

# Shanghai City Strategy 2050: Road Map to Knowledge City

CHEN, Yawei<sup>1</sup>

<sup>1</sup> Faculty of Architecture and the Built Environment, Delft University of Technology, NL

**Abstract:** Chinese cities have been engines of economic growth. They have for a long time enjoyed the advantage of low wage, low value-added production to become world factory and have thus lift millions from poverty. As they expand in size and number, they are under increasing strain. How to maintain vital economic growth, while creating sustainable livable cities for all remains the leading urban challenge facing. The European Union's Lisbon Strategies and EU 2020 suggest the development of a knowledge economy helps keeping up the future economic competitiveness of European cities. The 2030 strategic plan for global cities such as New York, London, Tokyo, Singapore and Sydney are some examples that further stress for the development of knowledge-based economy in their city agenda. Knowing that Knowledge and innovation plays a critical role in enhancing productivity, policy makers and academics in China agree that sustaining the cities' growth and dynamism will require knowledge-based development. Shanghai strives to develop its potential competitive advantages – knowledge-based economy and the production of high-value-added goods and services. Economic restructuring and urban transformation has thus been the main focus during the preparation to Shanghai's master plan for 2030 and 2050. Since 2013 various municipal organisations and local research institutes have helped Shanghai Municipal Government (SMG) examined strategic plans of global cities around the world and recommended possible strategies to develop Shanghai's master plan for 2030. However, what strategies should be explored in help creating urban platforms for knowledge and innovation? In what way can the agents of these cities facilitate the development of knowledge city? What experience can Chinese cities borrow the experience of European cities in developing knowledge city? This paper examines Shanghai's various challenges on its development path towards a knowledge city in 2050. The theory of knowledge city by van Winden et al (2007) is used as a reference to understand the conditions in developing a knowledge city, how far Shanghai has developed these conditions and what specific challenges Shanghai faces to become a knowledge city. The development of high-tech cluster and creative clusters will be used as cases to examine Shanghai's formation of its knowledge economy. This paper suggests that Shanghai's busy developing its hardware environment and software to accommodate, transfer and produce knowledge. To further develop itself as a knowledge city, its strategy 2050 should pay more attention to the social and cultural dimension of the city and an enabling environment that facilitates and accommodates creativity and innovation. In term of governance structure, beside a strong leadership with strong organizing capacity, a broad partnership of public, private, academia and community should be explored to facilitate and support the development of knowledge city.

**Keywords:** City strategy, 2050, knowledge city, Shanghai

## 1. Introduction

In today's global, information-driven society, economic success is increasingly based upon the effective utilisation of intangible assets such as knowledge, skills and innovative potential as the key resources for competitive advantage. The pillars of the rising knowledge economy are defined by Dahlman and Andersson (2000, p 32) as: an economic and institutional regime that provides incentives for the efficient use of existing knowledge, the creation of knowledge and entrepreneurship; an educated and skilled population that can create and use knowledge; a dynamic information infrastructure that can facilitate the effective communication, dissemination and processing of information; a system of research centers, universities, think-tanks, consultants, firms and other organisations that can tap into the growing stock of global knowledge, assimilate and adapt it to local needs and create new local knowledge.

While the national economy and national policies tend to be the focus in debates about the transition process towards a knowledge economy, various research have reveals the regional character associated with them and the differences in performance between urban regions within countries (van Winden et al. 2012). The Lisbon Strategy, also known as the Lisbon Agenda, was an action and development plan for the European Union to make Europe, by 2010, the most competitive and most dynamic knowledge-based economy in the world. The agenda suggest cities should prepare the transition to a knowledge-based economy, invest more in people and sustain the healthy economic outlook, with proper policy stimulus. Furthermore, local actors –being public and

private sector- and their ability to benefit from the transition process differs. Likely, local institution and local-tailored policies play a role in the performance difference.

Different from a long tradition of knowledge-based economic development Western cities enjoy, Chinese cities only started to catch up at the end of 1970s. The implementation of the open door policy was a deliberate state-driven policy that gave Chinese the opportunities to attract Foreign Direct Investment (FDI) and high technologies through various Special Economic Zones (SEZs) and techno parks. China experienced rapid economic growth since the 1970s with its impressive 9% growth over the last three decades. It has become the second biggest economy since the beginning of 2009. Such impressive gains have been largely driven by “a set of market-oriented institutional reforms, strong investment, and effective adoption and application of various knowledge and technologies, especially foreign ones through trade and foreign direct investment (FDI)” (Zeng and Wang 2007). Therefore, knowledge clusters like the SEZs and techno parks are essential to realize Chinese cities’ knowledge city ambition. The economic growth is concentrated in three major economic regions in China-Bohai Rim, Yangtze River Delta and Pearl River Delta. In each of the economic region, the economic activities are led by the metropolitan cities like Beijing, Shanghai and Shenzhen, which not only act as the economic powerhouse of the region, but also the knowledge center for research and Development, innovation.

While the rise of China and its awesome size of economy is no longer in doubt in the west, China’s technology leadership is still in debate. Chinese cities are increasingly paying attention to China’s development path toward knowledge economy and its regional innovative system and the policy issues towards knowledge economy of China and Chinese cities (e.g. Zeng and Wang, 2007; Sigurson 2007, Huang and Soete 2007). While some applaud the unique strong hand of the Chinese government in developing regional and local innovation system in such a short period of time, questions remained unanswered towards the effectiveness of the state effort on different localities. Giving the scale and complexity of China’s geographic context, “regional entities (including large cities) have developed different strategies to argument innovation capacity and to take advantage of local resource endowment” (Segal 2003, Wu 2009). However, what strategies should be explored in help creating urban platforms for knowledge and innovation? In what way can the agents of these cities facilitate the development of knowledge city? Among Chinese cities, Shanghai started in the 1990s to emphasize the importance of innovation in its urban vision. In its Shanghai Master Plan 1990-2020, the goal of becoming one of the international economic, financial and trade Centre was the first step to restructure its economy. Shanghai is busy developing its urban vision for 2030 and 2050, in which Shanghai gears to develop its knowledge-based economy in post-industrial era. It is important to overview the current status Shanghai reached before deciding what transformation strategy Shanghai should explore to become a knowledge city?

