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Physical Planning Strategies of National High-Technology Industrial Development Zones in China

Abstract

Over the last two decades, High-Technology Industrial Development Zone (HIDZ) has become an important strategy for urban development in China. Modeled on earlier examples in the US and Asia, they have developed in unique ways in China because of the rapid urbanization, large-scale sites, and trend toward high-technology-based new townships or technopoles. While the 84 current national HIDZs widely use planning strategies in their government-guided development and construction, the impact of these planning strategies remains is not well understood. This dissertation explores how and to what extent planning and management strategies impact the outcomes of HIDZs. It examines closely four case examples (Beijing Zhongguancun Science Park, Shanghai Zhangjiang High-Technology Park, Suzhou Industrial Park, and Shenzhen High-Technology Industrial Park). The study reveals the diverse and sometimes competing purposes of national HIDZs, ranging from stimulating innovation and improvement of products, to serving as an economic anchor and a tool for attracting international firms. The research demonstrates the importance of adopting a sustainable strategy for development of HIDZs that it guides place-making, regulates the land development process, improves the quality of the environment, facilitates cooperation among various sectors, and attracts investment. It explores the versatility of planning approaches, identifies a series of key factors that shape planning strategies, and provides suggestions for tailoring the approach to planning to local resources and conditions.

Degree Type

Dissertation

Degree Name

Doctor of Philosophy (PhD)

Graduate Group

City & Regional Planning

First Advisor

Gary Hack

Keywords

high-technology industrial development zone, China, planning strategy, urban design, science park

Subject Categories

Environmental Design | Public Administration | Technology and Innovation | Urban, Community and Regional Planning | Urban Studies and Planning

PHYSICAL PLANNING STRATEGIES OF NATIONAL HIGH-TECHNOLOGY
INDUSTRIAL DEVELOPMENT ZONES IN CHINA

Sisi Liang

A DISSERTATION

in

City and Regional Planning

Presented to the Faculties of the University of Pennsylvania

in

Partial Fulfillment of the Requirements for the

Degree of Doctor of Philosophy

2011

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PHYSICAL PLANNING STRATEGIES OF NATIONAL HIGH-TECHNOLOGY
INDUSTRIAL DEVELOPMENT ZONES IN CHINA

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Sisi Liang

DEDICATION

To My Grandfather
To My Parents
To Wei Zhang

ACKNOWLEDGEMENT

As I look back over the course of my dissertation research, I am overwhelmed by the number of people who supported me through what is usually considered solitary endeavor. First and foremost, I thank my dissertation advisor, Gary Hack. From our first meeting on September 4th, 2007, and through the many the phases of my journey though the Ph.D. program at Penn, you were everything I could ever have wished for in an advisor: supportive, extraordinarily responsive, and patient in guiding me and my research. More importantly, your encouragement and confidence has been a constant source of inspiration throughout the process. I owe a great deal of my success to you and I look forward to many more years of collaborative work and friendship.

I am deeply grateful to my dissertation committee members, Jonathan Barnett and Genie Birch, for their insightful instruction. Jonathan's extensive knowledge in the practice and theory of urban design greatly expanded the scope of my dissertation. He shares my enthusiasm about planning practices in China's urban development, and his criticism helps to direct and deepen my thinking. Genie has been outstanding in giving me sage advice, asking the right penetrating questions, and helping me place planning strategies and science park development in a transnational context. Being a prolific author, she has also provided me with innumerable writing suggestions. I am grateful for her guidance, dedication, and insights.

I would like to extend my special gratitude to many other faculty and fellow students who inspired me along the way in the City and Regional Planning Program at the University of Pennsylvania. In my first year I came to Penn, Lynne Sagalyn guided me into the field of city planning research with patience and insight. Later, John Landis's

understanding and enthusiasm for scientific research set a standard for which I will strive throughout the rest of my career. I also enjoyed and appreciated my time as a teaching assistant for Laura Wolf-Powers. She opened the door of urban economic to me and gave me tremendous encouragement. In addition, I thank Michael Larice, Amy Hiller, and Domenic Vitiello for their advice and guidance and Kate Daniel, Roslynn Carter, and Rick Dunn for constant support in countless ways. I have enjoyed the intimate yet open academic atmosphere of the Ph.D. group of City and Regional Planning at Penn, and the friendships with my colleagues, which I treasure and look forward to continuing in the future. I am particularly grateful to Amy Lynch and Matthias Sweet for their editorial assistance in various phases of this thesis. I am also indebted to Amanda Johnson, Stephanie Ryberg, and Seung Ah Byun, for making me a part of their studies, and have benefited greatly from their council on living in and enjoying my time in the U.S.

I am also grateful to several scholars in Tsinghua University for their comments on my dissertation, especially Liangyong Wu, Chuan Zuo, Wenyi Zhu, Qizhi Mao, Jun Shan, Weimin Zhuang, and Jie Zhang. They provided me great supports and guidance during my seven years in Tsinghua University, helping me through both my Bachelor of Architecture and Master of Architecture studies. More importantly, they offered advice and comments during my four years in the United States, and shared information and sources that were invaluable in my research. I look forward to continuing my work with these insightful people in my future career.

Thanks to the generous grant from the China Scholarship Council and School of Design, University of Pennsylvania, I was able to spend four years continuing my studies and conducting my research. I am also grateful to the faculty at Tsinghua University who

selected me as the only student of School of Architecture in Tsinghua University to pursue a Ph.D. in City and Regional Planning in the United States.

I am fortunate to have a terrific group of friends who have helped me through the entire process. To Steve French, I put you in my list of friends rather than faculty, because I am grateful to you for your constant encouragement to me during the writing process, and for pulling me up during my desperate times. To Mengke Chen and Penghui Sun, thank you for the constant calls and research discussions, our group study sessions in Van Pelt Weigle Information Commons and the Fine Arts Library, and countless lunches and dinners together. To Amy Lynch, our many discussions over brunch, Starbucks and Cosi coffee, and the time we spent together in libraries and 2010 ACSP workshop provided me a steady source of insight and diversion. To Shunxi Wang, thank you for being with me throughout my writing process, and for reading and revising drafts. To all my other close friends, thank you for sticking by me when I was buried in exams, writing, and work, and for such warm friendship.

Finally, I want to thank my family, especially my fiancé, Wei Zhang, for his unflinching love, patience, and support. I dedicate this dissertation to our coming wedding, for it is a testament to every minute of joy, courage, and life we have shared, and the difficulties we have overcome together over the years. I would also like to share the joy of completing my dissertation and upcoming graduation with my parents and parents-in-law in China. My dear parents, thank you for your constant encouragement during all my twenty-six years of life. Thanks also go to my aunts, uncles, and grandparents who have been by my side for as long as I can remember. Particularly, my dear grandfather in heaven, I know I am, and will always, a granddaughter you are proud of.

ABSTRACT

PHYSICAL PLANNING STRATEGIES OF NATIONAL HIGH-TECHNOLOGY INDUSTRIAL DEVELOPMENT ZONES IN CHINA

Sisi Liang

Dissertation Supervisor: Gary Hack

Over the last two decades, High-Technology Industrial Development Zone (HIDZ) has become an important strategy for urban development in China. Modeled on earlier examples in the US and Asia, they have developed in unique ways in China because of the rapid urbanization, large-scale sites, and trend toward high-technology-based new townships or technopoles. While the 84 current national HIDZs widely use planning strategies in their government-guided development and construction, the impact of these planning strategies remains is not well understood. This dissertation explores how and to what extent planning and management strategies impact the outcomes of HIDZs. It examines closely four case examples (Beijing Zhongguancun Science Park, Shanghai Zhangjiang High-Technology Park, Suzhou Industrial Park, and Shenzhen High-Technology Industrial Park). The study reveals the diverse and sometimes competing purposes of national HIDZs, ranging from stimulating innovation and improvement of products, to serving as an economic anchor and a tool for attracting international firms. The research demonstrates the importance of adopting a sustainable strategy for development of HIDZs that it guides place-making, regulates the land development process, improves the quality of the environment, facilitates cooperation among various

sectors, and attracts investment. It explores the versatility of planning approaches, identifies a series of key factors that shape planning strategies, and provides suggestions for tailoring the approach to planning to local resources and conditions.

