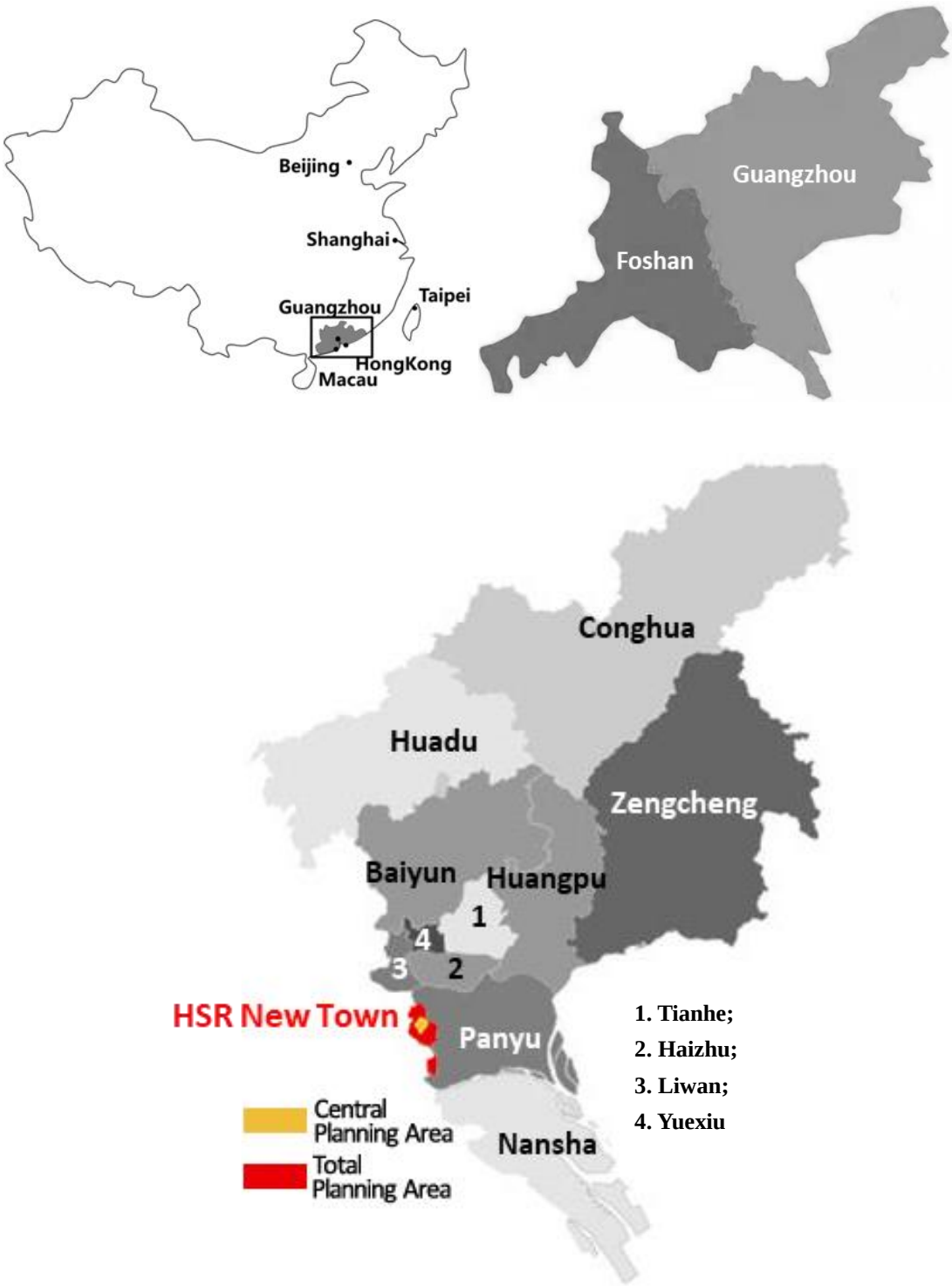

Figure 9. 1 Locations of Guangzhou city region in China, and the Guangzhou HSR New Town within the Panyu district, Guangzhou city region

The major spatial linkages between the Guangzhou HSR New Town and Guangzhou's core city and other nodal points within the Guangzhou city region are

primarily based on the Guangzhou Southern Station. These include external links through railways and internal links through local metro lines. The Guangzhou Southern Station is one of the three most important transportation hubs across the whole Guangzhou city region, together with the Guangzhou international airport in Baiyun district, and the Nansha port in Nansha district. The southern station is also one of the three main railway stations in the Guangzhou city region, together with the Guangzhou Station in Yuexiu district and the Guangzhou Eastern Station in Tianhe district, both of which are located in the core city of Guangzhou. In terms of the metro links, the southern station is the terminal station of both Line 2 and Line 7, as part of the advanced and convenient metro system of the Guangzhou city region (see Figure 9.2). Line 2 provides the major transportation link between the HSR New Town and Guangzhou's core city, whereas Line 7 is an internal line within Panyu district. Specifically Line 2 passes by several different districts within Guangzhou city region. It connects Panyu district with Guangzhou's core city and Baiyun district. By contrast, Line 7 is relatively short, and goes from the Guangzhou Southern Station to the Guangzhou university town, which is also located in Panyu district. Figure 9.2 shows the metro system of Guangzhou including thirteen metro lines.

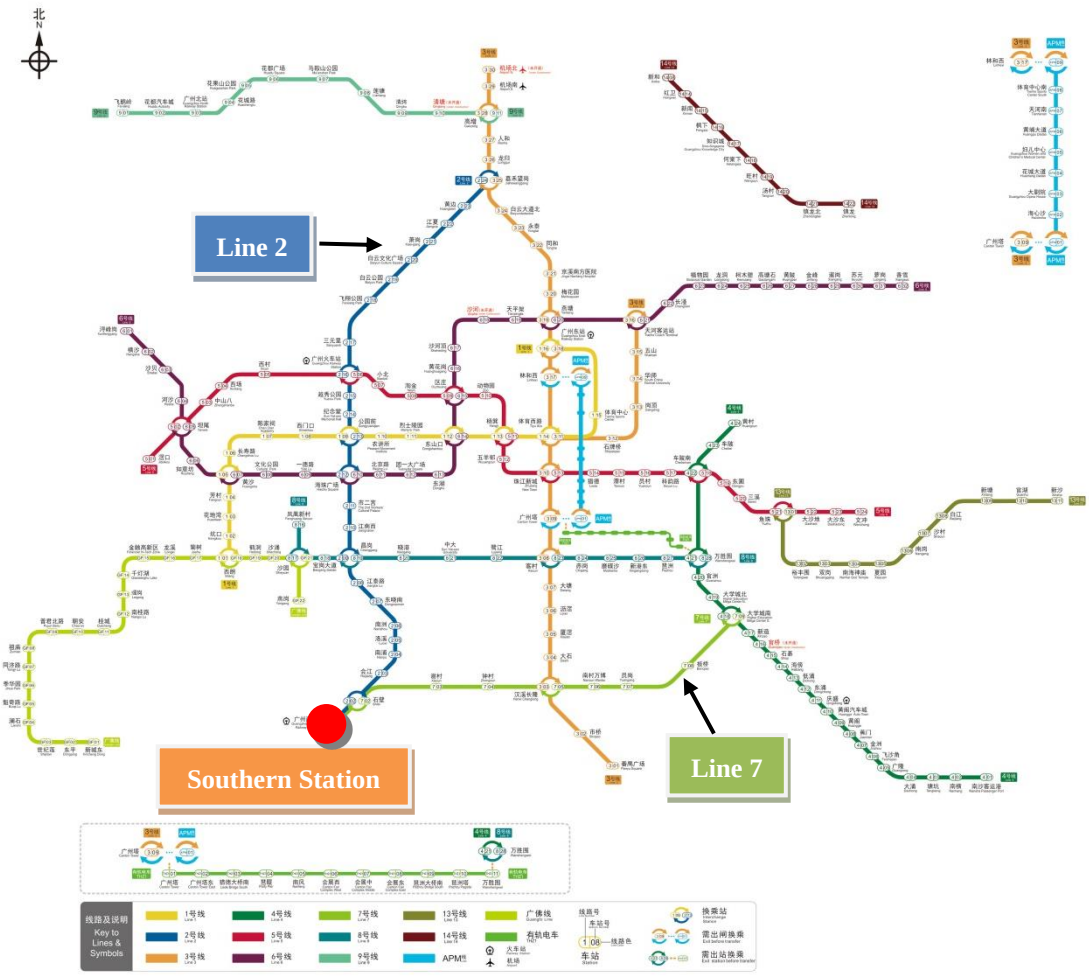

Figure 9. 2 Location of the Guangzhou Southern Station in the Guangzhou Metro System

Sources: Guangzhou Metro (2017).

9.3 Functions

This section examines the major functions of the Guangzhou HSR New Town specified in key planning documents, and its anticipated functional connections mainly with Guangzhou's core city, also based on a series of planning and policy documents.

9.3.1 Major functions

Relevant plans that have provided functional guidance to the HSR New Town include the *2011 Guangzhou City Master Plan* (Guangzhou Municipal Planning Bureau, 2012) at the city regional scale, the *Comprehensive Planning of Urban and Rural Regeneration of Panyu District (2015-2035)* (Guangzhou Panyu Urban

Regeneration Bureau, 2018) at the district scale, and the *Urban Design and Regulatory Detailed Plan of the Central Area of Guangzhou Southern Station Area* (Panyu District Government, 2014) at the local scale.

From the planning perspective, it is quite evident from all three planning documents, at the municipal, district and local scales, that the commerce and trade industries area highlighted as being the economic heart of this area, based around transportation and logistics (see Table 9.1). Both planning documents, at the district and local scales, also identified the exhibition and business services as having the potential to be major functions. Furthermore, as the planning period of the Panyu district level planning is from 2015 to 2035, it has become more ambitious compared with the other two plans, and designates the New Town as the location where several strategic and emerging industries, which are planned to be developed in future, can be concentrated, including artificial intelligence, information technology, and biomedicine. The *Urban Design and Regulatory Detailed Plan of the Central Area of Guangzhou Southern Station Area* (Panyu District Government, 2014) is a more detailed plan compared with the other two more strategic planning documents. It focused on the central area of the Guangzhou Southern Station Business Area, and provided the functions that the central area of the New Town would develop in the near future, including the commerce and trade, business services, exhibition, and tourism (Panyu District Government, 2014). Overall, the plan designates the Guangzhou Southern Station Business Area as the Southern China commerce and trade centre, and is intended to become a modernized comprehensive new city.

Table 9. 1 Major functions established from the Guangzhou city master plan, Panyu district plan and the HSR New Town plan

Nature of plans	Planning documents at different levels	Major functions
Strategic plans	Guangzhou City Master Plan (2011-2020)	• **Modern trade** • **Modern logistics** • Information services • Cultural and creative industries
	Comprehensive Planning of Urban and Rural Regeneration of Panyu District, Guangzhou (2015-2035)	**Based around the southern station** and focusing on two aspects of functions: • Modern services: Headquarters; **conference and exhibition**; hotels, **commerce and trade**; **business services** • Strategic emerging industries: Artificial intelligence; information technology; biomedicine
Detailed plans	Urban Design and Regulatory Detailed Plan of the Central Area of Guangzhou Southern Station Area	• **Commerce and trade** • **Business services** • **Exhibition** • Tourism

Sources: Guangzhou Municipal Planning Bureau (2012); Guangzhou Panyu Urban Regeneration Bureau (2018); Panyu District Government (2014).

From 2011 until the end of 2015, the Guangzhou Municipal Government, released eight land parcels for development in the core area of Guangzhou Southern Station Business Area. This included six commercial and financial land parcels and two commercial/residential land parcels (Guangzhou Municipal Commission of Commerce, 2016). Ongoing construction is readily evident around Guangzhou Southern Station (see Figure 9.3).

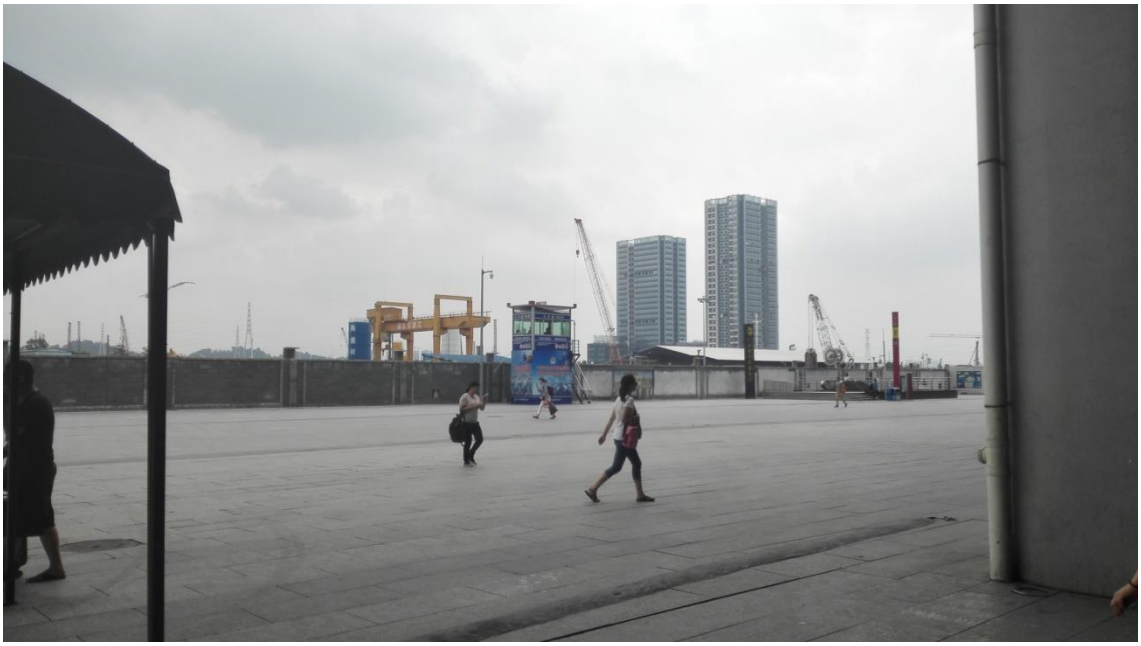

Figure 9. 3 The ongoing construction outside of the Guangzhou Southern Station

Sources: Photo taken by the author.

9.3.2 Functional connections

The aim of this section is to explore the functional role of the HSR New Town within Guangzhou's polycentric spatial structure. In doing so, this section focuses on the potential functional connections that the Guangzhou HSR New Town has with the Guangzhou's core city and with other cities/city regions within the wider Pearl River Delta.

The functional roles of the HSR New Town, within Guangzhou city region, can be elaborated from three spatial perspectives:

1) a significant transportation hub and a potential commerce and trade centre within the Guangzhou city region;

2) a gateway in promoting the Guangzhou-Foshan integrated development; and,

3) a platform which helps connect Guangzhou with other cities/city regions within the Pan-Pearl River Delta (PPRD).

At present, the primary function of the Guangzhou HSR New Town is based on its southern station, acting as one of three most important strategic transportation hubs within Guangzhou city region. From the planning documents, discussed in the previous section, the HSR New Town is designated to become a commerce and trade centre. In the most recent strategic policy document, proposed by Guangzhou Municipal Government, the *13th Five-Year Plan of Economic and Social Development of Guangzhou* (Guangzhou Municipal Government, 2016), it designated the HSR New Town as one of the important functional nodes within the Guangzhou city region.

A second functional role that the HSR New Town will play is as a gateway for Guangzhou's core city and the border areas within the city region to establish integrated development with the Foshan city region. In 2009, initiated by both Guangzhou and Foshan Municipal Governments, the *Development Plan of Guangzhou-Foshan Integrated Development (2009-2020)* aimed at providing detailed guidance for the Guangzhou-Foshan integrated development. It is the first cross-regional comprehensive planning document in China. The southern station area is recognised, in this planning document, as one of the five key coordinated development areas along the border of these two city regions (see Figure 9.4). It is planned as a regional logistics, business and trade centre.

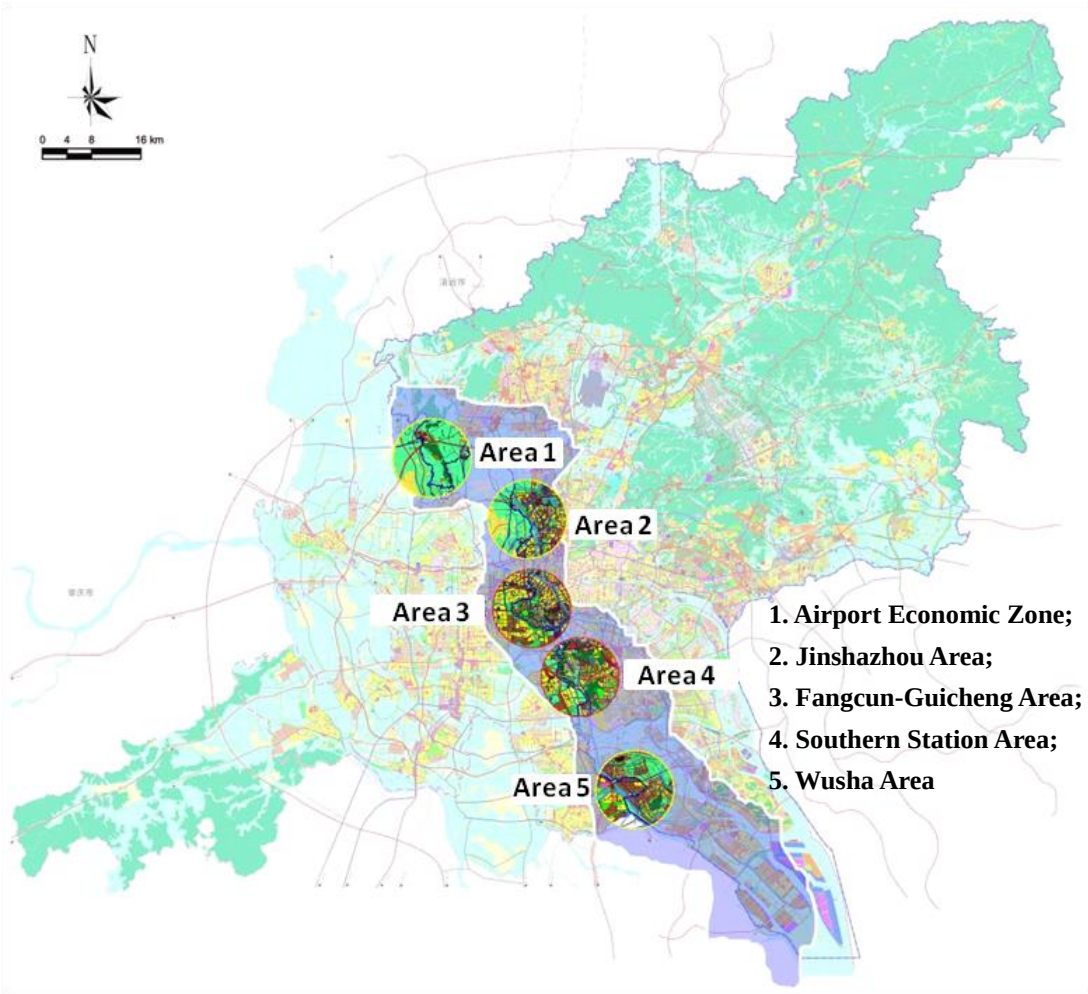

Figure 9. 4 Locations of the five key coordinated development areas along the border of Guangzhou and Foshan city regions

Sources: Guangzhou Municipal Government and Foshan Municipal Government (2009b).

More recently, in 2017, a joint *13th Five-Year Plan of Guangzhou-Foshan Integrated Development (2016-2020)* (Guangzhou Municipal Government and Foshan Municipal Government, 2017) was produced. The Guangzhou-Foshan region is planned to be the core area within the Pearl River Delta urban agglomerations, and a demonstration area of inter-city integrated development across the whole country. The Guangzhou Southern Station, because of its geographical advantages and its role as a transport hub, has been recognised as being and is intended to be enhanced as the core gateway within the Guangzhou-Foshan inter-city metro network. Hence, the Guangzhou Southern Station Area is considered to be one of the important nodes for promoting this integrated strategy.

As for the third functional role for the HSR New Town, in 2015, the Guangdong Provincial Development and Reform Commission officially approved the Guangzhou Southern Station Business Area as the permanent site for hosting the Pan-Pearl River Delta (PPRD) Cooperation and Development Forum, and the PPRD Economic and Trade Fair. The PPRD Co-operation Park is also planned to be located in the Guangzhou Southern Station Business Area (Panyu District Government, 2016). The HSR New Town will therefore provide an important platform for future co-operation between Guangzhou and other cities/city regions within the PPRD. The PPRD Cooperation Park is also under construction in the business area, with functional development focusing on the professional exhibition/expo space and business services (Guangzhou Municipal Government, 2016).