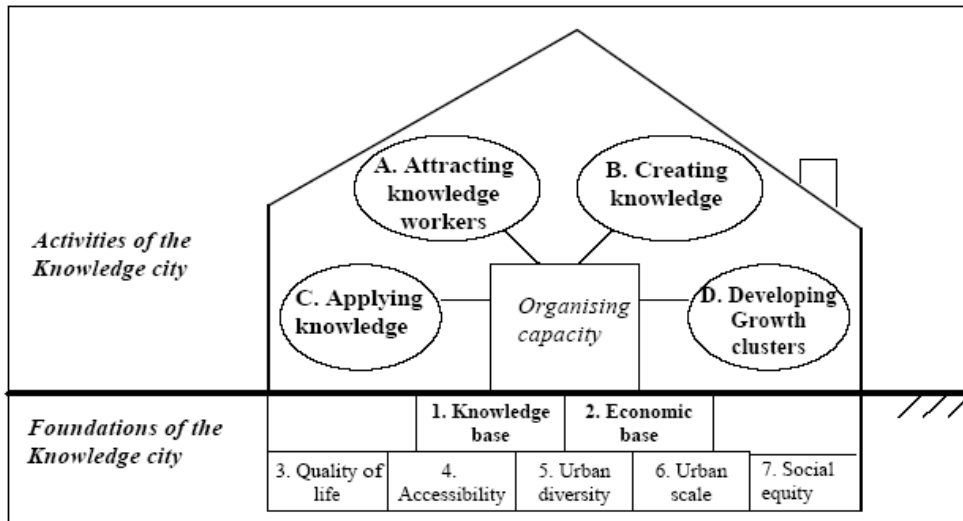
This research is based on an on-going research on the knowledge clusters in Shanghai. While most municipal organisations and local research institutes are busy helping Shanghai Municipal Government (SMG) examine strategic plans of global cities around the world and recommended possible strategies to develop Shanghai’s master plan for 2030, it is important to check what has been done and what current status of Shanghai’s condition of developing knowledge cities is before going on for the next strategies. This paper shows primarily findings based on the case study of knowledge clusters in Shanghai during the author’s fieldtrip conducted in 2012 and 2014. Following the introduction, section 2 explained the theoretical framework of the study, including the foundation of knowledge city. Section 3 uses the theoretical framework to examine what are the conditions in developing a knowledge city, how far Shanghai has developed these conditions and what specific challenges Shanghai faces as a fast growing international metropolis to become a knowledge city. Section 4 examines the development of knowledge clusters in Shanghai, which are essential for accommodating knowledge activities and help improve the conditions for knowledge city for Shanghai. Section 5 summaries the strength and weakness Shanghai face on its path towards becoming a knowledge city and the challenges Shanghai should address in the formation of knowledge clusters.

## **2. Perspectives on the innovation, knowledge economy and knowledge cities**

The importance of knowledge economy to city's success has been extensively examined in recent years by researchers and policy makers. Van Winden and van den berg (2004, p 3) see cities as the focal points of the knowledge economy where "knowledge is produced, processed, exchanged and marketed". Cities not only accommodate knowledge infrastructure (universities, other educational institutes, etc.) and well-educated people, but also are endowed with the network that may facilitate the in- and out-flow of knowledge and information. Cities can be the power house of creativity and innovation and the creation of new knowledge mainly take place in cities. Florida studies the relation between location and talents. He found out that cities that are more diverse, tolerant and open to new ideas tend to attract better diverse types of creative people: "Greater and more diverse concentration of creative capital in turn lead to high rates of innovation, high-technology business formation, job generation and economic growth,." (2002, p 249)

In the knowledge economy, metropolitan cities and regions play a significant role. While cities strive to develop towards the knowledge economy, "the best cards seems to be in the hands of internationally connected metropolitan area that have a diversified economy, strong knowledge base and a high quality of life" (Van Winden *et al* 2007: 544), which tend to concentrate a number of foundations' relevant for the knowledge economy. Mattiessen *et al* (2002 and 2006) found "a highly concentrated pattern of research with a small number of important units" that is in somehow correlated with the concept of the world cities network. When the analysis is linked to the concept of world cities and to the concept of cities as places of flows, Mattiessen *et al* (2006) identified seven highest level of knowledge cities comprised of London, New York, Los Angeles, the San Francisco Bay Area, Boston, Baltimore and Philadelphia, which he called as the global city of the knowledge society. Furthermore, there are also cities that have performed well in term of research output and knowledge production but have not fully developed the network that can execute the communication of conclude that the top-ranking centers by research output, like Tokyo-Yokohama, and those that perform well but behind the global cities of the knowledge society, like Osaka-Kobe, Paris, Amsterdam-Hague-Rotterdam-Utrecht, Beijing and Moscow.