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CHAPTER 1: SETTING THE SCENE

1. Introduction

Over the past 30 years, China has achieved an unprecedented economic growth rate of more than 10 percent per year and it is now an exemplar of Asian poverty reduction.¹ China has grown to be the second largest economy and trading nation in the world.² A contributing factor to China's success is its use of science parks to attract technically oriented international firms. Originating in the pioneering industrial estates and parks of the early twentieth century, science parks have become dynamic settings for businesses, incubators for new technologies, and high-skill employment centers that contribute to surrounding neighborhoods. The importance of science parks in economic development has grown in both developed and developing countries over the last two decades.³ China's science parks vary in scale, mission, industry mix, and management, ranging from small incubators to large-scale, high-technology-based zones.

Among the many types of science parks in China, the high-technology industrial development zone (HIDZ) is an important component of economic success and social achievement. With an annual growth rate of 36.5% over the past 15 years, HIDZs account for more than 10% of China's Gross Domestic Product (GDP). Despite the recent global economic crisis, HIDZs in China have grown in size and number and in 2008, Chinese national HIDZs provided 663,000 new job opportunities—the equivalent of establishing one-and-a-half Silicon Valleys in a year.⁴ By 2009, there were 57 national HIDZs in China, spread across the 28 provinces and central-guided municipalities. The

total area approved for HIDZs covers 1,290 km², twice the area of Chicago and more than ten times the size of San Francisco.⁵

HIDZs in China are planned by government-led urban planning teams who follow specific economic and planning principles. The parks are mixed-used and are located in a variety of urban and peri-urban settings, which means their development is closely associated with the country's overall urbanization and industrialization. The research demonstrates the importance of planning for the sustainable development of HIDZs that the key missions are to guide place-making, regulate the land development process, improve the quality of the environment, facilitate cooperation among various sectors, and attract investment. It explores the role of planning strategies in the ability of high-technology parks to adapt to local conditions and to achieve sustainable growth, explores the versatility of planning, and identifies a series of key factors determining planning strategies. The dissertation is written for Chinese readers involved in the planning and development of high-technology parks, and for international audiences interested in understanding the “why” and “how” of China's high-technology parks. The work emphasizes the physical planning strategies used in high-technology parks, a topic which has been largely neglected in academic research.

2. High Technology as an Economic Growth Engine

2.1 International Development of Science Parks

The first science park, Stanford University Park, was established in the San Francisco Bay area of Palo Alto, California in the 1950s. The first Western European

science parks, the Cambridge Science Park, in the United Kingdom, and Sophia Antipolis, in France, were both established in the late 1960s, and received early impetus from the American experience.⁶ A few years later, science parks in Germany, such as the Science and Technology Park in Berlin Adlershof, and the Heidelberg Technology Park, also developed rapidly, along with the Trieste AREA Science Park, and the Bio-industry Park del Canavese in Italy. Since the 1950s, a series of science parks, technology parks, and science cities have also been established in the former Soviet Union and countries in Eastern Europe, such as the Novosibirsk Technopark in 1957, and the Moscow State University Science Park in 1992.⁷ In other European countries, including Belgium, the Netherlands, Spain, Sweden, and Finland, science parks were not established in significant numbers until the 1980s and 1990s.⁸

When the wave of high-technology parks, originating from the United States, moved across the Atlantic towards Europe, it also encouraged the development of science parks in Asian countries across the Pacific. Japan was the first Asian country to establish science parks. The Japanese Ministry of International Trade and Industry master-minded the technopolis program, a national plan to create a series of new science cities in the country's peripheral areas, in order to simultaneously promote new technologies and develop lagging regions.⁹ Other newly industrialized and developing countries in Asia and Oceania also built various types of high-technology parks, among them Taiwan's Hsinchu Science Park, South Korea's Daedeok Innopolis, Singapore's Kent Ridge Science Park, Bangalore's International Tech Park, and Australia's Technology Park Adelaide.

The number of science parks worldwide rose dramatically in the 1990s and continued through the early 2000s. It is difficult to approximate the current number of science parks, as the figure depends on a varying definition, but, according to the International Association of Science Parks (IASP), by 2000, there were 1,240 science and technology parks worldwide.¹⁰

Due to the short history of science parks and differences in local contexts, there is a wide variety seen in intellectual resources, enterprises, investment strengths, and development environments in science parks worldwide. A significant number of international studies attempt to provide a comprehensive policy framework for policymakers to pump new life into flagging regional and national economies by pursuing high-tech industrial development.¹¹ These policy and theoretical analyses are usually at the regional level and are primarily confined to providing a comprehensive list of policies and factors necessary for high-tech industries to be vehicles for regional (re)development.¹² Despite the detailed literature, which thoroughly documents science-park development within the broader context of industrial technology and regional development (for a detailed annotated bibliography, please see appendix), until recently, there has been little discussion on the planning and management issues of science parks.

2.2 Learning from International Precedents and Experiences

Chinese high-technology parks have drawn upon international experience. Chinese academics and science park practitioners have devoted a great deal of attention to identifying the factors that contributed to the development of successful high-tech centers such as Silicon Valley, Boston's Route 128, and Raleigh's Research Triangle

Park.¹³ However, differences in political and economic frameworks have meant that European and American models must be modified to fit the Chinese context. As shown in the table below, after decades of development, high-technology parks in China have developed their own characteristics, which could serve as models for other countries.

Table 1.1: Four Dimensions of China Learning from International Precedents

DIMENSION	INTERNATIONAL CASES	CHINA
Typology	Three types: 1) micro science centers, 2) science parks, and 3) technopoles	Four Types: 1) the high-tech industrial belt, 2) the HIDZ, 3) the university science park, and 4) the specialized science park/incubator
Spatial Development	Strong relationships and interactions with universities; need the supports of cities	Parks are located for land value appreciation rather than for educational institutes and research resources
Planning and Management	Managed by a diverse group; government is important	Guided by governments, but have a variety of management structures, depending on the types
Design Principles	Green, public spaces, influenced by contemporary urban design theories	Imitate western parks; but many ignore local needs and specific contexts

- **A Loose Typology**

The types of high-tech concentrations vary considerably, as different levels of science parks have distinct development situations and features. Based on size and function, Castells and Hall, Komninos, Park, and many others¹⁴ have proposed a spatial typology consisting of three kinds of science parks: micro science centers, science parks, and technopoles. Micro science parks refer to small-scale centers, such as incubators and innovation centers, focusing on supporting businesses in the innovation process or as a concentration of research institutes with focused research and development (R&D) activities. Science parks (also called research parks, technology parks, or high-tech parks) consist of an agglomeration of high-technology firms. According to the IASP survey, 40%

of science parks worldwide have relatively small areas (a surface area of less than 0.2km²).¹⁵ Their main elements are business incubators and technology centers.¹⁶ The third type of high-tech concentration, the technopole, is a genuine “science city”, a cluster of science parks, incubator centers, and other facilities. Science cities are larger than science parks in scale and size, focusing on higher education, science, research and development, and supportive urban structures and functions. Generally, technopoles include a group of high-tech parks, incubators, and development zones, with a number of science parks and micro science parks inside. Historically, technopoles have had a prominent role in East Asia, supported by national, regional, and local governments, and exemplified by the Taiwan Hsinchu Science Park and Japan’s Tsukuba Science City.¹⁷

Table 1.2: A Summarized Typology of International Science Parks

Types	Scope	Principles	Major Actors	Formation	Examples
Micro Science Center	Small	Small-scale centers focus on supporting business in the innovation processes or as a concentration of research institutes with focused R&D activities	Cluster of firms and researchers, a narrower scope than a science park	Incubators; innovation center; centers of excellence; business park; business accelerator	Cambridge Innovation Center, MA; Center of Internet Business Incubation, Mokwon University, South Korea
Science Parks	Medium	High-Tech production, innovation and university-industry linkages and also a park-like environment	Spontaneous agglomeration development of government or university intervention	High-Tech industrial park; research park; science park; technology park	Stanford Research Park, CA; Peking University Science Park, Beijing, China
Technopole	Large	A wider urban-regional setting with urban and social infrastructure, not only research and/or industrial uses but also residential zones	Centralized political power structures; government planning and guidance	Science city; intelligent city; technopolis; high-tech region; learning region	High-Technology Industrial Development Zones, China; Tsukuba Science City, Japan