At present, the HSR New Town is functionally connected with Guangzhou's core city and is an important transportation hub and a gateway for the Guangzhou-Foshan integrated development corridor. Furthermore, it is planned to be (and construction is underway) a commerce and trade centre within Guangzhou city region, and the hub for a significant co-operation platform for Guangzhou and the other city regions within the wider PPRD. Indeed, it is developed and promoted as a strategic node both internally in Guangzhou's polycentric structure and externally within the wider regions (the Guangzhou-Foshan region and the PPRD).

9.4 Governance

As a designated development area within Panyu district, the governance of the HSR New Town involves governmental bodies from different levels of government, including the regional (especially the Guangzhou-Foshan inter-city scale), Guangzhou municipal, district (Panyu district), and local (Shibi street, under the jurisdiction of Panyu district) levels.

At the regional level, the development of the HSR New Town is being promoted at the Guangzhou-Foshan regional level, through regional planning and other policy

documents guidance (see section 9.3). Furthermore, in the implementation stage, both the Guangzhou Municipal Government and Foshan Municipal Government have initiated a number of co-operative activities, in order to guarantee the successful delivery of these planned policies in practice. For example, since April 2009, a joint meeting of the mayors of Guangzhou and Foshan municipalities has been organised every six months, with the main purpose of addressing major problems, coordinating the responsibilities of various departments, and examining planning implementation strategies (Guangzhou Municipal Government and Foshan Municipal Government, 2009b). These joint meetings are led by mayors of Guangzhou and Foshan municipalities, with representation from twenty-two key departments in both municipalities (Guangzhou Municipal Government and Foshan Municipal Government, 2009a). During the meetings, the *Annual Work Plan for Promoting the Guangzhou-Foshan Integrated Development* for the last year is reviewed and the work plan for the next year is discussed and approved. A number of joint projects are discussed in each of the meetings covering various aspects: the urban planning co-operation projects, key infrastructure construction projects, industrial co-operation projects, environmental protection projects, technological innovation projects, the public services projects, and so on (Foshan Development and Reform Bureau, 2010a; 2010b; 2011; 2014). Furthermore, a Joint Meeting Office has been set in each Municipal Development and Reform Commission (Bureau) of Guangzhou and Foshan, with the purpose of supervising the implementation of the agreed items from joint meetings (Guangzhou Municipal Government and Foshan Municipal Government, 2009a).

The governance arrangements for the HSR New Town at municipal, district and local levels are largely nested and integrated together. However, some major challenges and problems encountered within such a governance structure can also be identified.

In 2009, the Panyu government established the Management Committee of Guangzhou Southern Station Area. This is an agency of the Panyu District Government. This Management Committee is mainly in charge of the organisation,

coordination and management of urban and social affairs of the whole area (Office of Shibi Street, Panyu District Government, 2017). The compositions of the Management Committee reflect its important role and relationships both with the Panyu District Government and with the Shibi Street Office (see Chapter seven for explaining districts, streets and towns). The official website of Panyu district lists the key leading members of the Management Committee, with the six leaders/members of the Management Committee also holding significant positions in Panyu District Government and the Shibi Street Office (Panyu District Government, 2017) (see Table 9.2). This nested governance arrangement also suggests that, despite the strategic role of the HSR New Town being recognised in a series of regional and municipal planning/policy documents, the significance of the Guangzhou HSR New Town has not, as yet, in practice been raised to the Guangzhou municipal level, as the key leaders only come from the District and the Street levels.

Table 9. 2 Leaders with significant positions for the Management Committee of the Guangzhou Southern Station Area, the Panyu District Government and the Shibi Street Office

Positions in Management Committee	Positions in District Government	Positions in Street Office
Director of the Management Committee	Deputy District Head	—
Deputy Director of the Management Committee	—	Secretary of the Party Working Committee
Deputy Director of the Management Committee	—	Director of the Street Office
Deputy Director of the Management Committee	—	In charge of the Women's Federation of the Street
Office Director of the Management Committee	—	In charge of the Party and Government Office, Governmental Affairs Centre, and the information construction work
Deputy Investigator of the Management Committee	—	In charge of the traffic control

Sources: Panyu District Government (2017).

Although not being directly involved in the Management Committee, in 2013, over ten governmental departments and relevant agencies of the Guangzhou municipal level began to have direct influence on promoting the development of Guangzhou

Southern Station Business Area. The three main agencies in charge of the land development and project construction of the New Town are:

- Guangzhou Municipal Construction Commission, the leading governmental department taking full control of the land development, industrial development, investment promotion, and providing corporate services;
- Guangzhou Municipal Land Development Centre, the project owner and the main investment body; and
- Guangzhou City Construction and Investment Group, a state-owned enterprise as the construction agent corporation (G. Li et al., 2016).

Over ten municipal level power groups become involved, however, it is the Management Committee of the HSR New Town, a district level agency, who is responsible for the organisation, coordination and management of whole urban area and its associated social facilities. This has emerged as a major challenge for the HSR New Town management during the last few years. The governance arrangements of the HSR New Town have not been so effective, primarily due to the limited administrative power of the Management Committee, as at a lower district level with only eight leading members. In practice, it is really difficult for a district level agency to coordinate the activities of over ten municipal level departments or agencies. The Chairman of the Panyu CPPCC (Chinese People's Political Consultative Conference) expressed his concerns regarding the development of the Southern Station Business Areas as follows, 'the primary problem is that a deputy bureau-level agency (the Management Committee of Guangzhou Southern Station Area) can hardly organise or manage its constructions which involve so many bureau-level departments (municipal level governmental departments)' (Southern Metropolis Daily, 2016b, para.3).

9.5 Summary

Unlike Nansha district and Xintang, the Guangzhou HSR New Town is newly planned as a strategic development node at the central city scale within Guangzhou city region. It is being developed on the basis of major infrastructure development (Guangzhou High-speed Railway Station or Guangzhou Southern Station), and will followed by the building of comprehensive urban functions as designated by regional, municipal and local level planning documents.

After examining the spatial linkages, functional connections and governance arrangements of the HSR New Town, it is argued that this New Town can also be regarded as an emerging Chinese edge city that has been totally planned because of a strategic transportation hub. This is in contrast with Nansha and Xintang (see Table 9.3).

Table 9. 3 Key themes explored in the Guangzhou HSR New Town as a planned Chinese edge city

Key themes	Explanations of the key themes	Guangzhou HSR New Town
Spatial location and spatial linkages	Spatial location	Located at the western end of Guangzhou city region, within the jurisdiction of the Panyu district; Adjacent to Foshan city region
	Spatial linkages with the core city	External links through railways; Internal links through metro lines
Functions	Major planned functions	Commerce and trade industry; Transportation and logistics
	Functional connections with the core city	A significant transportation hub and a potential commerce and trade centre within Guangzhou city region; A gateway in promoting the Guangzhou-Foshan integrated development; A platform helps connect Guangzhou with other cities/city regions within the PPRD
Governance	Governance structure	Four levels: Regional – Municipal – District – Local

CHAPTER TEN

Discussion

10.1 Introduction

The three case study chapters (Chapters seven to nine) have explored in depth the development trajectories and formation mechanisms of Chinese edge cities within a polycentric spatial structure at the local scale. Each of the three case studies representing one type of Chinese edge cities has illustrated similar outcomes but with its unique characteristics. Following the three respective case study analysis, this chapter aims to provide a cross-case comparion and discussion based around common themes which have been explored in each of the case study chapter. Major findings regarding the challenges in the formation of Chinese edge cities will be summarised in the final concluding chapter, Chapter eleven.

10.2 Cross analysis over three Chinese edge cities

The most important findings from Chapters seven to nine is that all three selected cases have been evolving towards Chinese edge cities to help form the basis of a polycentric spatial structure for the Guangzhou city region. Different development trajectories have been demonstrated for each type of Chinese edge cities at three spatial scales, from the perspective of three key themes. The cross-case analysis in this section will follow the same analytical framework and generate a series of common features for Chinese edge cities.

10.2.1 Spatial location and spatial linkages

From a spatial perspective, Nansha is located at the edge of the Guangzhou city region and at the geographical centre of the Pearl River Delta. It has good

transportation links in terms of metro and expressways with Guangzhou's core city. Moreover, based on the various functional spaces of Nansha, its relationships with Guangzhou's core city are being transformed. Initially it was neglected by Guangzhou, and was passively accepting the expanding and relocating industries. More recently, it is seen as helping to fulfilling a national strategic task for the Guangzhou city region as a whole with more attention being paid to the liveability aspects of the city.

Xintang is located on the eastern edge of Guangzhou city region, adjacent to the Guangzhou core city or the central urban area of Guangzhou city region. Currently Xintang has good external transportation links with Guangzhou's core city in terms of freeway/expressway. An intercity line and a public transportation terminal have been planned and are under construction. These will undoubtedly enhance its accessibility to Guangzhou's core city.

Guangzhou HSR New Town, is located at the western edge of the Guangzhou city region, on the corridor of the Guangzhou-Foshan regional integrated development. It has established good transportation links with Guangzhou and Foshan cities, as well as other surrounding areas, mainly based on the Guangzhou Southern Station.

Therefore, from spatial perspective, all of the three Chinese edge cities are located at the edge of Guangzhou city region, with good transportation links having already been , or being, established with the core city and other cities within the wider metropolitan region.

Table 10. 1 Cross analysis over three Chinese edge cities in terms of spatial form

Spatial form	Spatial location	Spatial linkages with the core city
Nansha	Located to the south end of Guangzhou city region; Situated in the geographic centre of the Pearl River Delta	Transportation links (metro and expressway); Interconnections through various functional spaces
Xintang	Located on the eastern edge of Guangzhou city region; Adjacent to Huangpu district and Dongguan city	Transportation links (freeway/expressway, intercity rail line)
Guangzhou HSR New Town	Located at the western end of Guangzhou city region, within the jurisdiction of the Panyu district; Adjacent to Foshan city region	External links through railways; Internal links through metro lines
Common features	Located at the edge of Guangzhou city region	Good transportation links

10.2.2 Functions

From a functional perspective, Nansha has established functional connections with Guangzhou's core city as a gateway through port logistics and a media/platform for connecting Guangzhou's core city with Hong Kong, Macao and even, the world.

Xintang's economic development remains focused on the industrial development. However, it has already established various functional connections with Guangzhou's core city, including an industrial sub-centre within the Guangzhou city region, as gateway location in promoting the Guangzhou-Dongguan-Shenzhen integrated development, and a residential sub-centre started emphasising on its urban services and inter-city public transportations. Most notably from functional perspective, it has developed both as the Denim Clothing Town of China and as the Guangzhou Eastern Automotive Industrial Base.

The major planned functions of the Guangzhou HSR New Town are transportation, logistics, commerce and trade. Regarding its functional connections with Guangzhou's core city and the wider regions, the New Town is primarily a significant transportation hub within Guangzhou city region and a gateway for

promoting Guangzhou-Foshan integrated development. Furthermore, it is also planned to become a business, commerce and trade centre, not only within Guangzhou city region, but within the wider PPRD region as well.

It is evident that all of the three Chinese edge cities have become gateways or platforms critical in promoting regional integrated development.

Table 10. 2 Cross analysis over three Chinese edge cities in terms of functions

Functions	Major functions	Functional connections with the core city
Nansha	Secondary sector, especially industries	A gateway through port logistics; A media or platform for connecting Guangzhou's core city with Hong Kong, Macao or even the world
Xintang	Industries	An industrial sub-centre within Guangzhou city region; A gateway in promoting the integrated development of Guangzhou core city, Dongguan city and Shenzhen city; A residential sub-centre with increasing urban services and public transportation land uses
Guangzhou HSR New Town	Commerce and trade industry; Transportation and logistics	A significant transportation hub and a potential commerce and trade centre within Guangzhou city region; A gateway in promoting the Guangzhou-Foshan integrated development; A platform helps connect Guangzhou with other cities/city regions within the PPRD
Common features	—	Gateways or platforms in promoting the regional integrated development

10.2.3 Governance

From the perspective of governance, Nansha has gone through changes from initially, a suburban town of Panyu county with a national development zone under county-level governance, to an administrative district of Guangzhou city region under municipal-level governance, to the emerging multi-level governance initiated by governmental and non-governmental actors at national, regional, municipal and local levels.

Regarding the governing bodies and governance structures of Xintang, it has evolved from a largely self-organised and project-oriented economic structure to a more

complex emerging multi-level governance structure, comprising of governing bodies at national, regional, municipal, district and local levels. Compared with its organic development trajectory during its early developmental stages, it is now being subject to more top-down controls and regulations from upper level governments.

Concerning the governance bodies and structure of the HSR New Town, multi-level governments at four levels (regional, municipal, district and local) are all involved in its development.

Clearly, the emerging multi-level governance arrangements have become another common feature of Chinese edge cities.

Table 10. 3 Cross analysis over three Chinese edge cities in terms of governance

Governance	Changes of governing bodies	Governance structure
Nansha	County-level governance to municipal-level governance, and to the emerging multi-level governance	Four levels: National – Regional – Municipal – Local
Xintang	From mainly local governance to the emerging multi-level governance arrangements	Five levels: National – Regional – Municipal – County-level city/District – Local
Guangzhou HSR New Town	No change	Four levels: Regional – Municipal – District – Local
Common features	No common feature	Emerging multi-level governance consisting of four or five levels of government: (National) – Regional – Municipal – County-level city/District – Local

10.3 Summay

The three types of Chinese edge cities were identified based on reviewing relevant literature. In doing so, integrated, organic, and planned edge cities were identified as one of the criteria in selecting case studies for this research. After a detailed exploration and explanation of the three cases, it is interesting to note that all three Chinese edge cities were initiated, and promoted, based on top-down planning or

policy guidance. None has evolved through an organic or “spontaneous” process. In fact, the selected organic edge city, Xintang, is also the result of planning initiatives, when considering its transformation process towards a Chinese edge city. Therefore, ultimately Xintang could also be regarded as an integrated edge city. The difference between Xintang with the other integrated edge city (Nansha) is that, before the close involvement of a polycentric spatial development strategy in their development, Nansha was a nationally designated development zone promoted mainly by the municipal government, whereas Xintang had grown as an economic core mainly through local governance arrangements.

Specifically speaking, unlike American edge cities, whose development is a “spontaneous” process initiated by private developers (see Chapter three), Nansha, as a Chinese edge city, was developed mainly within the complex dynamics of national, municipal and local governance. The national strategic roles of Nansha such as a national development zone, State-Level New Area and Free Trade Zone were all designations granted by the State in its attempt to fulfil national strategic tasks, while the actual promotion was done by the Nansha local government. Meanwhile, as an administrative district within Guangzhou city region, Nansha district is supposed to be under the direct governance of Guangzhou Municipal Government. However, these national strategic roles have empowered Nansha’s local government significantly, helping it to get more power, indeed the same powers as Guangzhou Municipal Government.

From the establishment of Nansha as an Economic and Technological Development Zone in 1993, its development trajectory has not been a simple linear process. There have been uncertainties to its positioning and unexpected adjustments in its planning. However, with its increasingly interdependencies with Guangzhou’s core city both spatially and functionally, as well as its emerging multi-level governance, it is emerging into a Chinese edge city which is helping to promote the polycentric development of the Guangzhou city region. What’s more, both spatial and functional linkages have been established or are being established between Nansha and its

surrounding cities or regions, making Nansha a significant growth pole within the wider Pearl River Delta or the GHM Greater Bay Area.

Compared to Nansha, the initial development of Xintang mainly relied on the denim clothing industry with almost no planning or policy arrangements and guidance. The area therefore originally developed as a self-organised economy, which became the economic core within Zengcheng in its own right. Subsequently planning activities, especially from the Guangzhou city regional scale and policy directions from Zengcheng helped facilitate its transformation towards a Chinese edge city, mainly by enhancing interconnections with Guangzhou's core city. In this regard, Xintang can be regarded as an integrated edge city from a self-growing economic core within the Guangzhou city region, as its subsequent development towards a Chinese edge city was integrated with the initial economic core of Xintang (as compared to Nansha, which is becoming integrated edge city because of its role as a national development zone).

Wu and Phelps stated the dynamics of the new town growth in the Beijing city region: 'In the Chinese global city-region, post-suburban development is orchestrated by entrepreneurial arms of the state which aim to invent growth poles as a means of further promoting the international economic role of a polycentric Beijing metropolitan economy' (2011, p.427). Nansha also provides such an example in case. Xintang, on the other hand, represents a different dynamic of growth, especially with regards its initial development stages. As a functional area directly governed by a district level, rather than a municipal level government like Nansha, the development and transformational processes of Xintang are unique. Xintang was initially developed and managed on its own and became an economic core, organically, with few interventions from upper level governments.

Undoubtedly, there are many challenges that have been noted during the transformation processes of three Chinese edge cities. For Nansha, a number of aspects require more attention, including better planning for more efficient land use,

the need to improve inter and intra transportation links, and an urgent need for the construction of social infrastructure. For Xintang, the drawbacks and challenges that are a consequence of an initially self-organised approach are significant and include a poorly organised and constructed urban environment, a severe lack of services, which are also of poor quality, the haphazard management of land resources, and the need to constantly adapt to the governance changes of the recent past. As for the third case study, the Guangzhou Southern Station only started operating from 2010, and Guangzhou HSR New Town is still under construction, challenges in forming this Chinese edge city remain to be seen in future. Nevertheless, some concerns have already been raised following the early stages of the development of Guangzhou HSR New Town, mainly relating to its governance arrangements. The development of the HSR New Town, so far, has not been as expected and planned. It was reported that during the 12th Five-Year Plan period (from 2011 to 2015), the actual amount of development had not even reached one-third of its planning target (G. Li et al., 2016).

CHAPTER ELEVEN

Conclusions

11.1 Introduction

This final chapter brings together the various aspects discussed in this thesis, and draws together the major findings and original contributions from this research. Implications for planning and policy-making are discussed by reflecting on the major challenges and difficulties faced by the key actors when applying the polycentricity ideas to spatial planning activities in China. Furthermore, this chapter also outlines some limitations of this research and suggests some possible directions for future research.

11.2 Major findings and contributions

This section offers a brief discussion about the most significant research findings of this thesis. The main findings reflect objectives three and four of this research, and are identified based on the empirical analysis at two spatial scales (city regional and local scales). Three key themes will be discussed covering the findings from Chapters five to ten, including 1) the application of polycentricity in master planning practices in China; 2) development trajectories of Chinese edge cities; and 3) major challenges in the formation of Chinese edge cities.

11.2.1 Approaches and processes of the polycentricity application in master planning in China

The primary concern this thesis intends to explore is how and why the concept of polycentricity has been applied in the master planning practices within a Chinese context. The findings from Chapters five and six demonstrate how a polycentric

development strategy had been applied in planning documents and explain the dynamics behind each adjustment of the idea during various applications of the concept. Furthermore, upon understanding the polycentric development practices in master planning in the eight super/mega city regions in general, and Guangzhou and Nanjing city regions in particular, the divergent interpretations of polycentricity could be revealed. It is suggested the application of the polycentricity demonstrates a unique application when compared with the application of the concept from a Western perspective.

The concept of polycentricity has been applied in various rounds of master planning in super/mega city regions across China. It has been applied, within a city region, at all three spatial scales or planning scales of master planning activities. These include the city regional scale, the metropolitan scale, and the central city scale. At the city regional scale, with the emerging polycentric spatial development narratives, urban centres and rural towns within the city regional scale which comprised the 'settlement system' in the master planning, had planned to exhibit internal polycentric structures. It was intended to achieve more balanced and networked development including the designation of sub-centres or central/satellite towns. At the metropolitan scale, polycentricity had been used to create a network of balanced growth hubs, emphasising the connectivity between sub-centres. At the central city scale, various sub-cities or urban key areas had been planned within, or at the edge, of the core city, mainly with the purpose of creating a functional and interconnected urban area, and enhancing the competitiveness of the central city as a whole.

Regarding the Guangzhou and Nanjing cases in particular, the three rounds of *Guangzhou City Master Plan,* since 1984, and three rounds of *Nanjing City Master Plan,* since 2001, have all applied the polycentricity concept. The polycentric ideas have been adjusted in each of these plans to help achieve the major objectives of integrated and balanced urban growth. The main strategic development priorities that have emerged has seen an evolution from a monocentric core city to a polycentric metropolitan structure (see Guangzhou's case), or from a massive new town

construction to an emphasis on the regional development corridors with inter-dependent polycentric nodes (see Nanjing's case).