Among the top urban regions in Asia, the emerging of Chinese cities - Beijing, and to a less extent, Shanghai, are new knowledge nodes. Different from well-developed cities that are advanced in term of network building and in term of research output, the emerging cities need to not only strengthen knowledge creation but also establishing network to connect with other knowledge society. To understand the current status of Shanghai towards being a knowledge city, it is important to lay a series of standard measuring indicators to understand the current status of the Shanghai in its own development the knowledge economy, recognize the drivers of their knowledge economy and the path they have taken to develop their knowledge economy. We adopt the research framework of analysis from Van Winden and van den Berg (figure 1). In their framework, knowledge economy in urban regions are judged by both its knowledge foundation and its activities: To judge knowledge foundation, they further list 7 indicators: 1) knowledge base; 2) economic base; 3) quality of life; 4) Accessibility; 5) Urban diversity; 6) urban scale; 7) social equity. Among the 7 indicators, the extent of knowledge base and the economic base will be decisive to buildup and maintain a knowledge economy successfully, while the other 5 indicators can be characterized as supportive: they add extra strength to the fundamentals. For the activities of a knowledge city, Van Winden and van den Berg define four types of knowledge activities: 1) promote the creation of new knowledge; 2) promote the application of knowledge; 3) attract knowledge workers; and 4) develop new growth cluster. Van Winden and van den Berg (2004) explain that the knowledge activities are linked to the two key economic foundations: the knowledge base and the economic base of a city. Knowledge cities should have the capacity to attract, create, apply knowledge and develop growth clusters that accommodate knowledge creation, dissemination and attracting knowledge workers. Sufficient organizational capacity, therefore, should be needed to allow "those responsible for solving a problem to convene all concerned partners (public and private, internal and external), in order to jointly generate new ideas and formulate and implement a policy that responds to fundamental developments and creates conditions for sustainable economic growth" (Van Winden and van den Berg 2004: 17)



Source: Van Winden and van den Berg 2004

Figure 1: Assessing cities in the knowledge economy: a frame of analysis

The framework of van Winden and van den Berg was developed based on their findings from studying a series of knowledge cities in European cities but less special attention was paid to the emerging knowledge clusters from the emerging economies. While the conditions for developing knowledge cities and knowledge activities can be applied to a different localities, it is perhaps more essential to be aware of the actors that may execute different influence in knowledge activities in a local context. Following the similar strategies of East Asia and Latin American countries, China's open door policy and economic reform has particularly focused on attracting Foreign Direct Investment (FDI) and promoting knowledge transfer in established special economic zones (SEZs). As most high-technology regions in developing countries, "participating in the international division of labor means to prize export activities, starting from the bottom of the technological hierarchy, with the hope of gradually moving up (Zhou 2008, p 15). However, different from that of other emerging economies, China face geopolitical limits as a strategic rival to the United States. Besides questioning China's path to technological innovation, Zhou (2008) also questioned to the extent of technological benefit local economies in developing countries may actually get through knowledge transfer and therefore help develop their knowledge clusters, as multinational corporations(MNCs) may only transfer "know-how" (production engineering) but not "know-why" (Basic design, research, and development. Her study on the development of China's biggest knowledge cluster-Zhongguancun (ZGC) suggests that China's technological leadership is likely to emerge from the indigenous local companies that are well positioned to learn from MNCs and have an intimate connect with the vast Chinese market. Besides, the indigenous local companies cannot become a leading force for innovation without working with MNCs, giving the status of technological globalization and the lagging state of China. In this perspective, network building within China and network building to other key knowledge cities are both important to develop knowledge economy in Chinese cities. It in the end dependents on the system of the state, MNCs, research institutions, indigenous local firms that collaborate and the enabling environment facilitate the development of knowledge and innovation in knowledge clusters within Chinese cities.

Interestingly, a recent report on China's innovation survey (Veldhoen *et al* 2013), carried out jointly by Benelux Chamber of Commerce in China, 21st Century Business Review, China Europe International Business School, and Booz & Company, actually corresponds somehow to the different roles Chinese companies and MNCs play in the development of Chinese technological leadership. The survey shows that China is "well on its way to becoming a true global innovation hub for MNCs from developed markets: Some two thirds of the respondents reported that they are conducting R&D in China for foreign markets—and even more plan to do so in the future"(Veldhoen *et al* 2013). Contrary to a piece of conventional wisdom that innovation in China tends to focus on copying and making incremental improvements to existing products, the survey suggests that these

Chinese companies pursue Need Seeker strategies just like their counterparts in Silicon Valley: focusing their R&D efforts on consumer needs, developing products that meet those needs, and then quickly getting the products to market. In 2011, companies headquartered in China increased their R&D spending by 26.5 percent—more than double the global average, five times as much as European firms, and 11 times as much as Japanese firms. Companies in China have made great strides in building their innovation competitiveness, according to the 2013 China Innovation Survey. Chinese companies are more aggressively using their unique innovation strategies to pursue opportunities in global markets, particularly Western markets. MNCs in China, on the other hand, continue to drive innovation in the country predominantly through their “technology advantage,” stemming from fundamental research and superior technology. Local Chinese companies, in contrast, pursue Need Seeker strategies so they can identify customer needs more quickly and leverage the resulting insights to innovate along the entire value chain, including channel and service innovation. The fragmentation of customer needs across the vast country will also make it more and more important to understand these needs in order to tap into demand in lower-tier cities. As to the barriers faced by Chinese companies, the survey suggests:

“... access to talent, retention of talent, and rapid cost increases are all key concerns for innovation in the future. The areas of concern that have increased the most over the last year include difficulties in understanding market needs (particularly in the industrials sector), inadequate infrastructure and innovation ecosystems, and inadequate intellectual property protection (particularly in the health and life sciences industry). These worries are likely to increase pressure for stronger laws regarding intellectual property protection, and may well lead to more innovative ways to conduct R&D in cooperation with universities, institutes, and other entities.”

The obstacles that Chinese companies faces in innovation, as are described in the survey, seem to become increasingly similar as the MNCs from the developed economies. It shows on the path to become innovation leadership, Chinese companies not only need hard infrastructure and governmental policies to help nurture the creation of knowledge, but increasingly essential are soft infrastructure, like legal system to protect intellectual property right and eliminate local barriers to allow local competitions.