Currently, China contains over 10% of the world's science parks.¹⁸ Clusters of high-technology industries in China are loosely called high-technology parks or zones and in terms of scale and management approaches, there are four types: 1) the high-tech industrial belt, 2) the HIDZ, 3) the university science park, and 4) the specialized science park/incubator. The first type of development, the high-technology industrial belt, is a spatial concept referring to a cluster of multiple technological industry-based cities. Research shows that there are five high-tech belts in China: the Beijing–Tianjing Belt, the Yangtze River Delta Belt, the Pearl River Delta Belt, the Shenyang Highway Belt, and the Shandong Peninsula High-Tech Belt. China's development of a high-tech industrial belt is a top-down enterprise that follows the Japanese technopolis program which emphasizes coordinated regional economic development. University science parks and specialized science parks are set up by semi-public or private companies and are similar to what Castells and Hall call "micro science centers and science parks." University parks are operated by research institutes and universities, and are concerned with future developments in science and technology, and with bringing research outcomes to market. Many specialized science parks have distinct industrial focuses, varying from business and technology parks with a focus on product advancement and innovation, to industrial parks that focus on manufacturing. Some independent high-technology companies also set up incubators and standard office buildings, providing support for the development of high-technology firms.

China's second type of high-technology park, the HIDZ, is similar to the technopole. Planned as a large-scale development involving multiple science parks, R&D centers, and business incubators, HIDZs mirror the functions of their international

counterparts. Yet, in China, their classification has been expanded: Chinese HIDZs are not purely places for scientific research and production, but zones that induce new industrial growth, jobs, and production by attracting high-technology manufacturing firms to a privileged site with preferential policies. A HIDZ's development often starts from a single science park, originally based on links to universities and research institutes. With expansion, it adds other aspects of a city, including business, commercial, and housing. Some eventually become sub-centers of the city in which they are located while others become self-sufficient towns.

Table 1.3: Chinese Science Park Categories

FORMAT	CHARACTERISTICS	EXAMPLE
High-Tech Industrial Belt	<ul style="list-style-type: none"> • Governmental Guidance • Regional Area • Spatial Industrial Connection 	Yangtze River Delta High-Technology Industrial Belt
High-Tech Industrial Development Zone (HIDZ)	<ul style="list-style-type: none"> • Governmental Guidance • Mixed-Use • Important role as economic and social development • Feasible and researchable on planning and management • Include Various Types of Science Parks 	Shenzhen High-Technology Industrial Park Beijing Zhongguancun Science Park
University Science Park	<ul style="list-style-type: none"> • Groups of High-Tech Firms or Incubators • Cluster of Individual Office Buildings • Located in HIDZ 	Tsinghua University Science Park
Specific Science Park or Incubators	<ul style="list-style-type: none"> • Private Company • One or Two Individual Office Building • Located in HIDZ 	Pudong Software Park

- **Spatial Development**

The evolution of science parks illustrates the spatial characteristics of modern industrial clusters. By providing a location where researchers and companies operate in close proximity, research parks create an environment that encourages innovation and

promotes technology development, transfer, and commercialization. As bases of growth, science parks are emerging as strong sources of entrepreneurship, talent, and economic competitiveness for regions, states, and nations.¹⁹ Science parks have strong relationships and interactions with universities, as exemplified by the Stanford Research Park, and the North Silicon Valley in Canada. Educational resources often provide a motivation for the development of science parks. In Massachusetts, the presence of outstanding research universities, particularly MIT and Lincoln Labs, which MIT operates as a national laboratory, was a decisive factor in the development of Boston's Route 128 in the early 1950s.²⁰ By sharing facilities with universities, and by hosting research groups and offices, science parks have provided research institutes with environments for transferring research outcomes into the industrial productions.

Many Science Parks need the support of cities, regardless of their location in urban or suburban areas. Some parks are primarily an urban (or metropolitan) phenomenon and exist in a tight network that shares energy, transportation, communication, and infrastructure.²¹ Other parks are located in suburban areas, functioning simply as research and technology zones. Support resources, such as housing, medical facilities, commercial, and transit hubs are located in adjacent cities. In the early 1960s, the migrant population and movement of industries from London and the East of Britain motivated the growth of manufacturing in the Cambridge Science Park. Later improvement of the transportation network in the 1970s increased the accessibility of the Cambridge Science Park to major cities, and facilitated the park's development. Japan's Tsukuba Science City was constructed without dependence on any city, and was put in place to either establish or replace research institutes. The large original investment led to

the slow development of Tsukuba in the start-up period. Growth did not accelerate until the boundary of the Tokyo metropolitan area expanded towards Science City in the 1980s, and provided infrastructure, services, and associated facilities to Tsukuba.

In addition, science parks generally have a well-developed information network, allowing quick and easy communication with other parks and regions worldwide. More and more science parks have indicated that the presence of this information infrastructure is very important in their development.

In recent years, guided by theories of industrial agglomeration and growth poles, many Chinese state and local economic-development groups have attempted to create environments that are conducive to the expansion and growth of high-tech industry clusters, based on the commonly held notion that high-technology clusters offer advantages over other types of industrial activity. Applied under conditions of explosive urbanization, such efforts have yielded science parks with distinct spatial characteristics in terms of quantity, size, and population.

Distinct from other types of science parks, HIDZs are government-guided development efforts aimed at accelerating economic growth and one city may have many of them, scattered in different locations. HIDZs are not always located near education institutes, and may be located on vacant public land, allowing the city to profit from land sales. Being slightly decentralized, HIDZs may even release population pressure from central areas as population streams to the new zone in search of job opportunities. A common occurrence under rapid industrialization, this migration has incentivized mixed land use in science parks, instead of the pure research and manufacturing functions as originally intended. However, where parks are located for land value appreciation rather

than for their proximity to education institutes and research resources, the lack of support facilities has resulted in slow development, with much land remaining idle. Additionally, due to limitations on resident permits through the “HuKou” system,²² only a minority of the population working in parks can get certificates and gain the right to live in HIDZ areas. As a result, most employees must commute to work and traffic congestion is a significant and growing problem.

- **Planning and Management**

Internationally, most science parks are established by universities or with the cooperation of state and local governments. Consequently, science parks are managed by a diverse group of government development organizations, non-profit organizations, specialized companies, and research institutes. Only a few universities have successfully developed leading science parks, including Stanford University in the United States, and Cambridge University in the United Kingdom. Many large-scale science parks, such as Tsukuba Science City, Daedeok Innopolis in South Korea, and Novosibirsk Technopark are developed and managed by the state with full government funding.²³ Between the extremes of tightly planned, government-originated parks and loose university initiatives, there are many mixed schemes, including those involving cooperation between state and local government, and non-government entities.

Regardless, government has played a significant role in the development of science parks. While Silicon Valley developed rapidly and without governmental oversight, the Federal Government was a catalyst in the region’s 1955 to 1963 start-up stage, because the United States Department of Defense placed orders for semiconductor technologies. At the Research Triangle Park (RTP) in North Carolina, the government

also played an important impact on land use and industrial structure plans. In the early 1960s, the North Carolina State government established the Research Triangle Park Committee, which is responsible for land arrangements within the science park. In addition, the municipal government formed a specialized authority to organize infrastructure and incubator construction. The coordination of enterprise, government, and the research institute has led to the success of RTP. With the increase of a highly educated population and the establishment of research institutes, the park has fostered economic growth and community development and has been a success since the 1970s.

Local government has also played a role in other science parks, particularly in addressing environmental and energy supply concerns. For example, during the expansion of Silicon Valley, local government took the lead in addressing concerns of transit, natural resource, and energy from surrounding communities and environmentalists. Municipal and county governments have also supported science parks through such infrastructure investments as road improvements, transit accessibility and information-network construction.