Ever since the terminology polycentricity was applied in Chinese spatial planning documents, it quickly obtained widespread popularity among planners and policy-makers, and soon became a policy tool to determine future spatial structures and development priorities within city regions. In China, it has been regarded as an ideal model helping resolve the ever increasing problems of mono-centric central cities associated with unprecedented urban expansion and urbanization processes. The ultimate purpose of applying the polycentric development was also to help facilitate a more balanced and networked development as in the West. However, in practice, the focus of promoting the polycentric spatial development in China's super/mega city regions at this stage was more on enhancing the prosperity of the central cities and on promoting certain sub-centres with specific geographical or regional advantages.

11.2.2 The development trajectories of Chinese edge cities under the polycentricity delivery in China

Based on the cross-case discussions presented in Chapter ten, the development trajectories of Chinese edge cities are elaborated covering the integrated type (Nansha and Xintang) and the planned type (Guangzhou HSR New Town), with the similarities and differences between these two types being identified (see Table 11.1). The most significant difference of these two types of Chinese edge cities lies in their major functions and functional connectivity with the core city. Specifically, first, from the perspective of spatial location and spatial linkages, both integrated and planned Chinese edge cities are located at the edge of Guangzhou city region. Good transportation links with the core city exist, or are under construction, in all three edge cities. Secondly, from the perspective of functions, industries still take up the largest proportion of the economic structure of the integrated edge cities. While a transition is starting in all cases with an increasing emphasis being placed on the

tertiary sector. Indeed this is intended to be the primary role of the Guangzhou HSR New Town. The planned edge cities have been designed according to their unique functions. For example, the major functions of the HSR New Town are planned associated with its major infrastructure, including transportation and logistics, commerce and trade. Regarding their functional connections with the core city, or with other centres either within the city region or within the wider regions, both types of Chinese edge cities have become gateways or platforms in promoting the integrated development between their core city and other nodal points within the wider regions, primarily attributable to their specific geographical advantages. Furthermore, as integrated edge cities they mainly followed an industrial-oriented model, at least in their initial development stages, they have largely turned out to be industrial sub-centres within the city region (Xintang became a residential sub-centre as well). More recently, a more diversified economic and functional structure is being pursued. In Nansha, high-tech, new-tech and modern services industries are being actively promoted and in Xintang urban services and public transportation land uses are being constantly promoted. The purpose of such strategies, in both of the cases, is to facilitate their transformative development. The functional connections of the planned edge cities, on the other hand, are mainly based on major infrastructure and various newly planned functions. Finally, from the perspective of their governance arrangements, a multi-level governance structure is emerging in all Chinese edge cities, which involves governments operating at different levels including national, regional, municipal, district (or county-level city) and local levels. It should be pointed out that the interdependence or co-operation between different levels' governments (vertical), and between governments and non-governmental actors (horizontal) are also emerging at present in China. This has been noted in all three case studies, such as the nested and integrated governance arrangements between different tiers' governments, and a number of platforms or forums which brought together the governmental and non-governmental actors.

Table 11. 1 Key themes explained for Chinese edge cities within the Guangzhou city region

Key themes	Explanations of the key themes	Integrated Chinese edge cities	Planned Chinese edge cities
Spatial location and spatial linkages	Spatial location	Located at the edge of Guangzhou city region	
	Spatial linkages with the core city and within the region	Transportation links (metro lines, expressway/freeway, rail lines)	
Functions	Major functions	Secondary sectors, especially industries	Transportation and logistics; Commerce and trade
	Functional connections with the core city and within the region	Gateways or platforms in promoting the regional integrated development	
		Industrial/residential sub-centres with increasing urban services and public transportation land uses	Significant transportation hubs; Potential commerce and trade centres
Governance	Governance structure	Emerging multi-level governance consisting of four or five levels of government: (National) – Regional – Municipal – County-level city/District – Local	

11.2.3 Major challenges in the formation of Chinese edge cities

Drawing on the key actors' views and experiences, major challenges in the planning and delivery of the polycentric idea and in the formation of Chinese edge cities have been examined in Chapter six, from the city regional scale, and in Chapters seven to nine, from the local scale. To sum these findings up, several challenges and difficulties have been revealed and more attention needs to be paid to these if the potential of truly integrated polycentric edge cities is to be realised.

First, horizontal conflicts between different governmental departments have been noted during the plan-making processes at the city regional scale. There is a lack of effective partnership building between actors from different governmental departments, especially when preparing and formulating strategic planning documents or policy guidance. Furthermore, issues have also been raised in relation

to the conflicts that cross administrative boundaries. Such negotiations tended to be futile as illustrated from the cases, although with the Guanzhou HSR New Town trans- regional co-operation offers some hope.

Secondly, there is a lack of an implementation framework to help regulate and manage the delivery of upper level development strategies. As can be seen from Guangzhou and Nanjing's case, without an implementation framework to monitor and regulate the delivery of polycentric development strategies, the results turned out to be unexpected. Such outcomes, which have been highlighted, include an even more concentrated central city, competitive sub-centres, insufficient urban services in some of those planned centres, and a failure to establish horizontal linkages between polycentric nodes.

Thirdly, there are tensions and conflicts between the upper level governance and the local development needs and aspirations. This was a common problem in all three local cases. The primary concern of the upper level governments (here referred to as the municipal governments) was always the central city's growth potential and the competitiveness of the whole city region. Under such circumstances, planned centres at the local scale had to experience significant changes of development emphasis and priorities through the provincial and municipal governance arrangements (see Nansha's case). Local plans of the planned centres sometimes neglected the upper level strategic planning guidance, but had to be adjusted to accommodate local development realities (see Xintang's case).

Fourthly, a number of historical problems had been left over from the initial development stages of the edge cities, such as the messy spatial layout of industrial areas, an urgent need to upgrade and diversify their industrial structures, a severe lack of services, and the haphazard management of land resources. These are all presented as big challenges if these planned polycentric nodes are to be transformed into cities with a good urban environment and sustainable economic development potential.

11.3 Implications for planning and policy-making

This section aims to fulfil the last objective of this thesis, which is to make planning and policy recommendations related to the application/delivery of polycentricity and for the formation of Chinese edge cities. Recommendations are made mainly in response to the major challenges revealed from this research. They can be helpful for any future strategic planning making and delivery scheme, and can also offer some valuable insights and lessons for other super/mega city regions which have also applied or are about to apply the polycentric ideas to spatial planning.

The first is the necessity of effective partnership building between governmental departments in the making of strategic plans. Indeed, whilst it is the Municipal Planning Bureaus that initiated strategic or master plans, because of the comprehensive aspects that these plans should cover, all relevant governmental departments should, not only participate during the initial planning stages, but they should also be involved in the consultation and implementation stages. This would provide constant feedback and establish and maintain effective co-operation channels. Meanwhile, regarding planning and construction that are across administrative boundaries, such issues should be dealt with by stakeholders from all the involved administrative units. Consensus should be reached through constant negotiations with key stakeholders, and upon balancing their different priorities.

Another recommendation is related to the implementation and delivery of upper level development strategies. Master plans in China are macroscopic and strategic plans. In China, there have also been detailed plans or development schemes covering various aspects of the urban and rural development. However, these lower tier plans or policies are often not initiated by the same governmental departments or actors. This, in practice, makes the implementation hard to evaluate and co-ordinate. Therefore, an implementation framework is urgently needed which can be established immediately after the strategic plans have been developed. Detailed evaluation indicators, criteria and schemes should be included. Furthermore, this

implementation framework should also be a macroscopic and strategic one. It will need to be adjusted regularly based on evaluations of local development practices.

A third recommendation is about the governance arrangements in Chinese edge cities. As illustrated from the case study analysis, multi-level governance arrangements have emerged in Chinese edge cities. Two aspects are worthy of improvement in order to maximise the effectiveness of these governance arrangements. One is the establishment of co-ordination platforms to enhance the interdependency between different tiers' governments. The other is the involvement of more non-governmental actors and the establishment of new forms of co-operation, not only some platforms/forums to help address regional and cross-regional problems through discussions and negotiations at present (see Nansha's case), but more actors should be involved from non-governmental organisations, corporations, professional societies, business associations, and so on.

A fourth recommendation is related to the development and sustainability of Chinese edge cities. The initial development of Chinese edge cities, especially the integrated ones, mainly aimed to help relocate the expanding populations and industries out of the core city. The focus was to establish new industrial and employment centres on the edge of the city regions. This, inevitably, neglected the development of other land uses especially urban services. Therefore, it is important to rethink what the long-term strength of the edge cities' economy will be, but also consider the liveability of the edge cities. On the one hand, promoting interrelated industries and agglomeration economies can be significant for the sustainability of the edge cities' economy. On the other hand, it is also essential to focus more on the development of their urban functions, such as civic space, services, amenities and internal public transportation networks.

In addition to the above four recommendations which are made by reflecting on the major challenges revealed from this research, a fifth recommendation can be made regarding the longer-term development of the polycentric city regions, which can

help control the excessive urban sprawl and urban expansions, especially in the core cities. Green belts or green spaces should be planned and maintained strictly between the central cities and their surrounding sub-centres, and also, between the sub-centres or central/satellite towns across the city regions. The initial polycentricity application in the central city of Guangzhou presented a good example. Green belts were set between the urban clusters, but without effective regulations and subsequent control, those areas were soon replaced by construction and no longer exist.

Finally, one problem encountered during the data collection phase is that the transparency of governmental information in China is not very good at present. It is recommended that the economic and population statistical data, planning or policy documents which have been officially approved and should be publicly available, are made more easily accessible, if possible through the internet. If this situation could be improved, it would greatly help to promote future Chinese urban research.

11.4 Research Limitations

At this point, there is a need to rethink the whole research process, in order to identify any limitations that could be improved if the research was being conducted anew.

This research adopted an embedded, multiple-case design, which involved three case studies covering three types of Chinese edge cities, at three spatial scales. The data were drawn from locally available documentation and interviews with key actors. Around fifty interviews were conducted with relevant participants, which were sufficient to explore the research questions. Nevertheless, one of the aspects of this research, which could have been strengthened is to add more interviews, particularly at the city regional scale. Seven interviews were conducted in each city region at the municipal scale, with governmental officials, planners and academics. Governmental officials from economic sectors, urban-rural construction sectors were the anticipated participants to approach. However, officials from the Municipal Development and

Reform Commission declined to participate. They did not wish to be interviewed. The inclusion of one or two officials from the Municipal Development and Reform Commission, apart from the Municipal Planning Bureau and its subordinate unit (the Municipal Planning and Research Centre), could have added further insights into the findings from this research. They could provide some new experiences and perspectives especially regarding the social and economic development of the city regions. Although it remains hard to see whether they would wish to participate in future research, their participation would always be welcome.

Another aspect is related to the selection of case studies. If there was more time, it might be valuable to identify nine Chinese edge cities as potential case studies at first. That is to say, at each spatial scale all three types of Chinese edge cities could have been identified. Documentary analysis could then have been carried out in all the potential case studies, before the final selection of three cases studies was made. This would have involved extensive work in documentary data collection and data analysis for the potential cases. However, this approach would have probably provided a more thorough understanding concerning Chinese edge cities within a wider sampling frame.

11.5 Directions for future research

This section provides some possible directions that future research may take to further explore this topic. A continuing research agenda not only includes questions that are raised by this research, but can also involve research directions that go beyond this research.

The first question is about the effectiveness of the application of the polycentricity, which is a question generated from this thesis. In this research, the findings through exploring the formation of Chinese edge cities, partially reveal the effectiveness of the application of polycentricity. The findings of Chapters seven to nine have demonstrated that all three cases are emerging as Chinese edge cities to help form the

polycentric spatial structure of Guangzhou city region, based on spatial linkages, functional connections and governance arrangements. However, considering the city region as a whole, various other sub-centres and central/satellite towns should all be taken into consideration in order to explore the effectiveness of the polycentricity application. Key questions are raised: whether those planned sub-centres or central/satellite towns have become Chinese edge cities; and how they are spatially and functionally linked with each other at each planning scale.

If going beyond this research, there are questions about the spatial scales which have and can apply polycentric ideas. Polycentricity has been applied at various spatial scales in China, as in the West. This research focused on the intra-city scale, and explored the application of polycentricity in Chinese super and mega city regions. There is a need to expand the research scale to the inter-city, and to explore the delivery of polycentric development strategies at a macro level. More issues that cross administrative boundaries will probably occur, and the governance arrangements involving more tiers of governing bodies will be worthy of more in-depth exploration.

One of the major purposes of promoting polycentric development is to seek more balanced development, within cities or regions. Therefore, questions can be raised with regards to social and economic inequity across the city regions or urban agglomerations in China. This might highlight the need to come up with better solutions that requires a rethink in the investment/resource allocation mechanisms instigated through planning and various policy schemes, and to consider further re-adjust in the governance arrangements of certain areas.

11.6 Concluding thoughts

Overall, this research has demonstrated the divergent interpretations of the polycentricity concept within the Chinese context, and the processes and dynamics of the application of this idea in the strategic master planning activities of super and

mega city regions. Chinese edge cities are being formed under the polycentric development strategies, with spatial and functional interconnections with the core city. Through establishing such connections and linkages with the surrounding centres, some Chinese edge cities even have become nodal points within wider regions (see the cases of Nansha and HSR New Town).

The methodology set for this research aims to explore the application and delivery of the polycentric spatial development strategy in master planning practices; however, it could also be adopted in exploring the application and delivery of other upper level strategies. Furthermore, the research seeks to contribute to knowledge by filling the gaps in the existing body of research. This thesis provides the Chinese experience in terms of the polycentricity research, which offers a brand new perspective with examples that makes contributions to the knowledge. This includes how the polycentricity concept was understood and applied at the intra-urban scale in Chinese master planning activities, and whether and how Chinese edge cities were promoted and developed as polycentric nodes to help form a polycentric spatial structure.

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Appendices

Appendix I: Interview Questions

At the city regional scale:

Part One: The particular contexts in which the polycentric development has been delivered

1. What are the city regions' positions and development stages in current China, and how these have or will determine and influence their future development?

Part Two: The processes of the polycentricity application in master/strategic planning

2. How the concept of polycentricity and polycentric spatial development are understood in the Chinese context?
3. Why the concept of polycentricity was introduced in China and applied in master/strategic planning of this city region?
4. What are the influences of the polycentric spatial development in the master plan/policy-making processes?
5. Which aspects or items in master planning have applied polycentricity and why?
6. How did the polycentric spatial development contribute or influence the plan/policy-making processes in terms of approaches used and policy choices made?
7. What influences the polycentric spatial development made on other plans or policies apart from the master/strategic plans?
8. What are the underlying reasons of choosing those nodal points at different spatial scales within the city region to form a polycentric spatial structure, and their linkages to the core city and to each other?

Part Three: The implementation and governance issues

9. What are the main problems and challenges encountered in the application of polycentricity?
10. Is there any variation in the degree to which the implementation process picked

up the polycentricity?

11. Which public sectors or stakeholders have the key impacts in implementation and governance issues? What are their respective roles in delivering the polycentric spatial development from the city regional scale to the local scale?

12. Are there any conflicts in the coordination among different public sectors or stakeholders?

13. Are there any conflicts in the coordination that cross administrative boundaries?

14. Is the task of interpreting and applying the ideas of polycentricity best left to the local scale or to the city regional scale?

15. What are the main issues and challenges in the formation and governance of the polycentric nodes?

Part Four: Other issues and interviewee feedback

16. Other points which interviewees wish to raise in relation to the above issues: the polycentric development practices in master planning in China, the strategic planning processes and the aim, objectives and approaches of this research.

At the local scale:

Part One: The particular contexts in which Chinese edge cities have grown and formed

1. What are the positions and development stages of Chinese edge cities in the Guangzhou city region, and how these have or will determine or influence their future development?

Part Two: The delivery of the polycentric development to local planning and policy-making processes

2. How the concept of polycentricity and polycentric spatial development are understood in the Chinese context?

3. Which aspects or items in Guangzhou master/strategic plans which applied

polycentricity have delivered to local planning or development?

4. How did the polycentric spatial development contribute or influence the local plan/policy-making processes in terms of approaches used and policy choices made?

5. What are the underlying reasons in choosing this particular node to help form a polycentric spatial structure, and its linkages to the core city and to each other?

Part Three: The implementation and governance issues

6. What are the main problems and challenges encountered in the implementation of polycentricity and the making of Chinese edge cities?

7. Is there any variation in the degree to which the implementation process picked up the polycentricity?

8. Which public sectors or stakeholders have the key impacts in implementation and governance issues? What are their respective roles in implementing the polycentric spatial development and facilitating the formation of Chinese edge cities?

9. Are there any vertical conflicts in the coordination among different public sectors or stakeholders between the city regional and local scales?

10. Are there any horizontal conflicts in the coordination among different public sectors or stakeholders at the local scale?

11. Are there any conflicts in the coordination that cross administrative boundaries?

12. Are the tasks of interpreting and applying the ideas of polycentricity, promoting and governing Chinese edge cities best left to the local scale or to the city regional scale?

13. What are the main issues and challenges in the formation and governance of Chinese edge cities?

Part Four: Other issues and interviewee feedback

14. Other points which interviewees wish to raise in relation to the above issues: the polycentric development practices in master planning in China, the strategic planning processes and the aim, objectives and approaches of this research.

Appendix II: List of Interviewees

The tables below demonstrate the complete list of interviews with key actors from the Guangzhou and Nanjing city regions, and with key actors from two selected Chinese edge cities within the Guangzhou city region. When directly quoting the interview data in the thesis, labels were used for different groups of interviewees:

- P – Planners
- A – Academics
- GO – Governmental Officials
- E – Entrepreneurs
- VS – Village Secretary

Total interviews conducted during fieldwork in China:

Groups of interviewees	Guangzhou municipal level	Nanjing municipal level
Governmental officials	4	1
Planners	2	3
Academics	1	3
Total numbers of interviews	7	7

Groups of interviewees	Nansha	Xintang
Governmental officials	4	5
Planners	1	4
Entrepreneurs	2	3
Village secretaries	—	1
Community directors	2	—
Local citizens	3	2
Migrant workers	6	3
Total numbers of interviews	18	18

At the city regional scale:

City regions	Dates	Venues	Interviewees	Numbers of interviews
Guangzhou	March 17/25, 2015	Municipal Planning Bureau	Governmental officials	2
	March 18/24, 2015	Municipal Planning and Design Institute	Senior planners	2
	March 25, 2015	Municipal Planning and Research Center	Governmental officials	1
	March 31, 2015	Universities	Academics	1
	April 3, 2015	Municipal Planning and Research Center	Center directors	1
Nanjing	July 3/10, 2015	Provincial Planning and Design Institute	Senior planners	1
	July 3/10, 2015	Municipal Planning and Design Institute	Planners	2
	June 30, 2015 July 6/8, 2015	Universities	Academics	3
	July 7, 2015	Municipal Planning Bureau	Governmental officials	1

At the local scale:

Chinese edge cities	Dates	Venues	Interviewees	Numbers of interviews
Nansha	April 22, 2015	Guangzhou Municipal Planning Bureau Nansha Planning Branch	Governmental officials	1
	April 22, 2015	Guangzhou Municipal Planning and Design Institute Nansha Branch	Planners	1
	April 23, 2015	Nansha Construction and Transportation Bureau	Governmental officials	1
	April 30, 2015	Nansha Corporate Construction Bureau	Governmental officials	2
	May 12, 2015	Foreign-owned enterprise	Entrepreneurs	1
	May 20, 2015	State-owned enterprise	Entrepreneurs	1
	May 05/06, 2015	Local communities	Community directors	2
	May 06, 2015	—	Local citizens	3
	May 05/06, 2015	—	Migrant workers	6
Xintang	May 19, 2015	Zengcheng Land Resources and Planning Bureau	Governmental officials	2
	May 21, 2015	The Economic, Trade and Technology Information Bureau of the Zengcheng NETDZ Management Committee	Governmental officials	1
	June 08, 2015	Zengcheng Development and Reform Bureau	Governmental officials	1
	May 22, 2015	Xintang Urban and Rural Planning and Urban Renewal Management Office	Office directors	1
	May 19, 2015	Zengcheng Planning and Design Institute	Planners	2
	May 21/22, 2015	Private enterprises; Foreign-owned enterprise	Entrepreneurs	3
	May 22, 2015	Tanbei Village	Village secretary	1
	June 02, 2015	University	Planners	2
	June 07, 2015	—	Local citizens	2
	June 07, 2015	—	Migrant workers	3

Appendix III: List of published papers and conference presentations

Published papers:

- Lijuan Wu, Yuting Liu, and **Hui Cheng**. (2012) 'Review on the Dynamic Mechanism and Key Elements of Urban-Rural Integrated Development in China'. *Economic Geography*. 32(4): pp113-118. (*in Chinese*)

- **Hui Cheng**, Yuting Liu, and Shenjing He. (2012) 'From Development Zones to 'Edge City' with Chinese Characteristics'. *Urban Planning Forum*.(6): pp50-57. (*in Chinese*)

- Yuting Liu, **Hui Cheng**. (2013) 'The Research Progress on Edge City'. *Urban Planning International*. 28(3): pp52-58, 77. (*in Chinese*)

- **Hui Cheng**, Yuting Liu.(2014) 'Turning Development Zones into Chinese-style Edge Cities: A Case Study of Nansha'. *Urban Planning International*. 29(4): pp39-45. (*in Chinese*)

- **Hui Cheng**, Yuting Liu.(2017) 'Transition Paths and Mechanism of National Economic and Technological Development Zone'. *Planners*. (7): pp112-118. (*in Chinese*)

- **Hui Cheng**, Dave Shaw. (2017) 'Polycentric Development Practice in Master Planning: The Case of China'. *International Planning Studies*. doi: 10.1080/13563475.2017.1361318.