### **3. Shanghai towards a knowledge city**

Shanghai is located at the mouth of the Yangtze River, facing the East Sea and is the large city in China. The city is about 100 kilometers long wide from east to west and 120 kilometers long from north to south. It covers an area of 6340.5 square kilometer, of which 6218.65 sqkm is land area and 121.85 sqkm is water area. Shanghai is one of the four cities that are directly governed by the state council. Its economic development is of significance to the economic development of China. Although it only covers 0.06% of the China' land area, 1% of the population lives there, Shanghai contributes to 5.5% of the national GDP and 12.6% of national fiscal revenue and attracts 10.8% of total FDI flowed to China (Chen 2007). In its pre-1949 glory days, Shanghai was the most highly developed urban amenities in Asia outside of Tokyo. It was China's premier trading city and China's foremost industrial centre, along with well-developed financial sector and other producer services (Wu 1999, p 207). Between 1949 and 1978, Shanghai was preoccupied by heavy industrialization and firm state control, resulting that 70% of its economy were contributed by industry sector. Until the end 1980s, Shanghai still produced about one-sixth of the nation's industrial products and generated one-sixth of China's total government revenue, although Shanghai. During the last three decades, Shanghai have busy with economic restructuring to emphasize more on its tertiary sector. The turning point was to use the establishment of Pudong New Area as Shanghai's Special Economic Zone in 1990 to help Shanghai attract FDI and realize its goal of becoming one of the international economic, financial and trade centre and the economic engine of the whole Yangtze Delta Region by 2020 (Shanghai Master Plan 1999-2020). According to Shanghai's economic social development strategy 1996-2010, the realization of the four centers may allow Shanghai to hook into the global producing network as important node that link China and the outside world. On its path towards a global city, FDI not only accelerate Shanghai's transformation process to realize the economic restructuring to emphasize more on the service sector but also brought in advanced technology and managerial expertise to upgrade outdated local manufacturing sector. In its twelfth five-year plan (2011-2015), Shanghai further highlights the central driver for

its development will be innovation and transformation, giving the fact that the existing development model faces resource scarce as well as spatial and land constrain.

Although they indicate the seven factors to build up the foundation of the knowledge city, Van Winden and van den Berg (2004) only gave a proximate description how we should look at each factor. Hereby we briefly developed this framework with more concrete interpretation in figures (Shanghai Municipal Statistics 2012), as is seen below.

### 3.1 Economic Base

The economic base “determines for a large part the economic possibilities and restrictions, but also the difficulties for an urban region, within the knowledge economy’ (Van Winden and van den berg 2004, 14). Urban regions with an economy dominate by service activities, or with a diversified economy are less vulnerable to economic changes and have better chances to provide “incubation places for new developments and economic innovation” (Van Winden and van den berg 2004, 14). Shanghai enjoys rapid economic growth, by keeping a double-digit growth rate for more than two decades. Shanghai’s economic restructuring also leads to the gradual growth of the service sector, which contribution to the whole GDP grew from less than 30 % to about 50%. The development of the SEZ-Pudong New Area, as a strategically state intervention, played a key role in facilitating the transformation (Chen 2013, 78-88). The four main development zones in Pudong, designated to target different economic activities - finance and trade, export processing, tax-free activities and high-tech activities - relied heavily on foreign capital and foreign investment, foreign markets and foreign technology transfer. These four different economic activities were considered in the light of Shanghai’s geographic, economic and social advantages. The designation process led Pudong to formulate an outward-oriented economic structure aimed at giving Shanghai a place on the world stage (Chen 2007, 244) Shanghai’s rapid economic growth, preferential policy towards FDI, as well as its vast market, cheap but well-trained labor and high labor productivity, attract Foreign investor and FDI to invest in Shanghai. In recent years, Shanghai has gone through a process of economic restructuring, in which manufacturing sectors are moving to low-cost locations as service sector expands. With China’s reentry to WTO, Shanghai has become the national gateway to open its finance, insurance and real estate market and a global agglomeration site to provide professional service (Ye 2004, p. 17) As a result, the GDP of secondary industry dropped from 65% to 38% in more than 20 years, whereas the GDP in tertiary sector is doubled. Shanghai has made information, financial service, interflow of commodities and trades, auto manufacture, equipment sets, and real estate as its new six key industries. Compared with Shanghai’s old six key industries of auto manufacture, communication equipment, power station facilities, petrochemical industry, steel, and modern domestic appliances, the new ones are closely related with the hi-tech industry and service trades.

Indicator: economic base	Shanghai
GDP (Billion Yuan) (1990/2012)	78.17/2018.17
GDP per capita (US\$)	1236/13524
GDP composition	0.63/38.92/60.45
Contractual Foreign Direct Investment (million US\$) / Actual Foreign Direct Investment (million US\$)	22338/ 15185
Labour composition: Primary industry/secondary industry/ Tertiary industry	0.40/38.09/60.70
unemployment rate (%)	4.2
Labour productivity (thousands of euro/job, in full-time equivalent)	15

Source: Shanghai Municipal Statistics Bureau 2013, complied by the author

### 3.2 Knowledge base

The second foundation for a knowledge city is its knowledge base. Van Winden and van den berg (2004) includes tacit knowledge, codified knowledge and knowledge infrastructure. On the one hand, “the quality,