Science parks in China are guided by the government, but have a variety of management structures. Most university parks and specialized science parks are managed by independent entities, such as universities or research institutes. Some HIDZs are managed by independent management entities with full economic and social power but the majority are managed by governmental development committees. Development committees may be directly led by a municipal government that takes charge of all local district affairs, or be assigned by state government to undertake land and economic development, leaving social and commercial activities to town or community

organizations. Specific management strategies are dependent on the strength of the leadership of local municipalities, the location of HIDZs, and their development mission. Notably, with the improvement of market economies in China, more independent organizations have become involved in the management of HIDZs. For instance, some municipal governments have arranged for development committees to coordinate various departments, but have coupled them with other semi-public corporations to undertake infrastructure and land-development. Private enterprises are also involved in the various associations and participate in decision-making processes.

- **Design Principles**

Today's science parks are master-planned, mixed use developments that incorporate a broad variety of residential, commercial, social service, and recreational uses. Influenced by current design theory, physical environments are often environmentally friendly and emphasize public spaces, walkability, tree-lined avenues, greenbelts, and low-emissions facilities. In short, today's developments seek to emphasize the "park" in science park.

Contemporary urban design theories have also impacted the design of science parks. The zoning code and land-use plans of these communities are based on the principles of functionalism. The styles are usually modern and follow the technological development of materials and construction methods, with abundant use of reinforced concrete, metal skins, simple windows, and minimal decoration. Design is important as science parks seek to attract employers and companies with their livable physical environments. Taiwan Hsinchu Science Park has a number of employee dormitories, schools, nature parks, and green spaces in its 3.77 km² area. Because of their multiple

uses, convenience, and beautiful green parks, many workers prefer these parks to more conventional locations.

Accessibility, livability, mobility, and equity have gained increasing attention in today's community development schemes.²⁴ Science parks incorporate design principles to promote place-making and sustainable development. For example, there are specific institutes and places for communicating with employees and research professionals in Tsukuba Science City. The well-designed green spaces and livable environment of Tsukuba Science City have attracted employees and residents who work elsewhere in the city.

In the relatively short period of their development, Chinese science parks have absorbed many of the features of western parks. High-technology parks in China mirror the design format, land-development intensity, green space, and architectural forms of their international counterparts. However, the rapidity of the construction of parks in China did not leave adequate time for research on design regulations and quality control. Ultimately, local needs and specific contexts have often been overlooked. Yet, a few high-technology parks have been successful in developing their own style and responding to local cultural features and the demands of urbanization. Suzhou Industrial Park and the Virtual University Park in Shenzhen High-Technology Industrial Park is an example of this type of success, and will be discussed later.

3. High-Tech Park Initiatives in China

3.1. Initiatives from Globalization

The flow of capital, products, processes, individuals, and ideas globally from the United States, combined with the country's preeminence in technology, has inspired other nations to create their own technopoles.²⁵ Examination of the dynamic linkage model as it moves across the Pacific Rim shows how an essentially Western, land-based science park model fares in different political and economic environments. Operating under a completely different framework than the United States, China, like other developing countries, is transitioning from a tightly controlled economy and centralized government to a mixed economy and a major global player.

Global labor specialization has led to an international production chain. Many originally integrated companies outsourced their manufacturing processes to other locations. Since companies seek low-cost labor, which remains available in Asia, many of the new locations were in China. As a result, and buoyed by convenient transportation and rich labor resources, coastal areas in particular, have gained important production and export-processing districts. Many districts in China have become magnets for international support and investment, forming the base for further high-technology industrial development. Global competition also built a network of city-regions that were less subordinate to nation-states than in the preceding century.²⁶ Highly successful, but small, city-states, such as Singapore, have experienced economic growth, and have become major sources of assistance to China.

The development of high-technology development zones is also motivated by internal demand. An increasing number of countries see leveraging the knowledge economy as a key political strategy for domestic development. China's program of "developing the country by relying on science and education" and "developing high-technology industry" in the 1980s has become a focus of government. China seeks to use emerging high-technology industries to readjust economic structure and redistribute social and political resources.

3.2. Transforming from a Labor-Intensive Industry to a High-Technology Industry

In 1978, when reform started, China was a low-income country with agriculture as its largest employment sector. The Chinese economy was oriented towards heavy industry, and earned foreign exchange through the export of manufactured goods and raw materials such as crude coal, crude oil, minerals, and agricultural products.²⁷ At that time, China was similar to other low-income countries, rich in natural resources and unskilled labor, but poor in intellectual resources. In this situation, only labor- and resource-intensive industries had a comparative, open market advantage.²⁸ The heavy industry-oriented development strategy used before the reform in 1979 meant that the economic system in China remained distorted and closed.

Since the foundation of the People's Republic of China in 1979, Chinese industry has experienced several achievements.²⁹ The first industrial achievement occurred in 1986, when the exports of textiles and clothing exceeded that of crude oil. This point signified China's transition from exporting resource-intensive products to labor-intensive

textile and clothing products, which is consistent with China's comparative advantage. The second achievement happened in 1995, when China's export of machinery and electronics exceeded those of textiles and clothing. This is indicative of China's transition from exporting traditional, labor-intensive exports to exporting non-traditional, labor-intensive products. The third achievement came in 2001 after China's accession to the WTO, when high- and new-tech exports grew rapidly, and the level of product sophistication increased. China's central and local governments conducted regulatory reforms to improve the investment climate and to provide incentives for foreign direct investment (FDI), export expansion, and private-sector development. Chinese exports have since become an integral part of the global supply chains of multinationals in automobiles, computers, and airplanes.

Foreign investors bring not only capital, but also new products/services and practical sector-specific skills. From 1992 to 2001, FDI inflows to China exceeded indirect investment inflows, and the number of international firms rose rapidly in China. These multinational manufacturing firms from the OECD countries moved into China on a large scale, bringing advanced technology. After China joined the WTO, this trend accelerated. All levels of government attached more importance to attracting high-tech firms, managerial know-how, and talent, helping China to become an integral part of the global supply chain, and the manufacturing center of the world.

3.3. Industry and Urban Expansion

Under a planned economic system, urban areas are composed of self-contained units. Each unit, based around a factory or institute, provides associated housing and

other employee facilities. The state government employed programs that evenly managed, developed and distributed “welfare” houses. The government or institutes took full responsibility for the development and maintenance of such houses. The “welfare” system of urban-housing worked well under certain conditions but was inefficient in allocating resources. The system created an “iron rice-bowl”, which is a lifelong career for the worker and reduces his mobility.³⁰ After moving towards a market economy, the welfare system was canceled, and new functional areas were developed. The construction of a range of housing, office buildings, and commercial buildings placed heavy burdens on central cities.

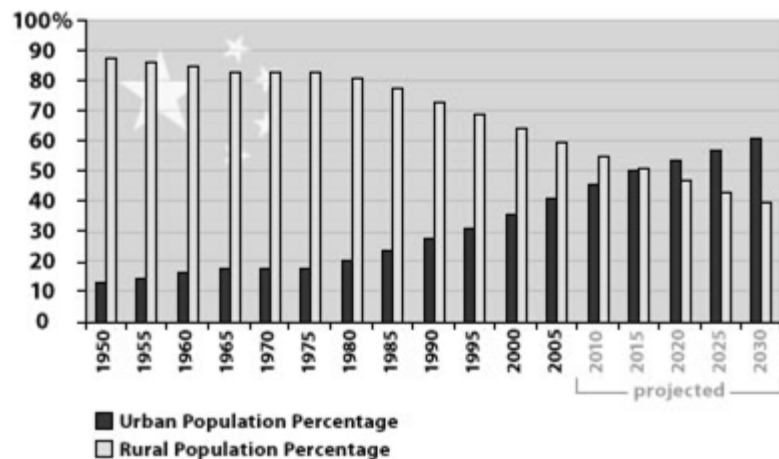
The wave of industrialization in China has led to the creation of industrial agglomerations in many regions and cities, and has dramatically increased the size of urban areas. Two boom periods can be identified: the first from 1992 to 1995, began when Deng Xiaoping started his “southern tour”, and ended when Zhu Rongji implemented macroeconomic adjustment, and the second, from 2000 to 2004, began when the property market recovered from the 1997 Asian financial crisis, and ended when the central state began to tighten land policies. Both periods ended with an overheated real-estate market and consequent macroeconomic adjustment that altered urban land development.