- **Hui Cheng**, Yuting Liu, Shenjing He and Dave Shaw. (2017) 'From Development Zones to Edge Urban Areas in China: A Case Study of Nansha, Guangzhou City'. *Cities*. 71: pp110-122.

Conference presentations:

- ‘Polycentric Development Practice in Master Planning: The Case of China’ – *The 9th IACP (International Association for China Planning) Conference*. Chongqing University. 19th ~ 21th June, 2015.

- ‘Study on the Transformation Paths of Development Zones: Case Studies of Nansha and Zengcheng in Guangzhou City’ – *Conference Theme: The Transformations of Development Zones and Innovative Development of Chinese Cities*. Suzhou City, Jiangsu Province. 27th ~28th June, 2015.

- ‘Polycentric Development Practice in China: Evidence from Guangzhou City Region’ – *Regional Urbanism in the Era of Globalisation*. University of Huddersfield. 3rd ~5th February, 2016.

- ‘The Planning of Polycentric Mega City-regions in China— Interpretations, Practices and Challenges’ – *2016 Annual Meeting of the IGU Urban Commission*. East China Normal University, Shanghai, China. 15th~20th August, 2016.

- ‘Planning Polycentric Mega City-regions in China: Evidence from Guangzhou’s Outer Suburbs’ – *The 33rd International Geographical Congress: Shaping Our Harmonious Worlds*. Beijing, China. 21st ~25th August, 2016.

- ‘Polycentric Development and the Making of a Chinese Edge City in Guangzhou Mega City-region’ – *RSA Student and Early Career Conference 2016*. Newcastle, UK. 27th ~28th October, 2016.

Appendix IV: Paper published in the Cities and International Planning Studies

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From development zones to edge urban areas in China: A case study of Nansha, Guangzhou City

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ABSTRACT

The new millennium signified a new phase in the development zone-oriented suburbanization of China. Spurred by a new round of urban development strategies, development zones in many large cities face a need for enormous transformations and re-development. These areas have often been compared with the Western concept of "edge cities", although in this paper we argue that this "imported" concept, in practice, bears little resemblance to the actual development tendencies in China. Taking a comparative approach, this paper presents a critical examination of edge urban formations in the Chinese context, and identifies the major differences between the concept in China and the United States. Drawing upon a case study of Nansha in Guangzhou, the unique paths and underlying dynamics driving these transformations are revealed. It is concluded that Chinese edge urban areas are being transformed from mono-function development zones into new fully functional cities. A city in China like Nansha reveals the dynamics of both state interventions and local actions in boosting the polycentric economies of large city regions.

1. Introduction

Despite widespread outward suburbanization, which has been witnessed in many Western countries since the 1960s, another phenomenon has been observed in the form of agglomerations in city regions. With the conversion of city functions and the reorganization of urban space, the urban spatial structure has undergone a gradual change from a monocentric to polycentric form, with new settlements emerging in the suburbs. These settlements with various terms have been taken as one of the definitions or major representations of post-suburbia. Among them, the term edge city "takes its place in a welter of terminology deployed to help chart the complexity of modern forms of urbanization" (Phelps & Parsons, 2003, p. 1726). Garreau (1991) described this as the third phase of American suburban development in the 20th century, and coined the term "Edge City" to describe the phenomenon. Subsequently, and based mainly on Garreau's definitions, edge cities have been identified in many different county contexts, including Europe, Southeast Asia and South Africa. Although differences exist, it has been argued that edge urban settlements, like American edge cities, have become a part of a polycentric model trying to promote rational expansion within Western metropolitan areas. This phenomenon has even been described as representing the advent of a post-suburban era (Wu & Phelps, 2011). In contrast, studies into suburban settlements of this kind are still in their initial stages in China, with little research having been made to date. Although the terminology has been appropriated and imported (Song & Wang, 2001; Yuan & Wang, 2010; Zhao & Peng, 2000), the characteristics and processes of development have yet to be systematically understood and explored. Recent studies on the development of urban fringe or the peri-urban areas have mainly focused on megacities like Beijing (Huang, Liu, Zhao, & Zhao, 2017; Zhao, 2011; Zhao, 2013; Zhao, 2017) and Shanghai (Tian, Ge, & Li, 2017). This paper therefore presents a critical evaluation of the nature of edge urban areas within the specific context of China, aiming to provide an understanding of whether new types of cities are emerging in the Chinese context, and if so, what are the main characteristics of Chinese edge urban areas. To this end, a case study is made of Nansha in Guangzhou City (another major megacities in China) to examine the growth of one particular example of a city that is emerging in edge urban areas in China.

In China, urban spatial expansion has been mainly the result of specific central planning efforts of the national government. In 1984, 14 national development zones were set up on the periphery of Chinese

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coastal cities, stimulating the construction of further large-scale development zones across the country, and this has been one of the primary means of urban and industrial restructuring and economic development. Established as a result of designed industrial relocation to the suburbs, early development zones emerged not only as industrial spaces at the urban-rural fringe of metropolitan areas, but also isolated "islands" with a loose attachment to the central cities. Development zones came to dominate the suburban landscape of Chinese cities in the late 1980s and 1990s, and after more than 20 years, they can today be recognized as the physical manifestation of a process of remarkable economic growth. That said, their futures are perhaps less secure, as they have been heavily dependent on foreign investments, while a slowdown of economic growth has resulted in resource bottlenecks.

More recently, suburbanization development in China has entered into a new era, and development zones are also entering a period of strategic transformation and re-development. The 11th Five-Year Plan of Economic and Social Development of National Economic and Technological Development Zones (Ministry of Commerce and Ministry of Land and Resources, 2006) aims to adjust the position of development zones by transforming them into multi-functional integrated industrial areas. Under the confluence of both the external environment and internal demands, a re-development of development zones has begun with the creation of new types of Chinese cities. This reflects the polycentric development strategies of many Chinese metropolitan areas, in which employment or business centers are promoted in order to help form polycentric structures. Edge urban areas are emerging as new centers, and are becoming a new model for the encouragement of rational urban expansion. This research uncovers some interesting and novel features of the processes by which cities on the edge or periphery of core cities are emerging. It is believed that Chinese edge urban formations can provide a better understanding of this new mode of (post) suburban development, which features strong state interventions and increased local capacity in promoting polycentric urban economies.

Following this introduction, the paper first reviews relevant literature on edge urban formations in the era of (post)suburbia. It continues with two interconnected sections that present a systematic study of Chinese edge urban areas. The first section discusses different stages of Chinese suburban development and summarizes the main characteristics of Chinese edge urban areas and their transformation using the cases from seven large cities in the Bo Hai Coastal, Yangtze River Delta and Pearl River Delta Regions. The following section presents a detailed case study of Nansha to illustrate the underlying dynamics and development processes behind the transformation from a development zone into a unique Chinese city.

2. Edge urban formations in the era of (post)suburbia

There is an increasing literature that has been studying the new and diverse settlement space which helps shaping and reshaping the traditional suburban areas. The term post-suburbia was proposed to capture this new phenomenon and has gained wider acceptance more recently. It has been reflected in an academic discourse defining it as a new era (Essex & Brown, 1997; Lucy & Philips, 1997; Wu & Phelps, 2011), a new category of settlements (Kling, Olin, & Poster, 1995; Teaford, 1997), and the distinctive urban politics (Phelps & Wood, 2011). In one recent review of post-suburban growth, it was noted that "when the term 'post-suburbia' has been used it has been used in rather different ways" (Phelps, Wood, & Valler, 2010, p. 369), which exists as an open question without being fully understood and determined (Nüssli & Schmid, 2016). Various settlement types termed "edge city" (Garreau, 1991), "edgeless city" (Lang, 2003) and "technoburb" (Fishman, 1987) etc., "are taken to signal something different from suburbia" (Phelps & Wood, 2011, p. 2591), and have been used to describe the complex form of urban expansion and changes to traditional suburban elements (Wu & Phelps, 2011). In China, the recent phase of suburban development has included important elements which could be considered as post-suburbia (Wu & Phelps, 2008; Wu & Phelps, 2011), and new settlements are also emerging at the edge of major cities, which share a certain degree of similarity to the US edge cities. However, it should be understood that the concept of an "edge city" was originally proposed based on the development background of US cities, and whether or not it can be applied outside the US context in mixed economy settings such as Western Europe, let alone state-transitional economies such as China, needs further exploration.

The existing literature has pointed out some of the limits in applying the term edge city outside the US (Bontje & Burdack, 2005; Phelps, 1998; Phelps & Parsons, 2003; Phelps, Parsons, Dowling, & Ballas, 2006; Wu & Phelps, 2008). Therefore, in view of the context specific feature of the term edge city, this paper avoids applying the exact term to China. Rather, in light of the new type of urban formations transformed from traditional development zones on the edge or periphery of core cities, and in light of this new type of settlements also represent some elements of post-suburban growth in China, the term edge urban areas is preferred in the paper to distinguish this new type of cities emerging on the edge from the US edge cities. Using edge urban areas emphasizes their two key features, edge (in terms of location) and city (in terms of function), which are also the two defining words of US edge cities, demonstrating the similar outcome of recent (post)suburban development both in China and the US. Although the emerging edge urban areas in China have significant differences specifically in morphological aspects and also some of the functional aspects compared with US edge cities, they conform to some of the defining criteria and in particular both of the settlements are functionally similar in being employment centers at the edge of core cities. As it is observed, "it is the morphology of edge cities, and not Garreau's (1991) five defining criteria, that most defines these settlements as specific to the US" (Wu & Phelps, 2008, p. 466). The similar outcome and some of the similar functional features between US edge cities and China's edge urban areas make it appropriate to compare them in other respects, in order to capture some new trends/features in the (post)suburban development of Chinese large cities. As Bontje and Burdack (2005, p. 317) noted in European context that "recent development tendencies in European metropolitan regions bear resemblance to Edge City development in several respects", but "the European Edge Cities are not mere copies of their American counterparts". Likewise, edge urban areas in China are also worthy examining more fully. There is thus a need to first review the formation of edge cities in the Western countries during the (post)suburbanization process, and the so-called Chinese edge cities (*bianyuan chengshi*) which is translated literally, usually meaning cities on the edge before moving on to a comparative analysis later in the paper.

In the United States, following the suburbanization and "malling" of the country, a large number of jobs in the service sectors moved out to the suburbs, leading to the gradual formation of functional edge cities. The term "edge city" was first coined by Garreau (1991), a Washington Post journalist, to describe the substantial new non-contiguous urban development at the edge of established major cities in the United States, believing that Americans were creating a new future, having changed nearly all the routines associated with living, working, communicating and playing. These new multiple urban centers, or "edge cities", contain all the functions of a city, but are located far from the old downtown on land that 30 years ago was at the edge of the city, and occupied by villages or farmland.

Following Garreau's coining of the term "edge cities", several researchers have adopted the concept and have attempted to conceptualize it more clearly. Byrum (1992), Nelson (1993), and Stern and Marsh (1997) tried to make a more accurate definition of the idea, while Scheer and Petkov (1998), McKee and McKee (2001), and Bingham and Kimble (1995), among others, came up with different typologies in an attempt to classify different types of edge city. Case studies have focused mainly on the United States (Bingham & Kimble, 1995; Dietsch, 2001; Jonas, 1999; McGovern, 1998; Nelson, 1993) and Europe (Begg & Kitson, 1991; Holden & Turner, 1997;

Kloosterman & Musterd, 2001; Meikie & Atkinson, 1997; Phelps, 1998; Stern & Marsh, 1997), and although American and European edge cities have some common characteristics, the process by which they developed have been quite different. The development of US edge cities was spurred initially by the market and its most capable assistant, developers, rather than by state interventions (Bontje & Burdack, 2005), although their further development depended on the guidance and control of the government and the relevant planning authorities. Unlike US edge cities, which could be seen as growing organically, European edge cities owe their origins largely to public or state planning, with both national and local governments, as well as other public sector agencies, playing a key role in their formation (Stanback, 1991). Central governments in Europe had more power and institutional capacity, and were often large landowners in their own right (Harding, 1991, 1997), and so European edge cities should be considered as a "typically European" variation of the original edge city model (Bontje & Burdack, 2005). Although they do not meet all of Garreau's defining criteria for an edge city, they do meet some of the more important ones, being important job centers and at the forefront of new urbanization tendencies (Phelps et al., 2006). Beyond the US and European examples, only a few other studies of edge cities have been made elsewhere, such as Australia (Freestone, 1997), Thailand (Dick & Rimmer, 1998) and South Africa (Michel & Scott, 2005).

Sun and Ma (1997) first introduced the term edge city to China, but they were followed subsequently by others who used Western concepts to explore Chinese edge cities, focusing particularly on three areas of activity: preliminary studies and discussions on the identification and characteristics of Chinese edge cities (Deng, Wang, & Wu, 2001; Zheng & Meng, 2012); the urban spatial structure of edge cities (Li, Wu, & Phelps, 2008; Wang, Deng, Song, & Wu, 2001; Zheng, 2010); and the planning and construction of development zones based on the concept of edge cities (Liu & Bu, 2013; Song & Wang, 2001; Yuan & Wang, 2010; Zhao & Peng, 2000). Interestingly, compared to Western countries, the extensive development and construction in the suburbs has not resulted in or exacerbated a decline in the central areas of large Chinese cities. Indeed, in parallel with the growth of "edge cities", in some cases the central areas have been able to maintain, and sometimes enhance, their original vitality. Furthermore, for many Chinese cities have not experienced large-scale suburbanization, the establishment of edge cities has not relied on traditional population migration patterns (Chen, 2009). It can thus be argued that the development process and underlying dynamics behind edge cities are different between China and Western countries, although they share many similarities in terms of the type, characteristics and industrial structures. Chinese edge cities provide a useful perspective for understanding the recent transformation of China's suburban areas, as well as the dynamics facilitating that transformation.

There is a common understanding in literature that edge cities are new settlements that are based predominately on employment rather than living. They are seen as unconventional products of (post-)suburbanization and have become a part of the polycentric model used to try to encourage balanced development within city regions in the West, especially in terms of promoting functional balance and spatial integration (Burger, 2011; Burger, de Goei, van der Laan, & Huisman, 2011; Burger & Meijers, 2012; Lambregts, 2009; Vasanen, 2013). In China, research on edge cities emerging on the edge areas has, to date, tended to focus on the defining characteristics of these places rather than the processes that facilitated their development. As Phelps (2012: 692) stated, the evolution of edge cities is a worthy subject for study in terms of what it may tell us about potentially significant transformations in societal values and the processes of urbanization. This paper will focus on one type of Chinese edge urban areas, transformed from development zones into cities, which have emerged in some large Chinese cities and have attracted attention due to their uniqueness within the Chinese context. Other types of Chinese edge urban settlements/areas can be categorized as newly planned suburban central towns (Tao & Liu, 2003); suburban secondary centers that developed out of residential areas (Huang, 2010); cities based on emerging suburban economic cores such as suburban superstores, outer suburban holiday villages or mega university towns; etc. (Meng, 2008). By exploring the main characteristics and defining criteria of development zone-oriented edge urban areas, and supported by a case study, this paper attempts to offer a valuable window onto recent processes in Chinese (post)suburbanization and development zones, while also addressing some of the key issues in this transformative process.

The remainder of the paper includes both a general and an in-depth analysis of the emerging development zone-oriented edge urban areas in China. To this end, the first stage is to establish the defining criteria for development zone-oriented edge urban areas to examine the extent to which these criteria can be used in a general way to characterize these settlements. Focus in this regards will be on seven selected development zones in Beijing, Tianjin, Dalian, Qingdao, Shenyang, Hangzhou and Guangzhou within the Bohai Sea, Yangtze River Delta and Pearl River Delta regions. As the emergence of edge urban areas relates to the development stage of central cities, seven development zones have been selected from three regions in China as representative of the most developed areas in the country. The data used to identify edge urban areas within these development zones is drawn from various sources, including National Economic and Social Development Statistics Bulletins, master and strategic plans from these seven large cities, and China's economic and development zone websites. The second part of the analysis focuses on one specific case to understand the dynamic processes that underline this contextually unique phenomenon. The analysis relies mainly on interviews conducted with key stakeholders, including government officials, planners and public consultants who participated in the municipal and local planning schemes (see Table 1), and on related documents that include past and current master plans and strategic plans, National Economic and Social Development Statistics Bulletins for Nansha, Investment Environment Analysis Reports of the Nansha Development Zone and other relevant research reports and proposals.

3. Characterizing development zone-oriented edge urban areas in China

In this section, a brief discussion will be made of the main characteristics of development zone-oriented edge urban areas in China, beginning with a review of the different stages in the Chinese suburbanization process from which Chinese edge urban areas emerged. In the following stage, based on the two key features of development zone-oriented edge urban areas — edge (in terms of location) and city (in terms of function), we draw from Garreau's functional defining criteria for American edge cities and other relevant research on edge urban settlements, and translate them into a set of criteria for China, applying the unique indicators for the measurement of China's development zones and adopting Chinese specific data. The characteristics of development zone-oriented edge urban areas are summarized in the final

Table 1
List of interviews in 2015.

	Dates	Interviewees
Guangzhou municipal level	March 18/24/25, 2015	3 planners/senior planners
	March 31, 2015	1 academic
	March 17/25, 2015	2 division directors
	April 3, 2015	1 center director
Nansha local level	April 22/23/30, 2015	3 government officials
	April 22, 2015	2 planners and consultants
	May 12/20, 2015	2 entrepreneurs
	May 05/06, 2015	2 community directors

part.

3.1. Suburbanization and the emergence of development zone-oriented edge urban areas in China

The suburbanization of US cities followed a staged process, from residential suburbanization to industrial suburbanization, after which, with the suburbanization of jobs, fully functioning edge cities emerged. During the initial stages of the formation of edge cities, it was the market and private developers that were the decisive players, but once edge cities had obtained development momentum, local government began to play an increasingly important role in shaping change (Bontje & Burdack, 2005). However, this pattern and process was not followed in China, which has not yet entered large-scale suburbanization development. The process of rapid urban expansion in some large and medium-sized cities has enabled the formation of new settlements in the suburbs or even outer suburbs. Research into Chinese suburbanization and suburban development can be said to have started in the mid-1990s (Feng, 2001, 2002). Generally speaking, the history of Chinese suburban development can be divided into four main stages (Cheng, Liu, & He, 2012). The first stage was an industry-oriented state-led suburbanization effort aimed at industrialization that lasted from 1949 to 1979. The second stage emerged at the beginning of the 1980s, when the industrial suburbanization deepened and was accompanied by passive population migration to the suburbs. The third stage began in the 1990s and combined several coexisting trends of suburban development, and was accompanied by a period of active population migration. More recently, in 2000 Chinese suburban development entered a new phase in which the transformation and re-development of suburban development zones has spurred the formation of new suburban centers. As a result, China's larger cities have begun to take on a more polycentric structure, and this has become one of the main features of Chinese suburbanization. In all of these processes, the government and the market have played different roles at different stages. Even though suburban development in China is quite different from that seen in Western countries in terms of the route followed, the outcomes of Chinese suburbanization have turned out to be similar to those in Western cities, as gradually formed new suburban centers or edge urban areas with more polycentric urban structures.

A preliminary comparison of US edge cities and new edge urban areas in China reveals several similarities. First, both are the products of urban functional conversion and urban spatial reconstruction; second, both experienced a development process from villages/rural areas to single functional areas (in North America, this was mainly a residential function, while in China it was mainly industrial), and then further into new multi-functional urban areas. Third, together with other edge urban areas and downtown areas, they help promote more balanced spatial structures across metropolitan areas. Finally, in both examples, the edge cities and edge urban areas are still growing, and so their final development status remains to be seen.

3.2. Identifying development zone-oriented edge urban areas in China

According to the key features of Chinese development zone-oriented edge urban areas, they need to fulfill two main criteria (edge and city), the first of which relates to their physical location, in that they should be seen as a satellite or on the edge of the core city. For the second criteria, Garreau's five functional criteria are taken as a reference to ascertain whether these settlements could be defined as multifunctional cities:

- The city should have 5 million square feet or more of rentable office space;
- The city should have 600,000 ft^2 or more of leasable retail space;
- The city should have more jobs than bedrooms;
- The settlement should be perceived by the population as an identifiable place; and,
- It should be nothing like a city 30 years ago (Garreau, 1991).