quality and diversity of the universities, other education institutes and R&D activities determined for a large extent the starting position of a city in the knowledge economy”; On the other hand, the presence of creative people formulate a kind of creative knowledge base for a city. Therefore we should look the current status of universities, R&D institutes, and on the other hand, we look at the development of the creative industries and the involved knowledge workers. Shanghai’s economic development is based on two pillars of knowledge creation and knowledge application (Sigurson 2005, 3). Knowledge creation is supported by a rapid expansion of higher education institutes, R&D research center. Shanghai has altogether 59 institutions, among which 23 of the institution are available for international students, 16 are private-run college and universities. There are 27 independently organized junior colleges for adult education. As one of China’s higher education centres, Shanghai has a good general educational system that foster one of the nation’s most educated workforces (Markusen and Yu 2009). The total number of students in institutions of higher education is close to 600,000, about 3.5% of the total population. In 2003, more than half of all students leaving senior high schools continue their studies in colleges or universities, allowing Shanghai to enjoy a higher percentage of higher-educated work force (Sigurdson 2005, 4). In 1998, the central government carried out the 985 project to cover 30 universities and aim to create fundamentally very strong universities. Three universities in Shanghai are included in this program – Fudan University, Tongji University and Shanghai Jiaotong University. Nevertheless, the universities in Shanghai still fall far behind in the world top 500. Nevertheless certain workforces cannot generate from the general educational system, but rather a specialized workforce training system matching the skill development demanded by employers. In term of science and technology activities, Shanghai has 1050 science and technology research institutions and almost 400,000 persons engaged in science and technological activities (Shanghai Municipal Statistics Bureau 2012). In a recent national-wide R&D investigation, Shanghai shows strong improvement in term of investment, personnel and institutions involved in R&D, as well as R&D product. The investment in R&D increased 20.9% annually, from which 27% from government accounts and 68% from enterprises (Shanghai Statistics Bureau 2010). Although Shanghai has seen a tendency of growth in R&D investment, output of high-tech/ industrial output and high-tech product export /total export, the challenges remains. A research on the innovation competitiveness of Chinese cities in 2012 suggests that Shanghai’s efforts pay off in enhanced R&D facilities, which now ranks as second on the competitiveness in Science and innovation among Chinese cities, just behind Beijing. It remains weak in innovation capability and has low level of innovation patent in comparison with Beijing. Furthermore, in comparison with other cities strong in science and innovation, Shanghai’s local enterprises, especially local private enterprises, remains less competitive. In term of innovation output (patent), 64% of the patents come from local enterprises, in comparison with 90% in cities like Shenzhen and Beijing. Besides, the top ten key players active in Shanghai’s science and technology area are preoccupied by state-owned enterprises or multi-national corporations, whereas private enterprises has limited space in growth . Furthermore, there is a weak link between research and enterprises to transform the innovation into product.

Indicator: Knowledge base	Shanghai
Universities	66
Reserach institutes	191
Personnel engaged in Scientific and technological activities) (1990/2012)	193,400/388,900
Expenditure on R&D (1990/2012)(100million yuan)	10.13/679.29
R&D expenditure, as % of GDP	1.30/3.37

Source: Shanghai Municipal Statistics Bureau 2013, compiled by the author

### 3.3 Accessibility

The knowledge economy is a networked economy that requires “a good international, regional and multimodal accessibility” though international airport, High-Speed Train stations and local infrastructure network and “high quality electronic infrastructure for vast and swift global communication” (Van Winden and van den berg 2004: 15). As the strength of Chinese companies lies in the connection with Chinese vast market, the quality of infrastructure system and accessibility can be crucial for Chinese companies. Besides, as China’s primary industrial city and economic center, Shanghai is node that connects both China’s thriving domestic market and export industry to other global market. As a matter of fact, Shanghai boasts one of the best transportation systems in China. The sophisticated infrastructure system included a core of ‘three ports’ (a deep water port, an airport and an ‘information port’) and ‘three networks’ (a rail network and metro system, an urban highway network and a cross-river transport network) The ‘three ports’ were important to allow Pudong to establish links

with the outside world and help Shanghai to become an international transport hub. The Port of Shanghai, located in the vicinity of Shanghai, consists of five working zones. In 2006, with a total of 537 million tons of cargo transported, it became the world's busiest port by cargo tonnage first time. Shanghai also processes two international airport: Pudong and Hongxiao, the only city in China with such privilege. The idea of the 'three networks' was to embed Pudong's infrastructure in the infrastructural framework of the Shanghai metropolitan area<sup>1</sup> as a whole. The key aim of the metropolitan transport system was to provide a rapid transport system allowing journeys in Shanghai's central area, inner suburbs and outer suburbs to take no longer than 15 minutes, half an hour or one hour, respectively (Chen 2007, p 143). Apart from traditional infrastructural services, telecommunication development has in fact become the key to the development of a global urban system, lowering the barriers to international interaction imposed by space and time. The city's telecommunication system as eventually developed was connected to a new national fibre-optic network. China's first city-wide digital cellular network is currently in operation in Shanghai (Olds 2001, p 181). In fact Pudong was designed as a telecommunications hub and became one of the first pilot Chinese smart cities since 2012 (Qiu 2013, p 234)

### 3.4 Quality of life

Quality of life is a key determinant to attract and retain knowledge workers: We can judge this aspects from various features an attractive living environment will provide: "an attractive building environment, high-quality houses, attractive city parks and/or natural surroundings, rich variety of cultural institutions, high quality public facility like schools and hospitals. In both areas, the quality of life have been set up with high standard. Life expectancy in both case are high. Both areas enjoy a variety of cultural amenities. special facilities like international schools, are provided to foreign expats who live in the cities. On the other hand, local inhabitants in Shanghai face increasing scarce in health care facility, enjoy less green space and the environmental pollution is a common challenges in local life. In recent years, housing affordability become a new concern for knowledge workers to locate in Shanghai. Housing price increase dramatically, in some cases several times at key locations in inner city areas, make the life in Shanghai expensive.

Indicator: Quality of life	Shanghai
Life expectancy (man/women)	78.08/82.48
hospital facility	317
Doctors per 10,000 inhabitants	44/23
International schools (1990/2012)	25
Percentage of green space (%) (1990/2012)	12.4/38.3
Number and diversity of cultural institutes	4117

Source: Shanghai Municipal Statistics Bureau 2013, complied by the author

### 3.5 Urban scale

Knowledge intensive activities have the tendency to take place in medium-large and large cities, where a more scaled economy and market support, better public facility cultural facilitate and where "a larger common pool of knowledge workers can be found. Shanghai has the advantage of its scale in urban area, population and a strong growing Chinese consumer market.