The development of industry largely changed the spatial orientation of urban landscapes. The central city relocated large enterprises and factories to the fringe, increasing industrial land in those areas. In doing this, the expansion of industry changed the composition of urban landscapes in two ways, through the closure of old industries in the central cities and through the relocation of industry to suburban areas. The inner

fringe lost factories, albeit at a slow rate, while outer fringe and suburban counties saw industrial growth. In addition, many small towns and villages began to turn to developing industrial parks rather than relying on agriculture, which facilitated residential suburbanization and led to further urban expansion.

Rapid urban expansion in China has led to urban sprawl, characterized by the extension of built-up areas in a discontinuous and low-density form, and by leapfrog development, large peripheral residential communities, development zones, and urban sub-centers.³¹ High-tech development zones, for example, when placed at the periphery, have transformed Chinese cities from compact to dispersed and multi-centered. Distinct from the large-scale suburbanization seen in North American cities, urban sprawl in China was not initially driven by residential preference. Until recently, local government formulated sprawl-inducing policies with the intention of stimulating local economic growth.³²

Figure 1.1: China Urban/Rural Population Growth 1950-2030



Source: China Statistics Yearbook 1980-2009

- **Urbanization and Coastal Development**

China is currently experiencing a period of rapid urbanization. Radically reoriented under market reform, Chinese cities play an important role in the country's overall economic development.³³ Levels of urbanization in China have risen from 18% in 1978 to 30% in 1995 and to 39% in 2002. In 2009, it was reported that the levels of urbanization in China was 47%.³⁴ Over the coming ten-year period, China will face considerable employment pressure, and must carefully address the issue. The sustainable development of new districts will be crucial in managing the profound changes in the patterns of people's lives and the new economic and social structures that follow rapid urbanization.

Since 1978, when Deng Xiaoping's economic reforms opened China and signaled a shift towards closer integration of the domestic and global economies, five types of development zones emerged.³⁵ These types, each with a different target, developed sequentially and are currently at different phases of economic development. They are: the economic technology development zone, the HIDZ, the tax-protected zone, the export-processing zone, and the border economic-cooperation zone. These development zones differ in their industrial functions and in their main elements. The economic technology development zone is the most common, and is the most conventional type that focuses on traditional industries. In its early stages, the economic technology development zone was similar to the "export-processing zone" of other countries; it used favorable taxation policies to attract foreign investors and other joint ventures to invest in the processing and manufacture of export-oriented products. Economic technology development zones have now become mixed industrial investment areas without regulations on exports. The second type of development zone, HIDZs, focuses on shifting from a labor-intensive

industry to a high-technology industry. Of the five types of development zones, HIDZs and economic technology development zones are, by far, the most common. The final three zones, the tax-protected zone, export-processing zone, and border economic-cooperation zone represent the minority and are specialized zones closely linked with ports and customs.

The creation of new development zones and their associated land development markets are rapidly changing the spatial distribution of Chinese cities, particularly those in coastal areas. Due to convenient transportation networks and human and intellectual resources, the Eastern coastal provinces of China have had booming economies since the mid-1980s, with occasionally double-digit annual growth rates. As the most highly urbanized regions, eastern coastal cities contain an overwhelming concentration of FDI, primarily in the three regions of the Pearl River Delta in Guangdong, the Yangtze River Delta around Shanghai, and the Beijing–Tianjin axis in the northeast. These urban clusters are already important economic-growth poles, and lead regional, urban, and rural development.³⁶ Industrial development zones in these areas served as economic-growth engines, experiencing increasing population pressure from the cities, and moving to extend new development spaces.

Table 1.4: Five National Development Zones in China

NAME	FEATURES
Economic Technology Development Zone	Traditional type, attracting economic investment through preferential policies, focusing on traditional industries, especially manufacture and processing
High-Technology Industrial Zone	Shifting from labor-intensive industry to high-technology industry
Tax-Protected Zone	Under custom supervision, focus on logistics
Export-Processing Zone	Favorable taxation policies to attract foreign investors in ports
Border Economic-Cooperation Zone	Specific border areas

3.4. Chinese Science and Technology Industry Park Policy

The planning and programming of HIDZs started in the late 1980s. In 1985, the Chinese Academy of Science (CAS) and the Shenzhen Municipal Government co-founded the Shenzhen Technology Industrial Park, a pilot science park that opened the door to HIDZ development in China. China then started the “863 Program”, also called the State High-Tech Development Plan, in 1986. Funded and administered by the central government, it was intended to stimulate the development of a range of advanced technologies and render China independent of financial obligations for foreign technologies.³⁷ Two years later, the launch of the national “Torch Program” provided carrots (incentives) and sticks (regulations) to lure foreign investment to “economic technology zones” and science and industrial parks concentrated mainly in coastal China. These sites, based upon the judgment of the central government, were most likely to benefit from infusions of foreign capital in the form of corporations and managers.³⁸ The creation of 27 HIDZs in March 1991 was the thrust of the Torch Program and a series of preferential policies to facilitate HIDZ development soon followed.

At this time, due to the economic benefits that high-technology zones often bring to cities, many municipalities in China were competing to declare HIDZs. In 1991, China was restructuring economically and was developing high-technology parks to prompt and accelerate the readjustment process. The country hoped that preferential policies relating to land price, tax relief, and additional funding would spur the rapid growth of cities. On the other hand, the municipalities needed the establishment of HIDZs to release their cities’ population pressures. In the early 1990s, when the state council began to reform tax-sharing between local municipalities and state government, local tax revenue

decreased. To increase income, many local governments developed on vacant land. Many cities in China were suffering from a real-estate downturn, and construction projects were postponed or suspended.

Chinese HIDZs can be national or provincial. The state council approved the first set of national HIDZs, after which provincial governments seeking to enhance their economic strength began establishing their own. Compared with provincial HIDZs, national HIDZs have more sources of income, including state funding support, preferential policies for land use, financial services, and taxation reduction for trade activities. For example, while provincial HIDZs have the right to reduce local taxes—housing property tax, individual tax, and urban construction tax—the taxation reductions of national HIDZs cover additional, and much larger, central taxes, such as value added tax, consumption tax, and enterprise income tax. Furthermore, national HIDZs play a particularly important role in economic development. In 2009, with over 50,000 high-technology enterprises located in national HIDZs, the total output value was 10% of China's total GDP. The R&D investment in high-technology enterprises in national HIDZs accounted for a third of the R&D investment in all enterprises in China, and the number of patents requiring investment created in HIDZs was half of the entire amount of all Chinese patent investment.³⁹

The planning strategies in high-technology parks evolved concurrently with the development of Chinese modern city planning and management. At the beginning of the 1990s, the “real-estate boom” and “development-zone boom” created an urban planning challenge, with places without controls or regulations. In order to calm the situation and strengthen the regulation of urban real-estate development, detailed regulatory planning

was implemented nationwide. After the reform of the taxation system in 1994, local government interests diverged from those of the central government. To balance the different demands, in May 1996, the state council issued its “Circular Regarding the Strengthening of Urban Planning”, which laid out the central government’s mission on urban planning under a market economy. The circular stated that “the basic task of urban planning is to uniformly arrange the various lands and spaces in cities; to comprehensively deploy the various construction projects; and to achieve sustainable economic and social development.”⁴⁰ Following the issuance of the circular, urban planning in high-technology parks gradually transferred from the original margin of the national economic plan, to regulatory measures guiding and controlling the investment activities of different market players.

4. Structure of this Research

4.1. Questions and Dimensions

With the significant number of science parks in China and due to their role in the national economy, the Chinese science park has become an important class of development. After half a century of development, international science parks now fall into several types, each having distinct features. China has developed a unique approach to the development of science parks, particularly with its most distinct type—the HIDZ. Chinese HIDZs differ from general university parks and specialized parks in that they perform many tasks ranging from economic growth to community development.

The HIDZ, with its close links to rapid urbanization and high-technology park development, extremely large-scale sites, governmental guidance with top-down

development and construction, and trend towards high-technology-based new townships or technopoles, is an increasingly dominant form of science park in China. This research fills the lack of academic study on planning intervention in science parks by comparing four national HIDZs that diversified beyond general science park operation and into large-scale, government-guided developments. The research considers three questions.