Table 2
The main research elements identifying development zone-oriented edge urban areas in China.

Origins of elements	Main research elements
Edge	Development stage of central cities Spatial locations of development zones
City and five functional defining criteria	Urban spatial morphology Degree of employment-to-population balance (number of jobs & residential population) Industrial structure Proportion of increase in value of tertiary sector Time taken for development into a "city"

In China, it has been suggested that the emerging new suburban and outer suburban settlements are linked with "a complex mix of elements", which "are commonly associated with post-suburbia — employment activities and luxury residential developments, civic functions and amenities" (Wu & Phelps, 2011, p. 415). Using the above as a framework, Table 2 identifies the translation of these characteristics within the unique context of what we called development zone-oriented edge urban areas in China.

Chinese edge urban areas are associated with civic functions and amenities. Meanwhile, it is clear that it was Garreau's intention to focus on the scale of producer and consumer services to evaluate both the scale and mix of industrial development in edge cities. Accordingly, this research will examine the industrial structure and industrial development level of development zone-oriented edge urban areas by taking the proportion of the increase in value in the tertiary sector and comparing it with the general criteria of existing and established Chinese cities. In 1993, the State Council of China approved a set of criteria to be used to ascribe different levels of city status in different contexts. For a county-level city, one of the indicators used in the designation was that the contribution of the tertiary sector to Gross Domestic Product (GDP) should be more than 20%, while for a prefecture-level city the tertiary sector should be more dominant, being more important than the primary sector and contributing more than 35% of GDP. This research will use these thresholds to establish whether or not new cities have been created within China.

Similar with Chinese edge urban areas in being employment centers, Garreau believed that a mature edge city should be able to provide more jobs than its residential population, and so should be a job center. Fishman (1987) and Teaford (1997) also proposed a greater working-living balance in the emerging post-suburban settlements. Following this path, this research will use the number of jobs and the residential population to evaluate the current degree of employment-to-population balance in development zone-oriented edge urban areas. For the final two defining criteria, two elements will be selected for comparison: First, the urban spatial morphology, i.e. whether or not they are perceived by people as to have been, or on the way to becoming, secondary centers within metropolitan areas; and second, the time taken for development zones to develop into a "city".

In addition, development zones will transform into Chinese edge urban areas as long as the central or core cities are in the process of development from agglomeration to dispersal, which can also be seen when central cities are undergoing a process of suburbanization. In this regard, one important element in the selection of a development zone should be the stage of development of the central city.

Previous discussions of the criteria used to evaluate development zone-oriented edge urban areas have focused around two themes: *Edge*, based on development stage of central cities and the spatial locations of the new development zones; and *City*, drawing from Garreau's five functional defining criteria and other relevant research on edge urban

settlements, notably urban spatial morphology, the current degree of employment-to-population balance, industrial structure, proportion of the increase in value of the tertiary sector and the time taken for development into a "city" (Table 2).

3.3. The characteristics of development zone-oriented edge urban areas

As mentioned earlier, China features other types of edge urban settlement/area, like newly planned suburban central towns, suburban secondary centers that developed out of residential areas, and cities based on emerging suburban economic cores. This research focuses mainly on development zone-oriented edge urban areas, due mainly to their uniqueness in large Chinese city regions and their wider implications to China's (post)suburban development. At present, Chinese development zones are classified into two types, national level development zones and provincial level development zones. The higher development zones stand a better chance of transforming into new fully functional urban centers, given that they are able to benefit more from national, provincial as well as city-level resources. Furthermore, at the beginning of 21st century a new trend emerged in the economic development and spatial integration of metropolitan areas, with development zones being promoted as fully functional edge urban areas as a key spatial strategy, as revealed in their master plans. Considering the above situation, national development zones were selected as the research subjects for this study, and so all of the selected development zones are National Economic and Technological Development Zones (NETDZs). It has been more than 30 years since the first NETDZ was established (1984), and in order to identify whether they have been fully transformed, a time period of at least 10 years since establishment is essential. In this regard, all 53 NETDZs that were established before 2005 are identified, among which 23 are located within the Bohai Sea, Yangtze River Delta and Pearl River Delta regions. A further selection is made from these 23 NETDZs based on two criteria in accordance with the background and aims of this paper:

1. The transformative trends of development zones have been mentioned in the master plans (since 2000) of their respective central cities; and
2. There is currently no evident agglomeration development between development zones and the central urban areas of their respective large cities.

The final sample comprises seven NETDZs within seven large metropolitan areas (Beijing, Tianjin, Dalian, Qingdao, Shenyang, Hangzhou and Guangzhou), which will be studied to investigate the main elements of development zone-oriented edge urban areas. An analysis of master plans since 2000 of the seven listed cities reveals that existing development zones have, on the whole, tended to transform into more comprehensive Chinese edge urban areas, meaning that urban spatial structures are becoming more polycentric. Details of these transformative trends of seven development zones are illustrated in Table 3, while Fig. 1 shows the locations of the seven selected cities of Beijing, Tianjin, Dalian, Qingdao, Shenyang, Hangzhou and Guangzhou.

In the following stage, an empirical analysis is carried out on Chinese edge urban areas within the seven selected large cities using the main research elements identified above. Each of the research elements is examined for the seven development zones to summarize their main characteristics as emerging or mature edge urban areas (Cheng et al., 2012). The major characteristics of the seven NETDZs are summarized in Table 4.

Comparing this data with the defining criteria of American edge cities results in a set of defining criteria for Chinese examples. The similarities and differences between the defining criteria of Chinese development zone-oriented edge urban areas and American edge cities are summarized in Table 5.

4. A case study of Nansha, Guangzhou city

This research presents an in-depth study of one of Guangzhou's formal development zones, Nansha, to investigate the main characteristics and underlying dynamics in its transformation into a Chinese edge urban area. Guangzhou is located at the center of the Pearl River Delta (Fig. 2), and has become the third biggest urban economy in China. The selection of Nansha for an individual case study was based mainly on the research elements summarized for seven NETDZs in Table 4. As discussed in previous sections, one of the most prominent characteristics of Chinese edge urban areas is a relatively even employment-to-population balance. The Nansha development zone tends to be more mature in this regard (jobs to residential population ratio: 1.45), while the Beijing, Tianjin and Qingdao development zones have a positive jobs to residential population ratio, and the Dalian, Shenyang, Hangzhou development zones have a negative jobs to residential population ratio. This is a further reason for the selection of Nansha development zone for further analysis. Although it can at present only be referred to as an emerging edge urban area (proportion of increase in value of tertiary industry in GDP just over 20%) and has only gone through 10 years of transformative development, its working-living ratio indicates Nansha's significance in exploring the differences between Chinese edge urban areas and American edge cities in terms of development processes and dominant dynamics. In the following analysis, we first embed Nansha in a broader context of Guangzhou and take a brief look at the evolution of Guangzhou's urban spatial structure. In the following stage, focus is on Nansha's transformative process from a development zone into a fully functional "city" and the different mechanisms at work during the four development stages.

4.1. Overview of Guangzhou's urban spatial structure evolution

4.1.1. Monocentric spatial structure (1978–2000)

With the implementation of the open-door policy in 1978, industries producing heavy pollution and consuming large amounts of energy were moved gradually to Guangzhou's suburbs in order to free up land and space for the development of tertiary industries (Yang, 2010). The suburban development of Guangzhou in this period was mainly a passive relocation of industries and population, while the central areas remained very compact. The 14th round of the Guangzhou City Master Plan in 1984 failed to move the city center out of the old urban areas, leaving behind administrative, commercial, residential and other functions, and resulting in an increasingly dense population and a heavy concentration of urban functions (Li, Yuan, Lai, & Cai, 2001). With constraints on the further expansion of central areas and increased congestion, the drawbacks of the monocentric model were all too evident. By 2000, it had become apparent that the development and expansion of Guangzhou as a single city was not possible due to insurmountable natural barriers to the north and east and administrative boundaries to the west and south. In short, the city had no more space for further development (Zhuang, Zheng, Lai, & Wu, 2008).

4.1.2. A more polycentric development trend (2000–2004)

In 2000, a document entitled "Outline of Guangzhou City Overall Strategic Plan" made a breakthrough in Guangzhou's monocentric spatial structure, articulating a spatial development strategy of "southward expansion, northward optimization, eastward extension, westward combination" through the development of a number of interconnected nodes. As one interviewee indicated, "one of the most important planning ideas in the 2000 strategic plan was to pursue the polycentric and clustered development" (interview, division director, Guangzhou, March 2015). At the same time, the cities of Panyu and Huadu were given more power and responsibility by becoming districts, extending the territory over which the Guangzhou municipal government had jurisdiction to ten districts. This corresponded to an increase in Guangzou's area of responsibility from 1443 km^2 to 3718 km^2,

Table 3
Transformative trends from development zones to edge urban areas under the new round of city regional development strategy in seven Chinese large cities.
Sources: City Master Plans of seven large cities obtained from Urban Planning Bureaus or their official websites.

City	City master plans	Spatial structure	Transformative trends of development zones
Beijing	Beijing City Master Plan (2004–2020)	Two axes–two belts–multi-centers	Yizhuang (in which BDA is located) will become an important node in Beijing's eastern development belt. Improvements to comprehensive service functions will enable its transformation from development zone to a comprehensive industrial new town.
Tianjin	Tianjin City Master Plan (2005–2020)	One axis–two belts–three zones	As the core area of Binhai New Area, TEDA will become the portal of northern China opening to the outside world. A high level modern manufacturing and research base, as well as a livable and ecological new urban district.
Dalian	Dalian City Master Plan (2009–2020)	Clustered structure of one core–two urban districts–three bays	Dalian Economic-Technological Development Area merged with Jinzhou district to become Jinzhou New District. As one of the two future "new urban districts" of Dalian, Jinzhou new district will be committed to achieve complementary and coordinated development with the core area.
Qingdao	Qingdao City Master Plan (2006–2020)	Relying on the central city, developing along the bay, a clustered structure with axial extensions	Qingdao Economic-Technological Development Area will be one of two sub-centers of Qingdao. It will become an international shipping center for northeast Asia, a logistics and trading center, a tourist resort, a modern manufacturing base and the central district of the western coastal area.
Shenyang	Adjustment on Shenyang City Master Plan (2010 – 2020)	From monocentric concentration to polycentric and sustainable development pattern	Tiexi new district (in which Shenyang Economic-Technological Development Area is located) is a future new district of the Shenyang city region. Its future development relies on co-operations between the development zone and Tiexi district.
Hangzhou	Hangzhou City Master Plan (2001 – 2020)	One core–two circles, three axes–two corridors, one ring–multi-centers	Xiasha district (in which HEDA is located) will develop on the basis of hi-tech industries and advanced manufacturing industries, and will transform to an ecological modernized new town with comprehensive functions such as education and scientific research, business and residence.
Guangzhou	Guangzhou City Master Plan (2011 – 2020)	Polycentric, clustered and networked structure	Guangzhou's stated its spatial development strategies are "southward expansion, northward optimization, eastward extension, westward combination and central adjustment". Nansha new district (in which Nansha Economic-Technological Development Area is located) is one of the six sub-centers within Guangzhou city region.

providing a new opportunity for urban spatial expansion and a new urban sustainable development strategy (Yuan, 2008). Panyu and Huadu's re-designation as districts highlighted their advantages of lower land prices, leading real estate development to become the dominant driving force in Guangzhou's suburban development during this period. In 2004, with the adoption of the Nansha District Development Plan, Nansha became a major strategic node along Guangzhou's southward growth corridor, enabling Nansha to transition from an industrial development zone to a new growth node as an integral part of Guangzhou's economic development strategy, helping to alleviate some of the spatial development issues of Guangzhou city. As a consequence, Nansha's strategic position changed dramatically.

4.1.3. From "smart expansion" to "optimization and improvement" (2005–2008)

Guangzhou's municipal governance structure was further realigned

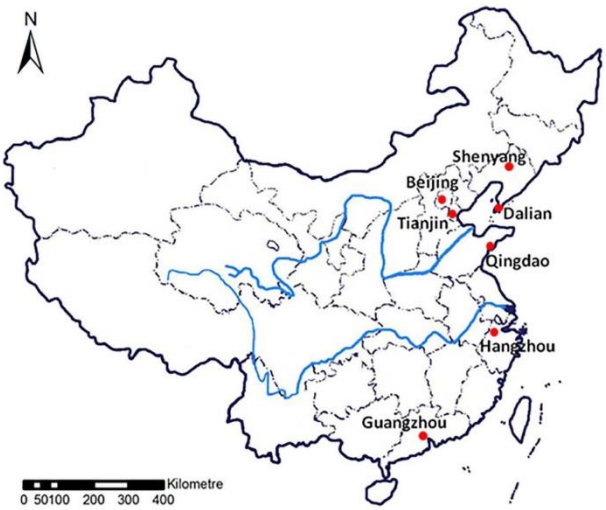

Fig. 1. Locations of seven selected large cities in China.

Table 4
Research elements summarized for seven NETDZs in China.
Sources: 2014 comparative analysis report on Guangzhou Economic-Technological Development Area and other main NETDZs, Guangzhou development district official website; 2013 quarterly data of NETDZs, Ministry of Commerce of the People's Republic of China; 2013 national economic data of Hangzhou Economic-Technological Development Area, www.HEDA.gov.cn; 2014 National Economic and Social Development Statistics Bulletins of Nansha, Nansha Statistical Bureau; The third national economic census bulletins of Beijing, Dalian, Huangdao district (Qingdao city), Nansha district (2013), Statistical Bureaus of Beijing, Dalian, Huangdao district (Qingdao city) and Nansha; 2013 Statistics Bulletins of TEDA, TEDA Development and Reform Bureau; 2007 comparative analysis report of main economic data on NETDZs, Ministry of Commerce of the People's Republic of China; The 12th Five-year Plan of National Economic and Social Development of TEDA, Administration committee of TEDA; www.dl.gov.cn; The sixth census data of Qingdao City (2010), Qingdao Statistical Bureau; 2011 National Economic and Social Development Statistics Bulletins of HEDA, Administration committee of HEDA; The sixth census data of Guangzhou City (2010), Guangzhou Statistical Bureau; Official websites of seven NETDZs.

Development zone	City	Proportions of tertiary industry increase value in GDP	Jobs divided by residential population	Year of establishment	Start year of transformation
Beijing Economic-Technological Development Area	Beijing	40.4% (2013)	3.64	1992	2005
Tianjin Economic-Technological Development Area	Tianjin	21.67% (2014)	2.77	1984	2006
Dalian Economic-Technological Development Area	Dalian	33.84% (2014)	0.53	1984	2008
Qingdao Economic-Technological Development Area	Qingdao	35.35% (2014)	1.90	1984	2001
Shenyang Economic-Technological Development Area	Shenyang	27.86% (2014)	0.33	1988	2007
Hangzhou Economic-Technological Development Area	Hangzhou	23.87% (2013)	0.54	1993	2004
Nansha Economic-Technological Development Area	Guangzhou	20.4% (2014)	1.45	1993	2005

in 2005, with the Dongshan and Yuexiu Districts being merged into a new Yuexiu District, and the Liwan and Fangcun Districts being merged into a new Liwan District. Meanwhile, the original Guangzhou Development Zone and Nansha Development Zone were integrated into a new administrative district, turning Nansha into one of Guangzhou's official administrative districts. In 2007, following Guangzhou's 10th Party Congress, a new spatial development strategy was announced (Fig. 3) in which urban spatial development would be transform from outward "expansion" to inward "optimization and improvement". As a result, the focus of Guangzhou's urban planning and construction changed, prioritizing suburban infrastructure and major projects; and similar to the general suburban development process in China, Guangzhou's suburbanization entered a new phase in which urban spatial morphology and spatial distribution of urban functions were given greater emphasis.

4.1.4. An increasingly clear polycentric spatial structure (2009–present)

Along with the ongoing transformative development from market segmentation to regional integration in the Pearl River Delta region, in 2010, Guangzhou's future spatial vision, "one metropolitan area, two new towns, three peripheral urban areas", was proposed in the "Guangzhou Strategic Planning and Master Planning Framework" document. At the 10th Party Congress of Guangzhou City at the end of 2011, a proposal for an urban spatial structure and urban functional layout was presented that aimed to create a polycentric urban structure. Later, in June 2012, the Chinese Academy of Social Sciences (CASS) proposed a "One Two Three" hierarchy of settlement development, with Guangzhou as the core, two new towns and three new sub-centers (Fig. 3). As one of the two new towns in Guangzhou city, the strategic position of Nansha was enhanced even further, and it has become a powerful engine in the transformative development of the Greater Guangzhou and Greater Pearl River Delta regions. Facing brand new opportunities and challenges in these times of globalization and regionalization, the building of a polycentric urban spatial structure was an inevitable choice for Guangzhou in its bid to become a "National Central City".

4.2. Development path and the emerging edge urban area in Nansha

4.2.1. Initial exploration stage relying on villages and towns (prior to 2000)

Fok Ying Tung, a Hong Kong Tycoon, first proposed the development of Nansha back in 1988, and played a major role in promoting Nansha's initial construction and development. Since then, the status of Nansha has improved step by step. In 1990, Nansha in Guangzhou, Daya Bay in Huizhou and Western Area in Zhuhai were established as three key development areas by the government of the Guangdong

Table 5
Comparison of defining criteria of Chinese development zone-oriented edge urban areas and American edge cities.

Functional defining criteria of American edge cities		Selected criteria of Chinese development zone-oriented edge urban areas		
Content	Comparative items	Comparative items	Content	
			Emerging ones	Mature ones
Suburbanization stage	Development stage of central Cities		suburbanization stage	
At intersections of main roads on the fringe of urban built areas or at intersections of suburban highways	Spatial location		Important nodes on regional transport corridor or portal areas for outward expansion	
5 million square feet or more	Leasable office space	Tertiary industry increase value	Proportions in GDP should be between 20% ~ 35%	Proportions in GDP should be over 35%
600,000 ft^2	Leasable retail space	Industrial structure	Coexisting manufacturing, producer services and high-tech industries	
More jobs than bedrooms	Employment-to-population ratio		Significant differences between jobs and residential population	A relatively balanced employment-to-population ratio
Perceived by the population as one place	Urban spatial morphology		Sub-centers at the fringe of large cities	
Nothing like a "city" as recently as 30 years ago	Time for development into a "city"		Transformative developments over 10 years or so	

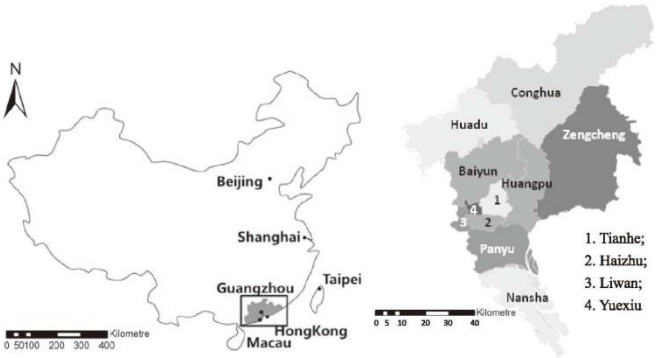

Fig. 2. Location of Nansha district in Guangzhou city, China.

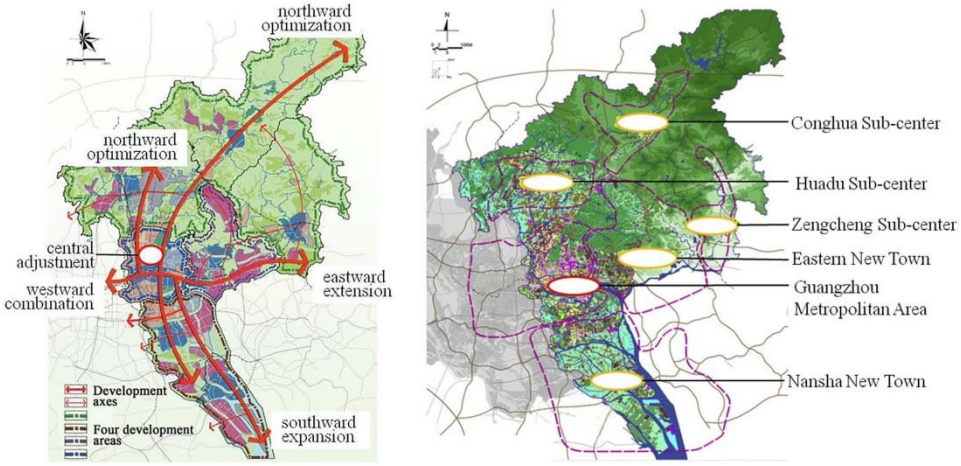

Fig. 3. Indication of Guangzhou "Cross Principles" development strategy and indication of Guangzhou "One, Two, Three" future spatial vision.
Sources: 2020 Overall Urban Development Strategic Plan of Guangzhou City.

province; and in 1992, the State Council approved Nansha as a treaty port. In the following year, the State Council gave its approval for the establishment of Nansha as a National Economic and Technological Development Zone. With Panyu city changing into Panyu district in 2000, Nansha, which boasts best deep-water port in southern China, also became part of Guangzhou city territory and the only coastal area in Guangzhou. At around that time, a "moderately heavy" industrial development strategy was proposed in Guangzhou, and Nansha began to take expanded industries from the central areas of Guangzhou.