Indicator: urban scale	Shanghai
Population (million)/ population growth rate (%)	17.42 /1.8
Population density (person/ sq. km)	2133
Urban area (municipality + metropolitan area) (sq.km)	6340.5

Source: Shanghai Municipal Statistics Bureau 2013, complied by the author

<sup>1</sup>. The short-term package of infrastructure was designed to cover 15 years (1990-2005) and the long term package 30 years (1990-2020).

### **3.6 Urban diversity**

Urban diversity promotes creativity. Florida (2001) argues the relation between creativity and diversity. Diversity may foster growth and have impact in cities' most innovative sector; on the other hand, can be a source of problems because of the tension between different social groups. The Randstad area has the reputation of being open, tolerate and gay-friendly. In Shanghai, the number of foreigners living and working in Shanghai reaches 90,400, though low in the percentage of the total population. The number of migrations come and leave Shanghai, is estimated at around 3 million.

### **3.7 Social equality**

A more balanced social equality prevents tensions between "haves" and "have-nots", and therefore better guarantees the urban safety, a basic precondition for urban economic growth. As one of China's riches city, Shanghai also made effort to establish its own social safety network that covers low income-group. Nevertheless, more efforts need to be made towards migration workers who are not within the social safety network. Furthermore, housing inequality, rising living cost and market reform continuously challenges social equality in the city.

For the last several decades, Shanghai has been keen on its role within the global economic system and how to maintain its own competitiveness in order to compete in the global urban network. The seven factors we have illustrated that defines the current strength and weakness of Shanghai in its development process to knowledge city. It took Shanghai decades' effort to reach the economic achievement it enjoys now. Shanghai's fate came with the acceleration of the economic reforms and the wave of globalisation that spread from the west to the east of China. The openness of Shanghai had become increasingly strategic in China's economic reform, especially to the Yangtze River Delta, where Shanghai has an absolutely leading position. Shanghai established its strategic goal of becoming an international centre of trade and finance (and later transportation) in the Asian Pacific Region. One of the important efforts Shanghai has made to develop itself toward s a global city is to establish high-tech industry and diversify the portfolio of industries and activities present in the Shanghai economy. As Shanghai' economy was traditionally supported by labor-intensive and "sunset" manufacturing industries such as textiles, the development of high technology sector will be an important measure for Shanghai's economic restructuring, allowing Shanghai to establish its new economic pillars on high-tech and service sector. The local government considered that a key part of the strategy towards achieving this goal was to develop SEZ like Pudong New Area and other economic and science park, where foreign investors can learn more about the social and economic traditions of China, while the Chinese can get acquainted with western technology, management and expertise (Wong & Tang 2005, p 307). As a result, the development of these knowledge clusters and their achievement in knowledge activities and innovation have become key factors that push Shanghai's path towards becoming a knowledge city.

## **4. Developing knowledge clusters in shanghai**

In the development of knowledge economy, the development of knowledge locations is of significance. The term knowledge location includes science parks, technology parks, open innovation campuses, creative districts, media hubs and so on (van Winden et al 2012: 4). In general, agglomerating knowledge-intensive activities in a particular location may offer a number advantages, like facility sharing, enhanced network and face-to-face interaction, fostering links between industry and local knowledge institutions and providing a favorable environment for start-ups. Furthermore, knowledge hubs give the cities a face and help to foster the identity of a city as a progressive knowledge based city (van Winden et al 2012: 5). Beyond above intentions, developing knowledge clusters is considered by the local government of Shanghai as perhaps the most efficient strategy to help Shanghai establish its high-tech sector and catch up with other well developed knowledge cities worldwide.

The modernization of Shanghai's economic sector is to focus on knowledge creation and knowledge application, of which the development high-tech sector is key. A substantial number of industrial parks and high-technology parks, often with attached incubator systems, play a very important role in Shanghai's industrialization efforts (Sigurdson 2005). The development of high-tech sector, is, on the one hand, supported by" the city's attraction to foreign investment in a wide range of industrial activities", and on the other hand, through "a rapid expansion of higher education and scientific research, where foreign investors have also become active by setting up research

laboratories” (Sigurdson 2005). What is interesting to highlight here is the role of high-tech parks in developing Shanghai’s high-tech sector and role of the local government in organizing the activities. Based on 1984 Master Plan, Shanghai implemented a series of measures on industrial restructuring and upgrading, like upgrading industrial zones with more advanced technology and the development of new science and technology parks. Industrial zones such as Wujing, Wusong, Beixinjing, Taopu, Songjiang, Chaohejing and Minhang Economic and Technological Development Zone was (re)designed and (re)developed during the 1990s. In the 1990s, Shanghai has established one large-scale high tech zone - Zhangjiang Hi-tech Park and six high technology parks that include Caohejin, Jinqiao, Jiading, Shangda and Qingpu. Besides, various smaller-scale high technology parks are also established by various districts and by local universities.