Firstly, what planning strategies did managers of HIDZs employ, in what circumstances, and for what purpose? Secondly, how did physical planning strategies impact outcomes, and to what extent? And thirdly, what are the major lessons and experiences?

To answer these questions, the study draws on a wide range of sources including enabling legislation, annual reports, financial statements, development plans, urban design, land-use plans, and interviews, to offer important insights into the opportunities and challenges that the existing governmental entities of science parks face when they plan and manage HIDZs. It identifies six aspects of planning intervention, including: **site selection, land-development approaches, planning and management systems, land-use plans and strategies, transit programs and implementation, and open-space design and construction.** Each of these aspects differs substantially in local context. This study demonstrates the importance of a variety of external and internal forces in determining planning approaches. These forces include sources of capital, composition of enterprises and institutes, and the strengths and weaknesses of land resources in terms of infrastructure, volume, and land-use.

In evaluating how planning approaches have affected the development of HIDZs, this chapter identifies five overarching comparative issues: the nature of development

plans, the role of plans in HIDZs, essential educational resources, implementation and organization, and environmental sustainability. In analyzing each issue, this research employs Lewis Hopkins's four criteria for assessing whether plans work. They are: effect (did the plan have any effect on decision making, action, or outcomes?), net benefit (was the plan worth making, and to whom?), internal validity (did the plan fulfill the logic of how it was intended to work?), and external validity (did the outcomes intended or implied in the plan meet external criteria, such as claims for a just society?).⁴¹ According to the principles of these four criteria, this research develops a series of dimensions to assess the uses of the approaches in each issue.

Table 1.5: Dimensions of Evaluating Planning Approaches

ISSUES	ASSESSING DIMENSION			
	EFFECT	NET BENEFIT	INTERNAL VALIDITY	EXTERNAL VALIDITY
	Effect of Plan	Was the plan worth making	The logic of how it was intended to work	Social Impact
Nature of Development Plans	Land use Housing Open space	People interaction Commuting Quality of public facilities	Land use plan principles Design principles	Urban expansion Urban village Development of small companies
Role of Plans	Consistency of mission Infrastructure investment	Regulation and guidelines Legal system vs. flexible control	Plan-making process Planning approval and review procedure	Involvement of multiple entities
Educational Resources	Cluster of high-tech firms	Using vs. creating new sources	Address weaknesses	High-tech trained professionals
Implementation and Organization	Effective organization	Effectiveness of infrastructure vs. initial cost Economic achievement	Multidisciplinary involvement Flexibility and phasing steps	Planning networking
Environmental Sustainability	Natural environment	Quality of environment vs. cost	Environmental standard	Social and natural culture preservation

4.2. Overview of the Dissertation

This introductory chapter outlines the issues and questions, sets the background and frames the research. Chapter 2 then starts with a general overview of national HIDZs including their phases of development, geographic distribution, and spatial planning features. The survey provides a typology of national HIDZs, organizing them by level of local resources and development objectives and outlining planning and management differences. The chapter also discusses the processes and criteria for case selection. Four cases are selected for in-depth study and comparative analysis: the Beijing Haidian Park of Zhongguancun Science Park (ZGC), the Shanghai Zhangjiang High-Technology Industrial Park (ZJ Park), the Suzhou Industrial Park (SIP), and the Shenzhen High-Technology Industrial Park (SHIP).

The four national HIDZs, and associated cities, serve as the basis for this thesis. The four case study chapters analyze the use, implementation, and effectiveness of planning strategies in different types of HIDZs. Each HIDZ is located in the heart of a major Chinese city, ranging in size from Shanghai, the second largest city in the country (14 million); to Beijing, the third largest (12.5 million); Suzhou, the fifty-fifth largest (6.3 million); and Shenzhen, two hundred and eighteenth largest (2.46 million).⁴² Zhongguancun Science Park is the largest high-technology zone in China, and the model for Chinese science parks. ZGC, located in the northwest of Beijing, is the main part of the Zhongguancun Science Park and has exceptional educational resources. Chapter 3 discusses the planning approaches and land development in mixed- used urban areas, and analyzes both the pros and cons of the large number of state-owned research institutes and universities.

Zhangjiang High-Technology Industrial Park is located within the Pudong New Area of Shanghai. It is one of five science parks in the Shanghai area, each of which serves a different district. ZJ opened in 1992 but began to boom from 1999 onwards, when the state council and Pudong government enacted a series of national policies, such as the “Focus on Zhangjiang Policy”. Thus, Chapter 4 analyzes how ZJ began as a small town, and gradually developed into an important, single-use, scientific and research industrial area. The chapter explores how governmental guidance and relative policies impacted ZJ’s development, integrating it with regional development of the Pudong New Area.

Chapter 5 examines the Suzhou Industrial Park, which is a typical, self-sufficient, new-town development. Located to the west of Suzhou city, SIP originates from a partnership between China and Singapore. With international investment and mature governance from Singapore, SIP has become a mixed-use, high-technology-based district, with 300,000 residents. The chapter discusses the planning approaches used in SIP’s development, and provides recommendations for developing new-town science parks in isolated areas.

Shenzhen High-Technology Industrial Park (SHIP) is located in the western Shenzhen Special Economic Zone, where Shenzhen’s geographic and historical features limit usable land and educational resources. While Shenzhen City has only 2.46 million registered inhabitants, there are over 12 million migrants in the Shenzhen Special Economic Zone. The large population and labor source have attracted successful private companies, which have become major powers in high-technology parks. Chapter 6

discusses how SHIP maximized land resources and local innovation systems, and how it tailored its planning strategies to address the lack of research sources.

The last chapter answers questions posed in the introduction through a crosscutting analysis of the four cases. It discusses five overarching comparative issues based on cross-case analyses. These issues build upon one another to create a new framework through which park managers, public officials, developers, and private citizens may better work together to help their high-technology parks grow more sustainably. It weaves together the findings from each case, demonstrating that planning strategies play important roles in the sustainable development of HIDZs through flexibly addressing a diverse set of local conditions, improving the quality of place-making, regulating land-development processes, and facilitating cooperation among various sectors. However, the decision-making and implementation processes were often challenged, and faced a series of limitations related to the socioeconomic context. The chapter reconsiders the importance of Chinese HIDZs, both in China's future development and in influencing international science-park development, and concludes with a summary of the lessons to be learned from current planning strategies and management approaches.

¹ World Bank Report. "Global Economic Prospects 2009." Washington D.C.: World Bank, 2008.12.

² BBC. "China Overtakes Japan as World's Second-Biggest Economy." *BBC Business News*, 2.14 2011. It mentioned: "Japan's nominal gross domestic product for the second quarter totaled \$1.288 trillion, less than China's \$1.337 trillion, the Japanese Cabinet Office said today. Japan remained bigger in the first half of 2010, the government agency said. Japan's annual GDP is \$5.07 trillion, while China's is more than \$4.9 trillion."