Similar to one type of Western edge cities whose original development is based on villages and towns, Nansha's initial exploration also looked to the outer suburban villages of Guangzhou. Driven by conventional industrial relocations, policy support from local government and private investments, Nansha entered its initial stage of development.

4.2.2. Rapid growth stage relying on industrial development (2001–2004)

In 2002, the Nansha Development Zone Construction Headquarters was established, and Nansha's leading construction and development body changed from the Administrative Committee of the Nansha Development Zone, under the responsibility of Panyu, into the Construction Headquarters of the Nansha Development Zone overseen by Guangzhou municipality. Furthermore, the leading investment body also changed, from the social investments of the Fok Ying Tung Foundation, to governmental investments (Wen, 2010). As one interviewee noted, "the development at that time aimed at developing four main industries: steel, logistics, shipping and petrochemicals. Nansha's positioning in the early "Big Nansha" period featured only industrial development" (interview, planner, Nansha, April 2015). The 2004 Nansha Area Development Plan established Nansha as a core area in Guangzhou's southward spatial and industrial extension, and promoted the development idea of "big industry, big logistics and big transportation". "The 2004 Nansha Area Development Plan was by this time

Table 6
Proportion changes of different types of land use in Nansha.
Sources: Zhou, Chen, Li, & Liu, 2009.

Land use types	1990	2000	2006	Change rate during 1990–2006 (= 100%)
	Percentage			
Arable land	54.64	38.47	31.44	− 42.46
Building land	**4.33**	**15.08**	**35.70**	**724.48**
Woodland	8.08	10.01	3.59	− 55.57
Water	32.50	35.56	29.35	− 9.69
Unused land	0.48	0.83	3.00	525.00

already treating Nansha as an independent city. This plan provided effective guidance for nearly a decade" (interview, planner, Nansha, April 2015). From the changes in the proportions of different types of land use in Nansha in 1990, 2000 and 2006, we can see that with the accelerated urbanization process, the proportion of land allocated for building increased dramatically, rising from 4.33% in 1990 to 15.08% in 2000, and then up to 35.70% in 2006 (Table 6).

Different from edge cities in the West, whose initial development is residential-led, the driving force for continuous development in Nansha was largely industrial development promoted by local government and private investments. The rapid growth of Nansha at this stage was driven mainly by the manufacturing sector.

4.2.3. Accelerating and upgrading stage oriented by projects (2005–2009)

In 2005, the administrative divisions of Guangzhou city were readjusted and Nansha district was finally established, with a total area of 544.12 km^2 (Li, 2007). At that point, "the development focus of Nansha turned from purely economic development to comprehensive construction, including the economy, environment, urban qualities, public services, etc." (interview, planner, Nansha, April 2015). At the end of 2008, the Pearl River Delta Region Reform and Development Plan (2008–2020) was approved by the State Council. Established as one of the five priority development areas in Guangdong-Hong Kong-Macao cooperation, Nansha New District led the transformation and development of the whole region, and became an important node in Guangzhou.

Its superior conditions in being established as a port spurred Nansha's heavy industry-oriented development in its early years. In line with this industrial development positioning, a large amount of investments were made into port construction, and the contribution of large-scale projects to Nansha's economic development exceeded a rate of over 50% (Nansha Government, 2012). A comparison of the above-scale industrial output value of the districts and counties in Guangzhou in 2009 reveals that Nansha's growth proportion ranked fourth with a percentage of 15.1%, indicating significant project-oriented industrial development.

Nansha became one of Guangzhou's official districts at this stage. Driven by a number of large-scale projects, Nansha accelerated its upgrade and began to transform from a single industrial function to comprehensive development. High-tech industry became the main function and breakthrough sector in its industrial development. Similar to Western edge cities, promoted by industrial integration and globalization processes, Nansha started to show a comprehensive and integrated transitional trend.

4.2.4. Transformative stage with follow-up services (2010–present)

The April 2010 Framework and Agreement of the Guangdong-Hong Kong Cooperation defined Nansha as a pilot area for in-depth economic and social cooperation, bringing it even greater opportunities. In 2011, Nansha ushered in an important historical turning point. The development of Nansha New District was promoted officially to a national strategic level in the 12th Five-year Plan for National Economic and Social Development. Together with Qianhai in Shenzhen and Hengqin in Zhuhai, Nansha became one of three key areas for "further strengthening the Guangdong-Hong Kong-Macao cooperation". In September 2012, the Nansha New District Development Plan (2012–2025) was approved by the State Council, and Nansha became the 6th new state-level district, filling the southern regions' gap in national districts. As stated in the plan, Nansha New District was become a comprehensive platform for the promotion of Guangdong-Hong Kong-Macao fully co-operations; a future important economic growth node in southern China; a regional ecological center; a regional transportation hub; and a regional service center. As an important carrier and platform representing Guangzhou city, the Guangdong province and even the entire nation in international competition and cooperation, Nansha will surely usher in a full range of improvements and promotions. If we take a closer look at the composition changes of GDP in Nansha from 2009 till 2012 (see Table 7), the increase of its tertiary sector mainly comes from real estate, wholesale and retail. Originally developed from a suburban town with natural port area, Nansha's transport, logistics and postal services also showed an increase in 2012.

Table 7
The composition of GDP in Nansha, 2009–2012 (%).
Sources: Nansha statistical year book, 2010–2013.

	2012	2011	2010	2009
Primary sector	5.1	2.6	2.8	3.1
Secondary sector	73.0	80.6	80.6	79.6
Industry	69.7	76.2	76.5	73.8
Construction	3.3	4.4	4.1	5.8
Tertiary sector	22.1	16.8	16.6	17.3
Transport, logistics and postal services	3.4	2.7	2.9	5.0
Wholesale and retail	4.2	3.0	3.2	4.1
Hotel and catering	1.6	0.9	1.0	0.9
Real estate	4.2	2.8	2.0	2.5
Other services	8.6	7.4	7.5	4.9
Total	100.0	100.0	100.0	100.0

More recently, at the end of 2014, the State Council approved the establishment of the China (Guangdong) Pilot Free-Trade Zone, including Nansha as one of the three zones in Guangdong province. As noted by two of the interviewees, "a number of national strategies delivered from the central state to Guangzhou are actually fulfilled by Nansha, such as the New District, FTZ, etc." (interviews, government officials, Nansha, April 2015). Another interviewee highlighted the dynamics of Nansha's transformation: "The bodies spurring Nansha's transformation are diverse. National policies play a part, but the most important part is the strong intentions of local governments to promote the development of Nansha" (interview, planner, Nansha, March 2015).

With the promotion and support of both central governmental policies and local governmental constructions, along with the gradual relocation of service industries and the concerted efforts towards Nansha's development, Nansha is beginning to share similar characteristics to Western edge cities. In particular, with the newly approved Nansha New District Development Plan (2012–2025), Nansha has already started its strategic transformation into a fully functional Chinese edge urban area. (see Table 8)

4.3. An emerging edge urban area of Guangzhou

A comparison of Nansha and other Chinese edge urban areas reveals five main similarities, including spatial location, increase in value of tertiary industry, industrial structure, employment-to-population ratio and urban spatial morphology. Huge investments and long-term efforts towards construction and development have granted Nansha with some of the most basic features of an independent "city". Regarding the time taken for development into a "city", it has taken only 20 years for Nansha to develop from a National Economic and Technological Development Zone to an emerging edge urban area of Guangzhou. Its prime spatial location central to Guangdong, Hong Kong and Macao, as

Table 8
Development process of Nansha, Guangzhou city: from a development zone to a fully functional "city".
Sources: Official website of Nansha New District.

Stages	Year	Macro background	Functional transformation	Significant events	Dominant dynamics
Initial exploration	1993–2000	Establish Nansha as a National Economic and Technological Development Zone; Deng Xiaoping's southern tour	Industrial function	In 1997, Guangzhou municipal government gave formal approval to the Master Plan of Nansha Economic and Technological Development Zone. In 2000, the new round of Guangzhou City Overall Strategic Plan was established, with spatial development strategy of "southward expansion, northward optimization, eastward extension, westward combination". In 2000, Panyu and Huadu cities changed into Panyu and Huadu districts, and Guangzhou became a coastal city.	Local governmental policies, private investments and industrial relocation
Rapid growth	2001–2004	Gain WTO membership; Scientific concept of development	Industrial-based, residential functions supplemented	In 2002, Nansha Development Zone Construction Headquarters was formally established. The development of Nansha started. In April 2002, Guangdong provincial government held a conference on promoting Nansha's development. In 2004, Nansha Development Plan was released.	Local governmental constructions and private investments
Accelerating and upgrading	2005–2009	Harmonious society; Low-carbon economy	Gradually become fully functional	In 2005, Guangzhou implemented administrative division adjustments, and Nansha transformed into an independent administrative area. In September 2009, Zhu Xiaodan, the Party Secretary of Guangzhou, emphasized "ecological priorities" for Nansha, and reintroduced the concept of Nansha Coastal Eco-town.	Large-scale project-led and globalization process
Transformative development	2010–2013	Guangdong-Hong Kong-Macao cooperation; Guangzhou "123" spatial development strategy	Face the whole region, and is transforming to comprehensive, integrated functions	In 2010, Framework and Agreement of Guangdong-Hong Kong Cooperation was signed. In 2011, the development of Nansha District was included in the 12th Five-year Plan for National Economic and Social Development. In October 2011, Guangdong provincial government held a conference on the development and construction of Nansha New District. In May 2012, the 11th Party Congress of Guangdong province stated Nansha's development and construction as the priority item in the transformation and upgrading process of Guangdong province. In September 2012, the State Council officially approved Nansha New District Development Plan (2012–2025).	Central governmental policies and local governmental constructions

Table 9
Comparative study of the main characteristics between Nansha and development zone-oriented edge urban areas in China.
Sources: 2012 National Economic and Social Development Statistics Bulletins of Nansha, Guangzhou city; Investment Environment Analysis Report of Nansha Development Zone, Guangzhou city.

Main characteristics of emerging Chinese edge urban areas		Main characteristics of Nansha, Guangzhou city	
Content	Comparative items	Comparative items	Content
Suburbanization stage	Development stage of central cities		Suburbanization stage
Important nodes on regional transport corridor or portal areas for outward expansion	Spatial location		Located in the southeast of Guangzhou; at the intersections of the Guangzhou, Shenzhen and Zhuhai highways
Proportion of tertiary industry increase value in GDP should be between 20 and 35%	Tertiary industry increase value		Proportion in GDP: 22.18% (2012)
Manufacturing, producer services and high-tech industries coexist	Industrial structure		Five major industrial clusters, including high-end services, technology intelligence industry, port advanced manufacturing, marine industry, tourism, leisure and healthy industry, etc.
Significant differences between jobs and residential population	Employment-to-population ratio		Ratio of jobs to population: 0.46
Sub-centers in the suburbs of large cities	Urban spatial morphology		A sub-center in the suburbs of Guangzhou
Construction and development occurring over 30 years or so	Time period for development into a "city"		Construction and development has occurred over 20 years or so

well as the powerful support it has received from national and local governmental policies have been key factors in its rapid development. (see Table 9)

In summary, Nansha can at present be regarded only as an emerging edge urban area of Guangzhou. Its transformation from an industrial zone into a coastal "city" with comprehensive urban functions has begun, and has already seen some success. Continuous improvement to its industrial base and urban functions will help promote its future development and the edge urban formation of Guangzhou.

5. Conclusion

Chinese edge urban areas have emerged as an inevitable outcome of the transformation of Chinese development zones and the strategic choice of large city regions as they strive to develop a more polycentric development pattern. This paper provides both general (in terms of characteristics) and in-depth and dynamic (in terms of processes) discussions on one particular type of Chinese edge urban area. To characterize Chinese edge urban areas, we adopted the defining framework for archetypal edge cities developed by Garreau, which we adjusted for the Chinese context. This context-specific framework was also used in a case study to test Nansha as either an emerging or mature edge urban area. The findings suggest that Chinese edge urban areas are transforming out of mono-functional development zones, which share certain similarities with American edge cities.

First, the *development stage of central cities*: in both cases, edge cities/urban areas emerge at the suburbanization stage of central cities. Second, the *spatial locations of Chinese edge urban areas* are at important nodes on the regional transport network or in port areas, allowing outward expansion. Third, they have an *industrial structure* that includes coexisting manufacturing industries, producer services and high-tech industries. Fourth, *urban spatial morphology*: they are perceived as one place by people, and in the Chinese case, edge urban areas become secondary centers in the suburban areas of large cities. Fifth, *the period of time to develop into a "city"*: their construction and development have occurred over 30 years or so, and the landscape has changed significantly.

That said, when taking into account the special development background of large Chinese cities, development zone-oriented Chinese edge urban areas present some unique characteristics. Comparing the relevant tertiary industry increase-value indicators of Chinese edge urban areas with normally established cities, and the degree of employment-to-population balance, Chinese edge urban areas can be divided into two categories: emerging and mature. The unique qualities of emerging Chinese edge urban areas include mainly a. Tertiary industry increase value: proportions of GDP should be between 20 and 35%; b. Degree of employment-to-population balance: significant differences between jobs and residential population (Table 5).

Furthermore, the development paths of Chinese edge urban areas are also different to those in the United States. In the US context, after cities underwent a suburbanization of jobs as a result of a large number of corporate headquarters and office parks relocating to the suburbs, urban functions of suburban areas were increasingly strengthened and improved. Edge cities, in this context, driven by the market and developers, formed gradually at the intersections of main roads on the fringe of urban built areas or at the intersections of suburban highways. In contrast, within the Chinese context, the basic path of transformative process from development zones to edge urban areas can be broken down into three different phases. 1) Initially, unlike market-oriented large-scale suburbanization in the United States, suburban villages/towns in China developed into single functional areas alongside industrial relocations. This early development stage of suburban villages/towns was driven primarily by the central city government. 2) In the 1990s the market came to intervene and became increasingly active. Entering into the 21st century, influenced by the external environment and internal demands, development zones with single industrial function faced re-development, and gradually entered the strategic transformative stage. Meanwhile, collaborations and spatial integrations within large city regions were strengthened and the producer services in large cities were reconstructed, which led Chinese suburban development into a brand new stage. 3) Accordingly, driven by the market and governments (unlike in the United States, where developers took the lead role) development zones in some large cities began to transform gradually into fully functional new edge urban areas. In this regard, we also argue that edge cities are context specific, and whilst their characteristics may bear some similarities, the processes of their growth and transformations are very different with respective to their specific dynamics and the dominant driving bodies at different stages of development.

Based on the above findings, some issues are raised to allow a deeper understanding of Chinese edge urban areas, so as to better promoting their future developments. Firstly, rather than simply adopting Garreau's ideas on defining US edge cities, critical translations and analyses of this "imported" concept are essential for Chinese edge urban areas, given the different path of their development compared to their US counterparts. Secondly, the interests of different steering bodies or stakeholders and the interactions among them should be explored in more depth in order to better understand the dynamics during the development of Chinese edge urban areas. Thirdly, it should be noted that not all development zones will necessarily end up in the form of Chinese edge urban areas. The example of Nansha presented here is currently in the process of becoming a "city" of Guangzhou. With the

new opportunities ushered in with the "One Belt, One Road" national strategies and policies, and the establishment of the Guangdong Free Trade Zone (to which Nansha contributes as one of the three major ports), Nansha will undoubtedly continue developing to a higher level, and may even become a regional central city of the Great Pearl River Delta region. Finally, given the rapid (post)suburban construction taking place in China and in the emerging Chinese edge urban areas in the suburbs of some large cities, Chinese edge urban areas are certainly worthy of more attention and further in-depth study. Future researches into Chinese edge urban areas can contribute significantly to the body of literature on edge urban formations in general, and can also provide unique and novel cases for comparative analysis.

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Polycentric development practice in master planning: the case of China

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ABSTRACT
Towards the end of the twentieth century, polycentricity was introduced into China as a planning concept. Subsequently a number of super/mega city regions began to adopt polycentric development spatial planning strategies, which are designed to facilitate more sustainable and balanced development. This paper seeks to identify the main differences in application of polycentricity between China and the West, and explore the major emerging thematic strands of polycentric development practice, as illustrated through an evaluation of master planning in eight super/mega city regions across China. In particular, the paper highlights the divergent interpretations of polycentricity in master plan-making practice and shows how plans have been adjusted to help deliver the idea of polycentric development. Although the concept of polycentricity is relatively new in China, it has already become a normative approach used to determine future spatial structures. While there is an absence of an articulated rationality to 'decide' whether this is (or should be) an 'ideal' model, already it has gone beyond Western approaches of initially using polycentricity as an interpretative tool to describe urban realities.

KEYWORDS
Polycentricity; urban planning; master planning; super/mega city regions; sustainable development

1. Introduction

The central idea of polycentricity can be traced back to Geddes in the early twentieth century or even Howard in the late nineteenth century. But the term polycentricity was not used. Nevertheless, since the early 1990s, the urban space in Europe, North America and Japan have all increasingly shown polycentric development trends (Yang and Cai 2008), suggesting that urban spatial structures were entering a new stage of development. Researchers in Western countries have been using multiple methods to study the morphology and composition of polycentric development across a variety of spatial scales. Nevertheless, the concept has been clouded in ambiguity depending on methodological tradition and geographical context (van Meeteren et al. 2016). In the literature, the concept has increasingly been invoked in recognition of the existence of multiple centres in one area (Kloosterman and Musterd 2001) and when articulated in a policy context often has the normative objective of seeking balanced development within cities and/or regions (Hall and Pain 2006).

Polycentricity, as a means of describing the urban landscape in advanced western economies, has been applied at range of different scales. At a city/city regional scale, examples included Atlanta (Harshorn and Muller 1989; Fuji and Hartshorn 1995), Cleveland (Bogart and Ferry 1999), San Francisco (Cervero and Wu 1997), Houston (Craig and Ng 2001), California (Modarres 2011), Barcelona (Garcial-Lopez and Miquel-Angel 2010), Rome and Milan (Paolo 2013) and Rotterdam (Musterd

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and van Zelm 2001); at a country scale, Belgium (Riguelle, Thomas, and Verhetsel 2007; Hanssens et al. 2013); at a transnational scale, perhaps the most famous is the European Spatial Development Perspective (ESDP) (CEC 1999). From a planning policy perspective at least, polycentricity can therefore refer to at least three spatial scales: (1) an intra-urban or 'micro' agglomeration scale, (2) an inter-urban or the territorial or 'meso' scale and (3) an interregional or the pan-European 'macro' scale (Davoudi 2003; Sykes 2005).

Towards the end of the twentieth century, the concept of polycentricity was introduced to China, although critical research was still in its infancy, and influential theories on polycentricity have not yet been constructed which are bespoke to the country context (Wang et al. 2012). The few studies on polycentricity in China have mainly focused on reviews and introducing the idea of polycentricity based on Western interpretations (Shi 1999; Shen, Zhang, and Chen 2005; Li 2012; Qin and Li 2012), the way cities and city regions exhibit patterns of polycentricity (Wei and Zhao 2006; Li and Zhao 2011; Wang and Sun 2011; Li and Phelps 2016; Mu and Yeh 2016; Zhao, Derudder, and Huang 2017) and the governance of polycentric city regions (Zhang, Luo, and Yin 2008; Zhang 2016; Huang, Li and Hay 2016). Nevertheless, a number of metropolitan areas have adopted polycentric spatial planning development strategies which are intended to guide future development (Luo and Zhu 2008). However, after more than 10 years of applying the ideas of polycentricity into planning policy, there is little research available which evaluates whether this concept has successfully been applied from a policy perspective. Instead, much of the research evaluates the patterns associated with connections and linkages within and between particular cities or metropolitan regions, e.g. the urban structure of Shanghai (Sun, Shi, and Ning 2010); co-production of knowledge linkages in the Yangtze River delta (Li and Phelps 2016) or intercity connections and migration patterns within city regions (Mu and Yeh 2016), and ascribes these to polycentricity. In an attempt to overcome this limitation, this paper attempts to critically evaluate the application of polycentric policy development practice in China through the lens of master planning. Hence, the paper is focused on exploring the emergence of planning practice and identifying any challenges arising from this application in practice.