In general, these parks can be divided by their status as state-level or municipal-level industry zones, depending on the preferential policies each park enjoys. Among which, five parks belong to state-level industry zones, including Zhangjiang Hi-tech park, Jinqiao Export Processing Zone, Waigaoqiao Free Trade Zone, Caohejing Hi-Tech Development Zone, Minhang District Economic & Technological Development Zone. Twelve belong to municipal-level industrial zone, including Shanghai Chemical Industry Zone; Xinzhuang Industry Zone; Jiading Industry Zone; Songjiang Industry Zone; Qingpu Industry Park; Kangqiao Industry Zone; Industrial Comprehensive Development Zone; Jinshan Industry Zone; Baoshan Urban Industry Zone & Baoshan Industry Zone; Chongming Industry Zone; Zizhu Science-Based Industrial Park; Xinghuo Development Zone. Among these parks, four are of particular significance to high-tech development in Shanghai:



Figure 1: Zhangjiang Hi-tech Park (Source: Shanghai Pudong, 2014)

- Zhangjiang Hi-tech Park, with a total area of 25 sqkm and is known as the Silicon and Medicine Valley in China, is designed as one of the 53 national high technology parks. It is 9 km from Shanghai’s city Centre - the Bund Area, 21 km from Pudong Airport and 25 from Hongqiao Airport, 25 km to Waigaoqiao deep-water port and 17 km to Shanghai Railway station. Metro line no 2 connects the two airports passing through Zhangjiang High-tech Park. The Zhangjiang Hi-Tech Park has its three technological focal points in three industries – semiconductors, software, and biotech & pharmaceuticals. Important national centres include: Shanghai Super Computer Centre, National Light Source Project in Shanghai, and Shanghai High Polymer Material R&D Centre. Both domestic and foreign companies have been attracted to set up R&D centres within the Park. The largest single R&D unit within the SZHTP is operated by the Zhongxing Technologies (ZTE) Corporation with a total

number of staff exceeding 3,000. Furthermore, it has attracted more than 20 education/research institute to set up branch campuses in the park. Zhangjiang Hi-tech Park is considered to be the most successful one. By the end of 2012, Zhangjiang has been home to over 7,000 enterprises with combined total asset of 329 billion yuan. It attracts 13.3 billion US\$ of contracted FDI and has an economic output that accounts for 10% of the total in Pudong. These enterprises attract over 150,000 highly skilled high-tech professionals (Zhangjiang Innopark n.d.).

- Caohejing National Industrial Park, as the oldest high technology park in Shanghai with a total area of 14.3 sqkm, was established in the early 1980s, with a focus on information and industry. It is 9 km from Hongqiao Airport, 15 km from Shanghai Railway Station and 3km from Shanghai South Railway Station. It is the bases for microelectronics, photo-electronics, computers, software and new materials –to support new major industries. The total number of companies is more than 1,700, which includes 450 foreign firms. It also accommodates more than 30 R&D centres from international and domestic corporations. The annual revenue is RMB 40 billion (41 million Euro (Caohejin High-tech Park, n.d.))

- Zizhu Science-Based Industrial Park (Minhang District) was established in 2001 and developed with the combining forces of private companies, institutions of higher learning (Shanghai Jiaotong University and East China Normal University) and government agencies. The first phase covers an area of 13 sqkm. It focuses on six sectors including microelectronics technology, optoelectronics, digital technology, software technology, nanotechnology and life sciences. In 2009, it was upgrade to state-level high-tech Park and became national base for biotech & pharmaceuticals. It has revenue of 1.27 billion yuan and has attracted contracted FDI of 1.19 billion US\$ (Zizhu National Hi-tech Industrial Development Zone, n.d.).

- Songjiang Science & Technology Park (Songjiang District) was established in July 2002. It was supported by the Shanghai Semiconductor Industry Association and some domestic and foreign companies like TCMC (Grace) from Taiwan have already invested in this park. It strives to set up a third microelectronics industrial base after Zhangjiang Integrated-circuit industrial base and the Caohejing IC industrial base.

There are some distinctive features in the design, implementing and operating these high-tech parks. First, most high technology parks are designed within Shanghai's Special Economic Zones. To quickly establish Shanghai's high-tech sector and upgrade it to a high level from a very low starting point, Shanghai decided to make use of the existing advanced knowledge from the West. As a result, various high technology parks are located within in Special Economic Zones or Economic & Technological Development Zones to benefit from having an easier access to advanced western technology. These SEZs allow foreign investors to take advantages of China's cheap labor and land and SEZ's preferential policies on taxation. The important requirement for foreign investors is to transfer modern technology that is longed for by the local to their Chinese partner. For example, Shanghai's biggest high technology park - Zhangjiang Hi-tech Park is designed within Shanghai's biggest Special Economic Zone - Pudong New Area.

Second, high technology parks are strategically located. In Shanghai larger scale and higher level high technological parks are designed in the suburban areas to ensure available land for extension; meanwhile they have easy access to urban infrastructure like airport, ring roads. High-tech parks like Zhangjiang and Caohejing both share this feature. Other high technological parks are established next to local universities in order to benefit from research and innovations from local Universities and R&D institutes, like Zizhu and Fudan University Science Park.

Third, the development of Shanghai's high technological parks is closely monitored by the local state with a more top-down approach. Therefore these high technology parks are more systematic designed, strategically located, and integrated within the local urban development strategies. The design of the state-level or city-level high technology parks is incorporated within Shanghai's Master Plan. The administrative bodies are established by local government in partnership with the local government organization and private parties. To facilitate the development of technology parks, local government issues a series of policies arranging from attracting talented human resources to funding for start-up. Preferential policies also cover the housing policies, special arrangement for the school of their children and jobs for their partners.

In 2012, Shanghai Municipal Government decided to include all high-tech parks and science parks under the name of Zhangjiang Innopark. Besides Zhangjiang Hi-tech Park as the core park, it also include 12 high-tech parks in Shanghai, like Kangqiao Industrial Park, International Medical Science Park. The whole Zhangjiang Innopark covers an area of 75.9 square kilometer, all enjoying the current preferential policies as well as other benefit Zhangjiang used to enjoy.