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- ³ IASP, "Survey of International Science Parks 2002." International Association of Science Parks (2002)
- ⁴ Census Data of Silicon Valley; Annual Statistics Book of China (2008).
- ⁵ Census Data of Chicago; Annual Statistics Book of China (2009).
- ⁶ Yiannis L. Bakouros, Dimitri C. Mardas, and Nikos C. Varsakelis, "Science Park, a High Tech Fantasy?: An Analysis of the Science Parks of Greece" *Technovation* 22 (2002): 123-28.
- ⁷ Yisheng, Chen, *An Incubator for Innovation in the High-Tech Industry: A Study of Science Parks* (Beijing: Chinese Economic Publisher, 2008).
- ⁸ D.J. Storey and Tether, B.S. "Public Policy Measures to Support New Technology Based Firms in the European Union." *Research Policy* 26 (1998): 1037-57.
- ⁹ Manuel Castells, and Peter Hall, *Technopoles of the World: The Making of 21st Century Industrial Complexes* (London: Routledge Press, 1994), 112.
- ¹⁰ IASP, "Survey of International Science Parks 2006-2007." International Association of Science Parks, (2006-2007). It is difficult to give even an approximation on the number of science parks, as the figure depends on the criteria used. The International Association of Science Parks (IASP) tends to be rather strict when labeling any project as a science park, as they give this status only to those projects that fulfill the criteria of the official definition of science park given by the IASP. Keeping this in mind the approximation of the number of genuine science parks, as defined by the IASP in the world in the early 2000s, may be between 700 to 850. When a looser definition is applied, the total number is probably closer to some 1,240.
- ¹¹ Castells and Hall, *Technopoles of the World*; Harvey A. Goldstein and Luger, Michael I., "University-Based Research Parks as a Rural Development Strategy." *Policy Studies Journal* 20, no. 2 (1992).
- ¹² Castells and Hall, *Technopoles of the World*; David Keeble, "High-Technology Industry and Local Environments in the United Kingdom." In *High Technology Industry and Innovative Environments: The European Experience*, ed. Philippe Aydalot and David Keeble (London: Routledge, 1988); Doreen Massey, Paul Quintas, and David Wield, *High-Tech Fantasies: Science Parks in Society, Science and Space* (London: Routledge, 1992).
- ¹³ Bradley M. Braun and W. Warren McHone, "Science Parks as Economic Development Policy: A Case Study Approach." *Economic Development Quarterly* 6 (1992): 135.
- ¹⁴ Castells and Hall, *Technopoles of the World*; N. Komninos, *Intelligent Cities. Innovation, Knowledge Systems and Digital Spaces* (London and New York: Spon Press, 2002).
- ¹⁵ IASP, "Survey of International Science Parks 2006-2007." On the other hand, 29% of the science parks have more than 600,000 m², while the giants, with over 1 million m², represent 19% of all science parks. However, they are still smaller than the technopolis, which refers to the cities or regions of science.
- ¹⁶ Ibid.
- ¹⁷ Ari-Veikko Anttiroiko, "Global Competition of High-Tech Centers." *International Journal of Transport Management* 28, no. 3/4/5 (2004).
- ¹⁸ IASP, "Survey of International Science Parks 2006-2007."
- ¹⁹ Margaret Pugh O'Mara, *Cities of Knowledge: Cold War Science and the Search for the Next Silicon Valley* (Princeton: Princeton University Press, 2005).
- ²⁰ Castells and Hall, *Technopoles of the World*, 31.
- ²¹ IASP, "Survey of International Science Parks 2006-2007."

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- ²² Hukou refers to the system of residency permits that date back to ancient China, where household registration is required by law in People's Republic of China and the Republic of China. A household registration record officially identifies a person as a resident of an area and includes identifying information such as name, parents, spouse, and date of birth. A hukou can also refer to a family register in many contexts since the household registration record is issued per family, and usually includes the births, deaths, marriages, divorces, and moves, of all members in the family.
- ²³ Chen, *An Incubator for Innovation in the High-Tech Industry*, 89
- ²⁴ Jonathan Barnett, *Redesigning Cities: Principles, Practice, Implementation* (Chicago: Planners Press, American Planning Association, 2003).
- ²⁵ Sam Ock Park, "Networks and Embeddedness in the Dynamic Types of New Industrial Districts." *Progress in Human Geography* 20 (1996): 476-93; Ann Markusen, "Sticky Places in Slippery Space: A Typology of Industrial Districts." *Economic Geography* (1997): 293-310; Michael E. Porter, "Location, Competition, and Economic Development: Local Clusters in a Global Economy." *Economic Development Quarterly* 14 (2000): 15-34
- ²⁶ Susan M. Walcott, *Chinese Science and Technology Industrial Parks* (Ashgate Publishing, 2003), 3.
- ²⁷ Justin Yifu Lin and Yan Wang, "China's Integration with the World: Development as a Process of Learning and Industrial Upgrading." In *World Bank Policy Research Working Paper WPS 4799*, 2008.12.
- ²⁸ Justin Yifu Lin, Fang Cai, and Zhou Li, *China's Miracle: Development Strategy and Economic Reform* (Hong Kong: Chinese University Press, 2003).
- ²⁹ Lin and Wang, "China's Integration with the World," 15.
- ³⁰ Here this metaphor refers to a saying of a confirmed lifetime job position, in state-owned institute under a planned economy.
- ³¹ Walcott, *Chinese Science and Technology Industrial Parks*.
- ³² Wei-wei Zhang, *Transforming China: Economic Reform and Its Political Implications* (Basingstoke: Macmillan Press, 2000).
- ³³ Qizhi Mao, et al. "The State of China's Cities." ed. UN Habitat (2010), 10.
- ³⁴ Annual Statistics Book of China (1980-2009)
- ³⁵ Jici Wang and Jixian Wang, "An Analysis of New-Tech Agglomeration in Beijing: A New Industrial District in the Making?" *Environment & Planning A* 30, no. 681-701 (1998).
- ³⁶ Mao, et al, "The State of China's Cities," 16.
- ³⁷ Wu, Hequan "The Progress of Communication Technology Subject of Hi-Tech Research Development Plan of China." *International Conference on Communication Technology Proceedings* 1 (2000)
- ³⁸ Walcott, *Chinese Science and Technology Industrial Parks*, 12.
- ³⁹ Annual Statistics Book of China (1980-2009)
- ⁴⁰ "Circular Regarding the Strengthening of Urban Planning", China State Council (1996) No. 18.
- ⁴¹ Lewis D. Hopkins, "How Plans Work." In *Urban Development, the Logic of Making Plans*, ed. Lewis D. Hopkins (Washington, D. C: Island Press, 2001).
- ⁴² Annual Statistics Book of China (1980-2009)

CHAPTER 2: A GENERAL SURVEY: CHINA'S HIGH-TECHNOLOGY INDUSTRIAL DEVELOPMENT ZONE (HIDZ)

1. Introduction

In China, High-Technology Industrial Development Zones are at the forefront of industrial growth. They transfer high technology and research knowledge into production, provide housing, commercial and social services, and explore the development environment for urban extension. During the past two decades, most Chinese HIDZs have planned strategic developments and contributed to the general understanding of balancing sustainable environmental quality, the role of releasing urbanization pressure, and the importance of attracting investment to facilitate economic growth.

This chapter reports the author's scan of national-level HIDZs. The national HIDZs are located in major cities and directly governed municipalities. They account for the highest level of the development of science and technology parks in China. Over 20 years of development, under the unified support and policies of the science and technology research plan by the Ministry of Science and Technology of China (MSTC), they have achieved remarkable economic and social accomplishments. Different from provincial HIDZs, which are entirely under the control of the municipal government, the development agencies of national HIDZs control administrative decisions in terms of planning and management. The national HIDZs have employed a series of planning strategies in guiding their large-scale, mixed-use developments, providing an abundance of information and resources for analyzing the role of planning and management intervention in the development of high-technology parks.

My national survey built a data set in order to explore the common planning practices in the development of HIDZs, through an understanding of their missions, strategies, and activities. The research shows that national HIDZs are widely distributed, covering almost all large cities in China. These HIDZs differ significantly in terms of spatial development and management approaches, as well as in the responses to different levels of local resources and contexts. The interventions of planning strategies in national HIDZs cover a wide range of factors, involving site selection, land development, infrastructure, planning system, land use, transit, and open space programming. The study develops a typology of national HIDZs and provides background for the in-depth case studies that follow.

2. Scan of National HIDZs

2.1 Samples

There are 84 national High-Technology Industrial Development Zones in China. Their development can be divided into several periods. Between 1991 and 1992, the state council approved the establishment of 52 national HIDZs. Out of these 52, 27 were approved in 1991, and 25 in 1992. Between 1993 and 1997 the state council approved only two national HIDZs; they were Suzhou Industrial Park (1994) and Yangling Agricultural High-Technology Park (1997). The economic accomplishments achieved by the first group of HIDZs have led the state council to allow local HIDZs to apply for national upgrading. Municipal governments scrambled to apply for funding to upgrade in order to benefit from preferential policies, especially tax relief. In 2007 and 2009, the

state council approved the change of three province-level HIDZ to national HIDZs, and in 2010 it announced 27 additional upgrades. This large number indicates recognition of the importance of national HIDZs by both state and local governments.