The paper starts by providing an overview of polycentricity more generally and its introduction into China in particular, before evaluating the way the concept has been applied in practice overtime in selected super/mega city regions at a variety of scales, before focusing particularly on Guangzhou and Nanjing. The analysis is based on a review of formal planning documents over time. This then highlights similarities and differences in the way that polycentricty has been interpreted and applied between the West and China.

2. A conceptual framework for evaluating polycentric practice in master planning in China

2.1. Conceptualizing polycentricity in practice

Before evaluating polycentric application through the lens of master planning, the defining characteristics of polycentricity need to be identified. There is an increasing literature that has been exploring the linkages which exist within and between nodes at a variety of spatial scales. This is often reflected in an academic discourse which explores these ideas through patterns of networked connectivity (see for example, from a Chinese perspective, Li and Phelps [2016], Mu and Yeh [2016] and Zhao, Derudder, and Huang [2017]). This stems from what Shaw and Sykes (2004) describe as an emerging academic but contested discourse about what polycentricity means. Is it merely a pattern that can be observed which reflects growing interconnectivity between different places at different scales, and is emerging largely as a function of increasing global competitiveness? From such a perspective, an interesting question emerges as how do such trends become embedded in policy-making discourses? From a European perspective, for example, polycentric policy-making during the early part of the twentieth century was largely top-down, applied at a variety of scales and

interpreted differently in different places for different purposes. In some cases it was an analytical tool, in some cases a rhetoric device for re-imaging places and the interconnectivities that existed at different scales, or a policy tool to foster collaboration and balanced development often used as a fig leaf to cover the spatially discriminating effects of none spatial policies (Jenson and Richardson 2000; Kunzmann 2000; Shaw and Sykes 2003, 2004).

Nevertheless from a policy perspective, it is often associated with two theoretically distinct aspirations: functional balance and spatial integration (Lambregts 2009; Burger 2011; Burger et al. 2011; Burger and Meijers 2012; Vasanen 2013). These two perspectives when combined have become the new objective of 'functional polycentric' development, which, if applied at a regional scale, can deliver an 'integrated polycentric region'. A defining feature of polycentricity therefore can be regarded as similar-sized independent centres with horizontal functional linkages replacing the classical urban hierarchy. The spatial relationship of the centres should be defined by their horizontal connections and functional interdependences at a variety of spatial scales (Qian and Wong 2012).

Hence, the basic nature of polycentricity, from a policy perspective, should embody two major principles: a settlement system and a spatial structure. In other words, urban form should be considered as a network system consisting of urban centres and rural towns, or functional interdependent centres/towns, all of which are horizontally and functionally interconnected at different spatial scales.

In this paper, we particularly focus on the way the policy-makers, through the development of selected master plans, have applied polycentricity ideas and principles. For the city regional level, polycentricity application can be regarded as a form promoting an interconnected multi-nodal structure, with functionally interdependent centres balanced across city regions. For the metropolitan level, polycentricity application often refers to a polycentric or multi-centred spatial structure. For the central city level, sub-centres within an urban development framework often with horizontal connections become a polycentric model. Based on the two major concepts of polycentricity (outlined above) and the defining criteria for each level of application, we will evaluate the application of polycentricity in selected super/mega city regions to see how exactly the concept was applied in plan making at each spatial scale and whether it complies with the basic nature of polycentricity in practice.

2.2. Urban and rural planning system and planning levels in city master plans of China

The current urban and rural planning system in China was introduced in 2008 through the Urban and Rural Planning Act (2008). This replaced the former Urban Planning Act which existed from 1990. Up to 2008, urban planning frameworks were very focused exclusively on the development trajectories of the cities themselves. In theory, the 2008 system created a more integrated and holistic planning approach exploring not just urban form but also the connectivities, both real and potential between settlements to create a more integrated network covering rural and urban areas (see Figure 1).

Based on the urban and rural planning system outlined in Figure 1, a city region's urban (town) system planning and county's urban (town) system planning were not legally binding but were designed to create a framework to guide urban master plans and rural-level plans. Hence under the new urban and rural planning system, urban master planning is being extended from the central city to cover the entire city administrative area (Qian and Wong 2012), with urban master planning being understood as an integrative planning tool considering both rural and urban needs together. Therefore, in most cases in China, a City Master Plan (*chengshi zongti guihua*) generally includes two (but may include three) levels of planning. The term city region (*shi yu*) is used here for the highest level of planning and focuses on the concept of functional regions often comprising a core or main city and its surrounding counties. The spatial scale for city regional-level urban (town) system planning is the whole administrative area, which includes all the urban districts, administrative counties and county-level cities. In some cases, middle-level planning, sometimes called metropolitan planning, can be included in master planning activities of some cities. This usually focuses upon a metropolitan area (*shi qu/dushiqu*) and planning policy covers the central city, its urban–rural fringe and some rural areas. Nevertheless, the most important plan is focused on the central city

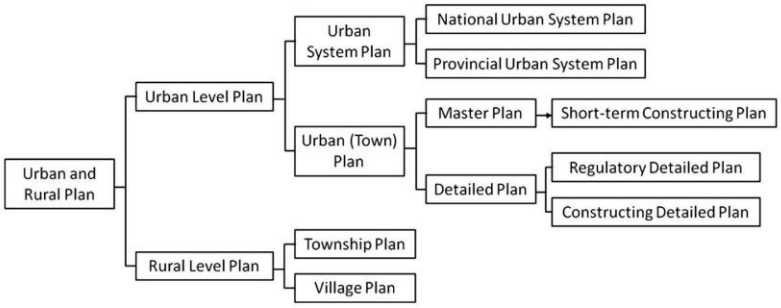

Figure 1. Urban and rural planning system currently practiced in China. Sources: Urban and Rural Planning Act (2008) and Qian and Wong (2012).

(*zhongxinchengqu*). Normally, it covers the continuous built-up of the central city and regulates the major future development of this area (see Table 1).

2.3. Tracing the origins of polycentricity practice in China

After the founding of modern China, in 1949, urban construction was mostly focused on the central part of the city (Shi 1999). This resulted in an increasingly monocentric urban structure characterized by a concentration of city functions and high population densities in the core cities. Further expansion of these urban agglomerations quickly meant that the drawbacks of monocentric model become increasingly evident. In an attempt to overcome the diseconomies of scale associated which such development trends, Shanghai and Beijing, in particular, drew inspiration from the development experiences of large Western cities. A number of new development zones, high-tech industrial parks, township industrial parks and various other forms of development were rapidly promoted in suburban areas, with the expressed purpose of decanting the ever expanding population and industries from central areas. For example, from the beginning of the 1950s, Shanghai established six suburban industrial areas, including Wusong, Wujiaochang, Yangpu, Caohejing, Changqiao and Gaoqiao, and seven outer suburban satellite towns, including Jiading, Anting, Songjiang, Minhang, Wujing, Jinshanwei and Baoshan. Beijing followed suite establishing satellite towns such as Yanshan, Tongzhou, Huangcun and Changping (Shi 1999).

The early creation of these industrial parks and satellite towns certainly played a role in relocating expanding industries and population from the central cities. However, since they were largely single functional industrial areas or suburban residential areas, the development of much of the necessary key infrastructure and public services failed to keep pace with the speed of development. This often made these satellite places extremely unattractive to new residents. Furthermore, many the early successes in terms of growth rates was dependent on foreign investments which, combined with a slowing down in economic growth and acute resource bottlenecks has, today, exacerbated these problems outlined above in Chinese development zones. Hence, development of single functional industrial areas or residential areas is recognized as being challenging and there are urgent calls for planned interventions to ensure a restructuring and strategic adjustments to these places (Yuan and Wang 2010; Che 2012).

Table 1. Spatial scope of different levels of City Master Plans in China.

Planning level	Spatial scope
City region (*shi yu*)	Entire city administrative area
Metropolitan area (*shi qu/dushiqu*)	Central city, its urban–rural fringe and some rural areas
Central city (*zhongxinchengqu*)	The continuous built-up of the central city

Shanghai's City Master Plan (1999–2020) covering the functional region, for example, proposed an urban spatial structure of 'multi-axis, multi-levels, multi-cores', which would be made up of the central city, new towns, central towns and market towns. 'Multi-cores' at different spatial scales can be regarded as the first representation of a polycentric spatial structure, and indeed, the first application of polycentricity to master planning in China. Following Shanghai, other large cities or metropolitan areas also proposed strategies and policies designed to build a more polycentric spatial structure. Hangzhou's City Master Plan (2001–2020) put forward an open spatial structure of 'one core-two circles, three axes-two corridors and one ring-multi-centres'. Beijing City Master Plan (2004–2020) also argued for a more integrate spatial structure comprising 'two axes-two belts-multi-centres'. A regional spatial layout of 'an axis-two belts-three zones' was proposed in the Tianjin City Master Plan (2005–2020), and Guangzhou, in its City Master Plan for 2001–2020, presented the idea of transforming its urban spatial structure from a monocentric to a polycentric form along the Pearl River. In consideration of the increasing adoption of the polycentricity concept in master planning, next the paper provides a broad overview of polycentricity application in selected super/mega city regions before moving on to a more detailed analysis of specific examples.

3. An overview of polycentricity application in Chinese master planning

3.1. Selection of Chinese super/mega city regions in terms of polycentricity application

Reflecting the enormous changes that have taken place in the scale and rate of urbanization in China since 1990, on 20 November 2014, the State Council of China issued a new 'Notification on the adjustment of city size classifications criteria.' This then replaced what had been a fourfold classification, which had been used since the 1990 Chinese City Planning Act. Using resident population in urban districts as the statistical standard, it classified all cities into five groups:

- a small city has a resident population in urban districts of under 0.5 million,
- a medium-sized city has a resident population in urban districts of between 0.5 and 1 million,
- a large city has a resident population in urban districts of between 1 and 5 million,
- a mega city has a resident population in urban districts of between 5 and 10 million and
- a super city has a resident population in urban districts of over 10 million.

Based on this classification, and the sixth national census which took place in 2010, there were 16 super/mega cities in the Chinese mainland. The population data from National Economic and Social Development Statistics Bulletins and Statistical Yearbooks of these 16 cities show that 7 of them are super cities and 9 are mega cities, with Shanghai, Beijing, Chongqing and Tianjin having populations exceeding 15 million (see Table 2). It is these super and mega cities which are the focus of the discussion in this paper.

For over 30 years, Chinese municipal governments have been expected to make legally binding spatial plans, the City Master Plan (*chengshi zongti guihua*) to provide a strategic overview of their urban development framework (Zhang 2000). By focusing on these super/mega city regions, all the master plans that have been prepared since 1995 have been examined to see whether polycentricity has been invoked to describe both the existing, and future, urban structure. This initial evaluation is intended to act as a basic overview before exploring more specific examples in a little more detail. By 2010, all the 16 super/mega cities had prepared a *shi yu* master plan and in at least half the cities, the original master plan had been replaced by a more recent and updated version (see Table 3).

When determining whether the ideas of polycentricity were being invoked, various terms were looked for as an indicator. These included not only the exact term *polycentricity* (*duozhongxin*) but also different variations of polycentricity terminology, including multi-cores (*duohe*), multi-centres (*duoxin*), multi-clusters (*duozutuan*), clustered spatial layout (*zutuanshi*), multi-spots (*duodian*), etc. The above are all variations of an application of the polycentricity concept in the Chinese

Table 2. The 16 super/mega cities and their resident population by the end of 2015.

	Super/Mega cities	Province	Resident population in urban district (10,000)
1	Shanghai	Shanghai	2415.27
2	Beijing	Beijing	2170.50
3	Chongqing	Chongqing	1838.41
4	Tianjin	Tianjin	1546.95
5	Guangzhou	Guangdong	1350.11
6	Shenzhen	Guangdong	1137.89
7	Wuhan	Hubei	1060.77
8	Chengdu	Sichuan	829.10
9	Dongguan	Guangdong	825.41
10	Nanjing	Jiangsu	823.59
11	Foshan	Guangdong	743.06
12	Hangzhou	Zhejiang	679.06
13	Xi'an	Shanxi	635.68
14	Ha'erbin	Heilongjiang	548.70
15	Shantou	Guangdong	547.64
16	Shenyang	Liaoning	529.90

Sources: 2016 Statistical Yearbooks of Shanghai, Chongqing, Guangzhou, Xi'an and Shantou, Statistical Bureaus of Shanghai, Chongqing, Guangzhou, Xi'an and Shantou; 2015 National Economic and Social Development Statistics Bulletins of Beijing, Tianjin, Shenzhen, Wuhan, Nanjing, Chengdu (here use registered population), Dongguan, Foshan, Hangzhou, Harbin and Shenyang, Statistical Bureaus of Beijing, Tianjin, Shenzhen, Wuhan, Nanjing, Chengdu, Dongguan, Foshan, Hangzhou, Harbin and Shenyang.

context reflecting different stages of polycentric development practice in China's master plans. Although the terms have been applied, at this stage it remains uncertain as to how they have been elaborated in master planning at different scales.

In terms of the application of polycentricity in master plans, four broad types of practice emerged:

(1) those city regions that had applied polycentric principles to both rounds of master plans,
(2) those city regions that had applied polycentricity principles in their latest iteration of master plans, and had been adopted before 2005,
(3) those city regions that applied polycentricity principles in their latest round of master plans, but were adopted after 2005, and
(4) those city regions that had never applied polycentricity to any of their master plans.

The focus of the rest of this paper is to explore in more detail how and why such a categorization was evident based on a more detailed evaluation of a smaller number of case study examples of policy in

Table 3. Application of polycentricity in master plans of 16 super/mega city regions.

	Super/Mega cities	Belonging provinces	Planning period of earlier master plans (after 1995)	Planning period of current master plans
1	**Shanghai**	**Shanghai**	**–**	**1999–2020 (applied)**
2	**Beijing**	**Beijing**	**–**	**2004–2020 (applied)**
3	**Chongqing**	**Chongqing**	**1996–2020 (applied)**	**2007–2020 (applied)**
4	**Tianjin**	**Tianjin**	**–**	**2005–2020 (applied)**
5	**Guangzhou**	**Guangdong**	**2001–2010 (applied)**	**2011–2020 (applied)**
6	Shenzhen	Guangdong	1996–2010	2010–2020 (applied)
7	**Wuhan**	**Hubei**	**1996–2020 (applied)**	**2010–2020 (applied)**
8	Chengdu	Sichuan	2004–2020	2011–2020 (applied)
9	Dongguan	Guangdong	1996–2010	2000–2015
10	**Nanjing**	**Jiangsu**	**2001–2010 (applied)**	**2011–2020 (applied)**
11	Foshan	Guangdong	–	2012–2020 (applied)
12	**Hangzhou**	**Zhejiang**	**–**	**2001–2020 (applied)**
13	Xi'an	Shanxi	1995–2010	2008–2020 (applied)
14	Ha'erbin	Heilongjiang	1996–2010	2011–2020
15	Shantou	Guangdong	–	2002–2020
16	Shenyang	Liaoning	1996–2010	2011–2020 (applied)

Sources: City Master Plans of 16 super/mega cities, collected from Urban Planning Bureaus or their official websites. Super/mega cities which have applied polycentric ideas in their current or both earlier and current master plans were highlighted in the table.

practice. It is not the purpose to evaluate the effectiveness of the policy, but rather to understand the ways in which polycentric ideas were being applied to plan-making processes. Therefore, super/mega cities which fall into the first (Chongqing, Guangzhou, Wuhan and Nanjing) and second type (Shanghai, Beijing, Tianjin and Hangzhou) become the focus of the remainder of this paper (see Figure 2).

Each of these super/mega cities and regions is enormous (Table 4). All have very big populations ranging from 24 million in Shanghai to 6.7 million in Hangzhou. The areas that these super regions cover are vast and incorporate at least 11 lower tier administrative districts or counties.

3.2. Spatial scales of polycentricity application in city master plans

In the range of master planning activities within these super/mega cities, polycentric development strategies have been applied at all three levels. Table 5 illustrates the different levels at which polycentric development strategies have been applied in the various rounds of master planning activities in the eight super/mega cities.

It can be seen from Table 5 that there are some differences in terms of the scale at which polycentric ideas are being applied within these mega city regions. In some cases, Guangzhou, Nanjing and Hangzhou, it has been applied at all three spatial scales. Only in Beijing and Tianjin, it has been applied at one spatial scale, and then only at the city regional scale. From a temporal perspective, the picture in terms of whether polycentricity is becoming a more prominent policy narrative is a little mixed, but only in Guangzhou has the policy principle become less prominent, and then only at the intermediate or metropolitan scale. In the forthcoming sections, we look at the way that polycentricity as an idea has been articulated at the three spatial scales or levels outlined above.

Figure 2. Locations of eight selected super/mega cities in China.

Table 4. Basic information for eight selected super/mega city regions.

Super/mega city regions	Region type	Resident population in urban district (10,000) (2015)	Overall area (km^2)	GDP (2015) (billion Yuan)	Administrative divisions
Shanghai	Municipalities	2415.27	6219	2496.50	16 districts
Beijing	Municipalities	2170.50	16,411	2296.86	16 districts
Chongqing	Municipalities	1838.41	82,400	1571.97	26 districts, 12 counties
Tianjin	Municipalities	1546.95	11,920	1653.82	16 districts
Guangzhou	Provincial capital	1350.11	7434	1810.04	11 districts
Wuhan	Provincial capital	1060.77	8494	1090.56	13 districts
Nanjing	Provincial capital	823.59	6582	972.08	11 districts
Hangzhou	Provincial capital	679.06	16,596	1005.36	9 districts, 2 county-level cities, 2 counties

Sources: 2015 National Economic and Social Development Statistics Bulletins of Shanghai, Beijing, Chongqing, Tianjin, Guangzhou, Wuhan, Nanjing and Hangzhou, Statistical Bureaus of Shanghai, Beijing, Chongqing, Tianjin, Guangzhou, Wuhan, Nanjing and Hangzhou.

3.3. At city regional level

The evaluation in Table 6 highlights how polycentricity has been applied at city regional level in latest round of master plans in Shanghai, Beijing, Tianjin and Hangzhou, and both rounds of master plans for Guangzhou and Nanjing, with the broad approaches being similar. A more detailed analysis of each of the master plans shows that application of polycentricity is based on three distinct but interconnected aspects, the spatial structure, settlement system and settlements exhibiting an internal polycentric structure. Details of these characteristics are illustrated in Table 6.

The application at this level, in relation to either the existing or prospective spatial structure, includes four interconnected elements. A 'Point' usually refers to the core of the whole region and other centres/towns within each level. A 'Line' refers to the axes, belts or corridors which connect different centres/towns and is also designed to promote the wider regional development and outward expansion of the region as a whole, not just the core city. 'Zones' refers to the key areas of influence which surround the core and centres, with the former dependant on the later. Such an approach is also used to emphasize, at the same time, integrated urban–rural development.

The 'Settlement system' usually describes the hierarchy of urban centres and rural towns within the city regional scale. While such terms are not really explicitly used, the functional interdependency in some cases especially between new towns and the rest of the settlement hierarchy suggest

Table 5. Different levels of polycentricity application in earlier and latest rounds of master plans of eight super/mega cities.

		Application levels		
Super/mega city regions		City region (*shi yu*)	Metropolitan area (*shi qu*)	Central city (*zhongxinchengqu*)
Shanghai		√		√
Beijing		√		
Chongqing	1996–2020		√	
	2007–2020		√	
Guangzhou	2001–2010	√	√	√
	2011–2020	√		√
Tianjin		√		
Wuhan	1996–2020			√
	2010–2020		√	
Nanjing	2001–2010	√	√	
	2011–2020	√	√	√
Hangzhou		√	√	√

Sources: Shanghai City Master Plan (1999–2020), Beijing City Master Plan (2004–2020), Chongqing City Master Plan (1996–2020), Chongqing City Master Plan (2007–2020), Guangzhou City Master Plan (2001–2010), Guangzhou City Master Plan (2011–2020), Tianjin City Master Plan (2005–2020), Wuhan City Master Plan (1996–2020),Wuhan City Master Plan (2010–2020), Nanjing City Master Plan (2001–2010), Nanjing City Master Plan (2011–2020) and Hangzhou City Master Plan (2001–2020).

Table 6. The application of polycentricity at city regional level.