Figure 2 Art Centre in Yangshupu Road (Source: the author)

In recent years, new type of knowledge clusters emerged by new actors other than Shanghai Municipal Science and Technology Bureau as important new impulse of Shanghai's knowledge economy. Some of these clusters emerged from bottom-up initiatives by creative class. Contrary to the development initiated by the local government or the private developer, the transformation projects happened along the waterfront of the Suzhou Creek, as is shown in figure 2, has much to do with the initiatives of the artists who searched for cheap but spatial spaces for their workshops and galleries (Chen 2012, 452). Understanding the importance of the creative sector, the local government made the effort to understand the sector and facilitate the sector. By 2009, 75 creative clusters had been established covering 221 hectares. Several steps have been taken to ensure the Creative industry to develop into Shanghai's new economic pillar, which include: publish the guidelines of developing Shanghai's creative industries and incorporate the development of creative industry into Shanghai's strategic planning, like the city's five-year plan; Continuing developing creative industry in combining with the regeneration of historical buildings (old industrial plants and warehouses; Promoting the creative industry in collaboration with sector association and market parties and setting up platforms; Specially develop those sectors that Shanghai has strong potential, like R&D based creative design; District level governments and related government agencies collaborate in facilitating the creative industries by creating creative industrial park (Wang 2006, p 8-9). Beside bottom-up initiative, Shanghai Municipal Human Resources and Social Security Bureau initiated China (Shanghai) Public Practicing Base for Entrepreneurs in Yangpu District in 2009. The base focuses on facilitating your entrepreneurship and increase employment opportunities for young people. The initiative investment is 1 billion yuan. It provides 110,000 square meters incubator space, facilities, training and coaching program for graduates and young entrepreneurs at different stages of their entrepreneur ship. Up to 2 years these entrepreneurs can use the incubator free of charge. One advantage of these new knowledge clusters is that these new clusters offer space and stimulus to let local private enterprises grow. If becoming successful, this effort may improve the positions of local private entrepreneurship.

To further facilitate the development of knowledge clusters, Shanghai speeds up its effort to protect intellectual property right. Shanghai Municipal Government drafted Shanghai Intellectual Property Strategy Outline 2004-2010 in 2004 as well as Shanghai Intellectual Property Strategy Outline 2011-2020 in 2012. In both documents, Shanghai emphasized the need of developing Shanghai as Asian Pacific Intellectual Property Centre. Besides, the outline also advocates the important of establishing a sophisticated legal and service system to stimulate Made-in-Shanghai product, innovation and protecting intellectual property right. Nevertheless, the enforcement of protecting intellectual property right remains a difficult issue not only in Shanghai but also in the whole China.

By examining the design and development of various knowledge locations such as the high-tech parks, creative clusters or entrepreneurship incubators in Shanghai, it is clear that the government play a decisive role in providing the urban vision and set up implementation strategies for the road map towards a series of successful knowledge clusters. Zhangjiang High-tech Park as a success example can be seen as a product of appropriate state intervention that established high-tech and innovation-based new economic sectors. These high-tech parks attract both multi-national corporations and domestic high-tech companies to locate in the clusters. Along with them are hundreds of thousands highly skilled high-tech professionals. Meanwhile, universities, local and Chinese high-the companies as well as MNCs also play an important role in shaping the development path and visions of knowledge locations. However, the development process of these knowledge clusters also shows that the dialogue among the knowledge players seems less observable. Market players, universities and other bottom-up initiatives remains marginal positions in Shanghai. Policy incentives, such as land price or tax deduction or exemption, are still predominate measures to allure the knowledge actors into knowledge location. As China has an institutional structure that continues to handicap the innovation elements of society, despite of continuous undergoing reform, more discussions are needed as to what extent the local government interferes and when to leave the space for other players. It is more effective for the state by collaborating with other technological players and be willing and able to adapt and respond to changes and demands by other players (Zhou 2007, p 167). From a policy perspective, it is important to open up the debates on the design of knowledge locations to the real knowledge players.

## **5. Urban vision 2050: Shanghai's road map towards a knowledge city**

Shanghai is busy developing its knowledge-based economy. During the last three decades, Shanghai has made great effort in establishing a knowledge-based economy and positioning strategically within the global urban network. Innovation has become the new driver for the city's development in the last three decades and will be the key drivers for Shanghai's growth in the next three decades. The seven indicators suggests that Shanghai has in general a strong economic base and a knowledge base to support its knowledge activities. Its strong accessibility and large urban scale allows Shanghai to become a key node that links chinese market with global economic system. Although Shanghai is attractive for professionals and creative class to stay, especially for those graduated from overseas. Various attention points regarding quality of life, urban diversity and social equality explained in section 3 suggest that Shanghai should look more at the social and cultural aspects to improve its urban environment.

Shanghai is busy developing its hardware environment and software to accommodate, transfer and produce knowledge. We can also see the effort Shanghai has made to invest in its knowledge institutions, upgrade its urban infrastructure to improve the accessibility within Shanghai and with the outside world and upgrade its physical environment to attract business and talents. Nevertheless, there is a long way to go before Shanghai can compete with other urban regions. Preferential policy that are successful to attract technical talents in the high-tech sector may have difficulties to repeat its success in attracting the creative class that are of significance to the creative industry and the knowledge economy. To further develop itself as a knowledge city, its urban strategy to Shanghai's urban vision 2050 should pay more attention to the social and cultural dimension of the city and an enabling environment that facilitates and accommodates creativity and innovation. The emerging clusters in recent years shows some initiatives in nurturing private entrepreneurs, which Shanghai lack behind other Chinese cities. In term of governance structure, beside a strong leadership with strong organizing capacity, a broad partnership of public, private, academia and community should be explored to facilitate and support the development of knowledge city.

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**Yawei Chen** is assistant professor in the department of Real Estate & Housing, Faculty of Architecture and the Built Environment, Delft University of Technology. She obtained her doctor title in Real Estate Management from the same institute, with research on the management of large-scale urban development projects, in particular the rapid development of Shanghai's Pudong New Area. Her research covers various issues related to the urban development process in a European and Asian context. Her specialisation is managing large-scale urban development projects in European-Asian comparative research. Her research focuses on effective management activities and instruments for urban development in a complex environment as well as governance in changing global-local context.