Super/mega city regions		City regional level		
		Spatial structure	Settlement system	Settlements exhibiting an internal polycentric structure
Shanghai		Multi-axes, multi-levels, multi-cores	Central city, new towns (including counties), central towns, general towns	Multi-levelled urban areas/towns
Beijing		Two axes-two belts-multi-centres	Central city, new towns, general towns	Multi-centres within city region
Guang zhou	2001–2010	A multi-levelled, constellation-styled spatial structure, with the central urban area as core centre and balanced distributed urban areas/towns at each level	Central urban area, central district areas, central towns, general towns	Multi-levelled urban areas/towns
	2011–2020	Polycentric, clustered and networked structure	Central urban area, sub-centres, satellite towns, small towns	Sub-centres within city region
Tianjin		One axis-two belts-three zones	Centre and sub-centre, new towns, central towns, general towns	New towns
Nan jing	2001–2010	'Cross-shaped' pattern	Central city, new urban district, new towns, central towns, general towns	New towns
	2011–2020	Two belts-one axis	Central city, new towns, lower tier new towns (*xinshizhen*)	New towns
Hangzhou		One core-two circles, three axes-two corridors, one ring-multi-centres	Central city, central towns in counties or city regions, central towns or urban clusters, general towns	Multi-levelled urban areas/towns

Sources: Shanghai City Master Plan (1999–2020), Beijing City Master Plan (2004–2020), Guangzhou City Master Plan (2001–2010), Guangzhou City Master Plan (2011–2020), Tianjin City Master Plan (2005–2020), Nanjing City Master Plan (2001–2010), Nanjing City Master Plan (2011–2020) and Hangzhou City Master Plan (2001–2020).

the application of polycentricity at the city regional scale remains valid both within the core city and also between the core city and other satellite centres within the wider city region.

As for polycentric models, multi-levelled urban areas/towns were all included within a polycentric spatial structure, including general towns which were dependent on or attached to central towns/new towns in most cases. This was evident in 1999 Shanghai Master Plan, 2001 Guangzhou Master Plan and 2001 Hangzhou Master Plan. This clearly went against the basic nature of polycentricity, as functional interdependent centres/towns are supposed to serve as polycentric models. Another specific case was Beijing. Beijing planned multi-centres[1] as a polycentric model within the 2004 Master Plan for the city region, although the planned connectivity of these centres was expected to extend well beyond the city region. These were intended to be functional centres, expected to provide services to the whole nation, provide spaces for global cooperation and respond to global risks, thereby promoting the centrality and competitiveness of the city as a whole. However, many of these urban functional centres surrounding the city core were not balanced or evenly distributed across the city region as a whole. Therefore, we argue that the scale in applying polycentricity (multi-centres) in Beijing can only, in reality, be regarded as being focused on the central city scale, not as stated in its master plan to cover the whole city region. Its polycentric development strategies primarily aimed to promote central city's competitiveness, not balanced development of the whole city region.

3.4. At metropolitan level

Moving down in scale and focusing at the metropolitan scale, polycentric development practice within master planning can be examined from two aspects: firstly the overall spatial development strategies of respective metropolitan area and secondly the spatial layouts of cities/towns. The latter are the main components within the spatial structures. Table 7 shows where polycentric development practices at

metropolitan level have occurred. The evidence is drawn from both rounds of master plans. It was really only applied at the earliest round of master planning in Guangzhou, and was not explicitly considered during the second phase of master planning. In Chongqing and Nanjing, polycentricity as a concept has been applied in both rounds of master planning, but was really only applied to the spatial structure. In both Wuhan and Hangzhou during the most recent round of master planning, polycentricity has been used to create a network of balanced growth and emphasizing the connectivity between centres, sometimes emphasizing the role of growth corridors along transport routes (e.g. Nanjing) but equally placing a strong emphasis on managing and maintaining the natural environment as the context for growth (Guangzhou, Nanjing and Hangzhou).

3.5. At central city level

Focusing in still further; at the core urban agglomeration within the metropolitan or city regional scale, several core cities, Shanghai, Guangzhou, Wuhan, Nanjing and Hangzhou, have also applied polycentricity in their master planning to highlight the importance of the internal structure of the city (see Table 8). Paralleling the practices at the metropolitan level, two particular aspects can be highlighted. One is strategic recognition of the spatial layouts of these central cities, often highlighting the importance of sub-centres. This is then translated into something more specific and concrete in the urban development framework, where the core areas and sub-centres are often explicitly identified, as well as the actual and envisioned relationships and connections between urban core and sub-centres.

4. Major planning adjustments in polycentric development practice in Guangzhou and Nanjing

Of the eight selected super/mega cities, Chongqing, Guangzhou, Wuhan and Nanjing have all applied polycentricity to both rounds of their latest master plans, although only Guangzhou and Nanjing have explicitly applied polycentricity narratives and strategic thinking at the city regional

Table 7. The application of polycentricity at metropolitan level.

Super/mega city regions		Metropolitan level	
		Spatial structure	Spatial layout of cities/towns
Chongqing	1996–2020	Polycentric and clustering spatial structure	Be divided into main urban area (3 districts and 12 clusters) and periphery clusters
	2007–2020	Polycentric and clustering spatial structure	Two parts: main urban area (middle, northern, southern, western and eastern districts) and suburban area
Guangzhou	2001–2010	Polycentric, clustering and networking spatial structure based on the natural patterns of mountains, rivers/lakes, cities, fields and sea, and mainly develop along the Pearl River	–
Wuhan	2010–2020	Multi-axes, multi-centred open spatial structure with main city as urban core	Axial extension and clustered organization
Nanjing	2001–2010	A polycentric and open spatial structure with the Yangtze River as the main axis and the main city as the urban core	Central city, new urban districts, new towns
	2011–2020	With the main city as urban core, radial transport corridors as development axes, ecological space as the green wedge, a polycentric open spatial structure with axial clusters developing along the river	One belt-five axes
Hangzhou	2001–2020	One major core-three sub-centres, two centres two axes, six clusters and six ecological belts	–

Sources: Chongqing City Master Plan (1996–2020), Chongqing City Master Plan (2007–2020), Guangzhou City Master Plan (2001–2010), Wuhan City Master Plan (2010–2020), Nanjing City Master Plan (2001–2010), Nanjing City Master Plan (2011–2020) and Hangzhou City Master Plan (2001–2020).

Table 8. Application of polycentricity at central city level.

Super/mega city regions		Central city level	
		Spatial structure	Urban development framework
Shanghai		Multi-centred and open	CBD and main public activity centres (one city-level centre and four city-level sub-centres)
Guangzhou	2001–2010	Multi-clustered and semi-networking	Three developing areas with several clusters in each of them: urban central area, east-wing urban developing area, north-wing urban developing area
	2011–2020	Polycentric and networking spatial structure with new central axis as the urban core	Zhujiang New Town – Yuan village area, Pazhou area, Bai'ertan area, Baiyun New Town, southern area of the central axis, etc.
Wuhan	1996–2020	Polycentric and clustering spatial structure following balanced development strategy	Two core areas (Wuchang and Hankou), 10 central districts and 10 comprehensive clusters
Nanjing	2011–2020	One major core-three sub-centres	Major city and three sub-cities (Dongshan, Xianlin and Jiangbei)
Hangzhou		One major core-three sub-centres	Major city and three sub-cities (Jiangnan city, Linping city and Xiasha city)

Sources: Shanghai City Master Plan (1999–2020), Guangzhou City Master Plan (2001–2010), Guangzhou City Master Plan (2011–2020), Wuhan City Master Plan (1996–2020), Nanjing City Master Plan (2011–2020) and Hangzhou City Master Plan (2001–2020).

level. Hence, because of this polycentric development, practices at the city regional scale in Guangzhou and Nanjing are selected as particular cases to discuss these ideas further. By comparing the spatial structures, settlement systems and polycentric models of Guangzhou and Nanjing city regions over time, changes in the way polycentricity has been conceptualized can be examined (see Figure 3).

4.1. Guangzhou

Guangzhou applied polycentric development strategies in both of its city master plans in 2001 and 2011. In a document called an *Outline of Guangzhou City Overall Strategic and Concept Plan* published in 2000, a break with Guangzhou's previous monocentric spatial structure was made. This clearly stated the spatial development strategies of 'southward expansion, northward optimization, eastward extension, westward combination' (Guangzhou Municipal Government 2000). At the same time, there was some administrative reorganization with Panyu and Huadu cities losing some of their independent status by becoming districts. Subsequently, the 2001 city master plan reiterated this eight-word spatial development strategy advocating a polycentric, clustered and networked spatial structure. It should be acknowledged that at this stage the polycentric spatial structure largely referred to the metropolitan area of Guangzhou (rather than the city region of Guangzhou) which included within the central cluster Panyu and Huadu, but excluded two county-level cities, Zengcheng and Conghua. Meanwhile, a multi-levelled, constellation-styled spatial structure was planned at the city regional level. This envisioned establishing 13 central towns as major growth centres primarily aimed at promoting urban–rural integration and more balanced development across the whole of the Guangzhou city region. However, functional interdependent centres were not highlighted and promoted as polycentric models in 2001 master plan.

Later, in 2007, a 'central adjustment' strategy was proposed at Guangzhou's 10th Party Congress. This added to the original eight-word development strategy by promoting ongoing transformative development, away from market segmentation to regional integration across the whole of the Pearl River Delta region. In 2010, Guangzhou's new spatial vision, 'one metropolitan area, two new towns, three peripheral urban areas', was proposed as part of Guangzhou's Strategic Planning and Master Planning Framework. This 10-word strategy based on the so-called Integration Principles was adopted as part of the city master plan in 2011. Hence, from 2011 onwards, the Guangzhou Master Plan has adopted a polycentric, clustered and networked spatial structure covering the whole region, focused around six sub-centres and nine satellite towns which collectively can help to form a polycentric city region.

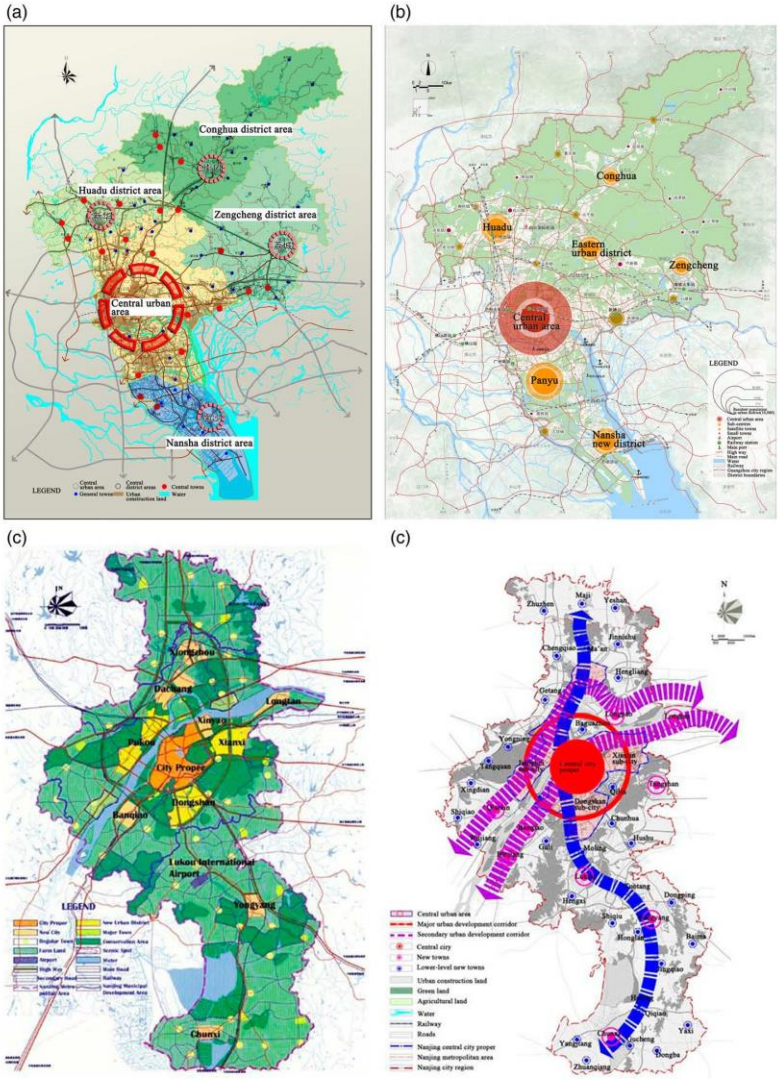

Figure 3. Spatial structures/urban (town) systems of Guangzhou and Nanjing city regions in Master Planning. (a) 2001 Guangzhou City Master Plan. (b) 2011 Guangzhou City Master Plan. (c) 2001 Nanjing City Master Plan. (d) 2011 Nanjing City Master Plan. Sources: Guangzhou Municipal Planning Bureau, Zhu (2013) and Nanjing Municipal Planning Bureau (Revised by authors).

It is also worth noting that sitting alongside the idea outward sub-regional expansion and more balanced development within the whole city region, with planned improvements to each of the key sub-centres and satellite towns, was an explicit recognition of the need for investment and renewal of Guangzhou's central city. Hence despite the rhetoric of balanced integrated development, the leading role of the central city is still pre-eminent. Table 9 illustrates both the continuities and differences in applying the concept of polycentricity in both rounds of Guangzhou City Master Plans.

4.2. Nanjing

In Nanjing's case, there have been two significant adjustments to the administrative territory covered by the Nanjing municipal government. In 2000, the municipal government consisted of 10 districts and 5 counties. In 2007, the area for master planning comprised 11 districts and 2 counties, and finally in 2014, further reorganization saw a simplification of the administrative structure and 11 districts were created. These changes and extension to Nanjing's municipal area provided new opportunities for urban spatial expansion and the promotion of more sustainable urban development. The 2011 Nanjing City Master Plan created a three-tiered settlement system with nine new towns. This replaced the former five-level settlement hierarchy and accompanying seven new towns. This clearer and simpler settlement system is hoped to better promote planning implementation and policy delivery. Banqiao, Longtan, Yongyang and Chunxi continue to be four identified new towns in both the 2001 and 2011 master plans, while Dachang, Xinyao and Xiongzhou have been replaced by Tangshan, Lukou, Binjiang and Qiaolin in the more recent plan. The reasons for the continuities with Banqiao, Longtan, Yongyang and Chunxi continuing to be chosen as new towns was because they had already become functionally interdependent centres with horizontal connections, and/or have the internal potential and external environment for this to realistically realized in the future. These four towns lie on the primary north–south corridor (Yongyang and Chuxi) or the east–west corridor (Longton and Banqiao). In both cases, these four new towns can be considered a certain degree of success in contributing to polycentric spatial structures. Most of the other five new towns envisaged as contributing further to a polycentric structure are located along these axes.

When further exploring the main characteristics of the chosen new towns, two similarities become apparent in Nanjing. One is their origin. They are largely based on the original district (county) government-based towns. The other is their functions. Future developments rely on expanding functions from the central city, new industries and the major construction urban infrastructure, hence the focus on corridor development. Furthermore, in some cases, these new towns do not just look to bolster the city regional economy but also aim to promote regional development across administrative boundaries. For example, in the 2011 Nanjing city master plan, Yongyang is planned to be a comprehensive new town not just within the Nanjing city region but also within Ningbo-Hangzhou urban agglomeration. Furthermore, Chunxi is also expected to be a comprehensive new town providing services to the border regions of Jiangsu and Anhui Provinces. Table 10 illustrates both the continuities and differences in the way the concept of polycentricity has been applied in both rounds of Nanjing City Master Plans.

5. Discussion and conclusion

This paper provides a broad overview of the application of polycentric development strategies in China's master planning processes. First, a conceptual framework for urban and rural planning

Table 9. The application of polycentricity in both rounds of Guangzhou City Master Plans.

	The earlier round of master planning (2001–2010)	Latest round of master planning (2011–2020)
Spatial development strategy	Southward expansion, northward optimization, eastward extension, westward combination	Southward expansion, northward optimization, eastward extension, westward combination, central adjustment
Spatial structure	A multi-levelled, constellation-styled spatial structure, with the central urban area as core centre and balanced distributed urban areas/towns at each level	Polycentric, clustered and networking structure
Settlement system	Central urban area, central district areas, central towns, general towns	Central urban area, sub-centres, satellite towns, small towns
Polycentric model	Multi-levelled urban areas/towns	Six sub-centres: Panyu, Nansha new district, Eastern urban district, Huadu, Zengcheng and Conghua

Sources: Guangzhou City Master Plan (2001–2010) and Guangzhou City Master Plan (2011–2020).

Table 10. The application of polycentricity in both rounds of Nanjing City Master Plans.

	Former round of City Master Plan (2001–2010)	Latest round of City Master Plan (2011–2020)
Settlement system	Central city, new urban district, new towns, central towns, general towns	Central city, new towns, lower tier new towns (*xinshizhen*)
Polycentric model	7 new towns: Dachang, Xinyao, Banqiao, Longtan, Xiongzhou, Yongyang and Chunxi	9 new towns: Longtan, Tangshan, Lukou, Banqiao, Binjiang, Qiaolin, Longpao, Yongyang and Chunxi

Sources: Nanjing City Master Plan (2001–2010) and Nanjing City Master Plan (2011–2020).

system in China was set up, and the background and origin for polycentricity practice were elaborated. Secondly, 8 super/mega city regions which have applied polycentric development strategies at various spatial scales were selected from the 16 super/mega city regions in China and examined to explore the way that polycentric concepts have been applied at three spatial scales, city regional, metropolitan and central city level. Finally, Guangzhou and Nanjing, two city regions that applied polycentric thinking in latest two rounds master planning, were examined. At each stage, major changes in the polycentric application processes and models were emphasized.

Although the concept of polycentricity has only officially been adopted in master planning since 1999, when it first appeared in the Shanghai City Master Plan, it has gained widespread popularity becoming both a normative approach and strategic guidance to determine future spatial structures. Polycentric development strategies have been articulated in a number of super/mega city regions' master plans at a variety of different spatial scales right across China. The advocacy argument for applying polycentric thinking is to begin to resolve the ever-increasing problems associated with unprecedented urban expansion and urbanization processes. However, in practice, any critical analysis as to whether applying polycentricity as an 'ideal' model is still rare in China. The same is true with regards to empirical findings which seek to describe and interpret new Chinese urban realities through the lens of polycentric development (Li and Zhao 2011). This lack of critical analysis and more of an application of a simply descriptive interpretation of polycentricity can be regarded as one of the major differences in the conceptual evolution and adoption between China and Europe. It is an idea that seems to have been applied or invoked without critical reflection.

Other differences can be illustrated from evaluations of polycentricity application in planning documents, and have been highlighted through our interpretations of the nature of polycentricity within a Chinese context. Inevitably, as an 'imported' concept, the polycentric development practice in China has its own characteristics which, sometimes goes against the basic nature of polycentricity. In some cases (e.g. Shanghai, Guangzhou and Hangzhou), a multi-levelled structuring of urban areas/towns are all regarded as polycentric models. There is lack of nuanced understanding with regards to the basic nature of polycentric models: functional interdependence and horizontal connectivity. On the other hand, major changes in the settlement system at city regional scale, largely a function of unprecedented urbanization trends, are in line with the spirit of polycentricity. Although settlement systems are still set up based on a separated classical urban (town) system hierarchical planning framework, within the emerging polycentric development structure narratives, they are now designated to deliver a more networked system including urban centres and rural towns.

Compared to Western countries, extensive developments and constructions in suburbs or outer suburbs have not resulted in any decline in central areas of Chinese super/mega cities. Indeed, central areas still maintain their original vitality and primacy at the city, metropolitan and city regional scales. This is because polycentric development strategies in China still place a great emphasis on development of core central cities. At all three spatial scales (city region, metropolitan area and central city), polycentricity indeed aims to promote more sustainable and balanced development; however, this balance is still more rhetoric when compared with the Western concept.

Based on the above findings, some issues and challenges can be identified regarding the application of polycentricity in Chinese master planning. Firstly, there is a need to rethink the rationale and the timing of the introduction of the application of polycentricity in master planning in China.

Instead of using the concept of polycentricity as a universal applicable approach, the different development stages and potentials of particular cities, metropolitan areas and city regions need to be considered more carefully to see whether the urban systems really need to accommodate this concept. Instead of being a kind of simplified policy narrative, polycentricity should be interpreted more in terms of the need for and potentials of developing still further horizontal and vertical linkages within and between urban centres. Secondly, with regard to the delivery and promotion of polycentric development strategies, it undoubtedly requires both implementation efforts from central and local levels of governance. There is thus a need to clarify the roles and importance of central and local stakeholders to avoid the presumption that key tasks will inadvertently be left to either scale. This might include developing planning and policy guidance, under a polycentric development framework, in order to promote cooperation between different actors (at different levels) who are responsible for, or involved in, the integration of policy-making and implementation and delivery.

Note

1. Multi-centres include the core area of Zhongguan Village High-tech Park, Olympic central area, the Central Business District (CBD), Technology Innovation Centre behind Haidian Mountains, Shunyi modern manufacturing base, Tongzhou comprehensive service centre, Yizhuang high-tech industries development centre, Shijingshan comprehensive service centre, etc.

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