Table 2.1: Timeline and Number of National HIDZs

APPROVAL YEAR	NUMBERS	EXAMPLE
1991	26	Shanghai Zhangjiang High-Technology Industrial Park
1992	26	Beijing Zhongguancun Science Park
1994	1	Suzhou Industrial Park
1997	1	Yangling Agricultural High-Technology Development Park
2007	1	Ningbo High-Technology Industrial Development Zone
2009	2	Xiangtan High-Technology Industrial Development Zone
2010	27	Tangshan High-Technology Industrial Development Zone

Due to limitations on time resource, this research study used a general survey based on the first 57 national HIDZs. It is noteworthy that the recent batch of 27 national HIDZs was originally province-level high-technology zones that were established in the early 2000s. Before getting approval for upgrading, they were different from the national HIDZs in terms of the degree of preferential policies, taxation, and regulation. However, these zones regarded the original national HIDZs as templates and applied their experiences to practical projects. Thus, they have adopted a similar process in planning and construction. The discussion of the spatial development of the first 57 national HIDZs can, to some extent, represent the entire development condition of High-Technology Industrial Development Zones.

The original HIDZs are located in the coastal areas, middle areas, and western areas. This geographic distribution illustrates that the State Council recognizes every province's right to develop national HIDZs. While provinces and cities apply for national HIDZs, the selection of cities in which to develop national HIDZs is decided by state

government. Although there is some debate as to the degree of control, China's central government decides what areas of the country will receive powerful developments in incentive priority. The 57 national HIDZs are located in 56 cities, covering 28 provinces, and are directly governed by Chinese municipalities. These high-technology zones exist in every region of the country and in cities with populations in urban areas ranging from under 1 million to over 10 million. Of the 57 cities, 48 of them have populations of over 2 million. Moreover, the cities with national HIDZs are ranked highest in their provinces in terms of GDP achievement. In 2009, 45 of these cities ranked in the top 3% of GDP amount in their provinces. Among the 287 prefectural cities in China, the total GDP of the 57 cities with national HIDZs occupied over half of the GDP.

Nevertheless, the distribution of HIDZs is not even. On the map, the dots indicating national HIDZs along the coastal areas are denser than those in central and western areas. The figure also shows that Eastern China and Southern China, which are well-developed areas in China, have almost half (27) of the national HIDZs. This illustrates that the development of national HIDZs is highly correlated with a city's urbanization level and economic development.



Map 2.1: 57 National HIDZs in China

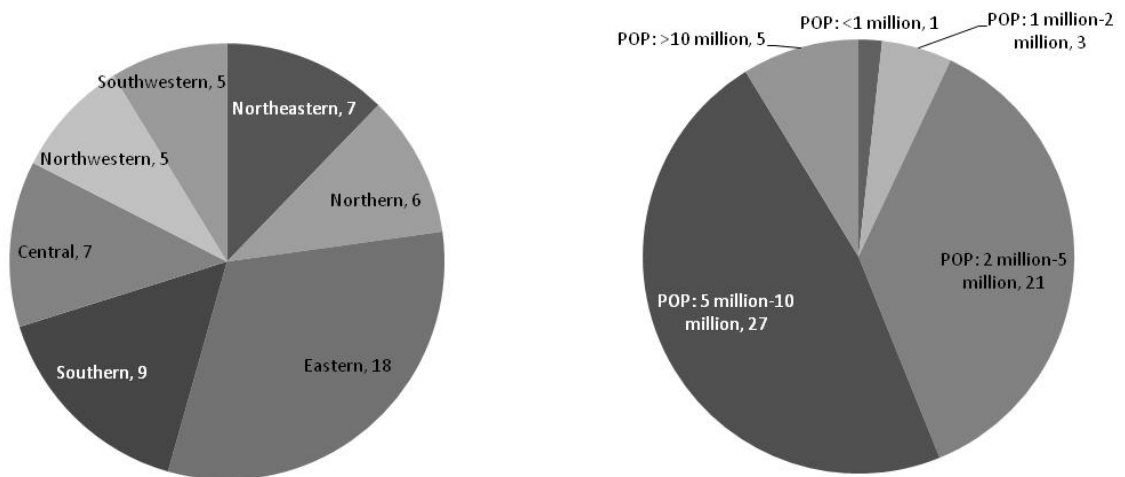


Figure 2.1: HIDZs Number in Each Region **Figure 2.2: HIDZs Numbers in Cities and Population**

2.2 HIDZs and their Cities

The synergistic relationship between a high-technology park and its city is important. High-technology industrial parks conform to their cities' development mechanisms and regulations. The city provides management organization, resources, and funding support for the park's development. In exchange, the city benefits from a high-technology park through land sales, economic growth, employment opportunities, and funding support from the central government. In 2008, there were 12 national HIDZs that were contributing over 20% of the GDP of their respective cities. Furthermore, national HIDZs provided many employment opportunities for the cities. In 2009, the 57 national HIDZs held 53,418 enterprises, with an average of 971 firms per national HIDZ. For comparison, less than 2% of international science parks have over 800 enterprises in each park.

Each national HIDZ is developed around a single city and performs an important role for the city. These cities have different resources and provide different motivations

for HIDZ development. These cities can be divided into three types. The first type of city is the extremely large city, as exemplified by Beijing, Tianjin, Shanghai, Wuhan, and Xi'an. With an abundance of universities and research institutes, these cities offer a rich variety of scientific and research resources to the HIDZs. In addition, the commercialization needs of research outcomes motivate the emergence of HIDZs in these cities. A second type of city is the industrial city. These cities have a strong focus on such manufacturing industries as steel and oil, yet they are weak in research resources. When transforming traditional industries into high-technology-based industries, these types of cities need to establish high-technology parks in order to stimulate the adjustment of the industrial infrastructure. The last type of city is the coastal, border, or riverside city, as exemplified by Weihai, Suzhou, Shenzhen, Xiamen, and Changzhou. These cities have benefited from opening-up policies and convenient transportation. They have experienced rapid economic growth through foreign trade, and have attracted international investment and talent. The agglomeration of international high-tech firms facilitates the proliferation of High-Technology Industrial Zones in these areas.

A variety of local socioeconomic circumstances, especially the types of local resources available, has led to HIDZs having a series of different development goals, including the creation of employment opportunities, high-technology industry development, commercialization of scientific and research outcomes, social services, and sustainable environmental practices. These missions range from single R&D-oriented to mixed-use-oriented development. But their development status is not evenly distributed along a continuum. Instead, HIDZs exist at opposite ends of the spectrum. Some HIDZs concentrate on developing R&D and manufacturing in order to fully use the educational

resources and power of manufacturers. Other HIDZs fully integrate multiple types of urban activities into their construction, aiming to build mixed-use districts to relieve population pressure on the center of the city. Some HIDZs start with manufacturing as the principal land use, and gradually become mixed-use because of their increasing needs for housing, commercial and retail spaces, and other functions.

There are several different types of relations between the location of HIDZs and the center of the city. Some national HIDZs originate from small clusters of science parks that were developed in existing urban areas where there is an abundance of educational and research resources. For example, Beijing Zhongguancun Science Park began from a cluster of high-tech firms in the Haidian Cultural and Educational Area near Tsinghua University, Peking University, and CAS. Then, needing more space, it expanded toward the suburban areas. This is common in Chinese cities where overly dense urban functions and populations in the center of the city have led to the expansion of the city's area. Increasingly, urban fringe areas are constructed as the new industrial district, as in such areas as Xi'an, Guangzhou, and Chengdu. The original movement toward urban fringe areas used existing infrastructure to reduce the cost of construction. However, later development of industrial districts in outer areas called for additional infrastructure development and other urban functions. The main challenge now is to rapidly attract a cluster of companies and high-technology industries. Moreover, some large-scale industrial districts are isolated from cities, but still within a metropolitan's administrative boundary. They center on small villages or towns, and connect with the cities through highways or rail lines. While these HIDZs have land and natural resources, they have to

overcome the costly investment in infrastructure, and they still rely on the city's functions and services.

2.3 Spatial Development

HIDZs concentrated on attracting high-tech companies, including international companies, R&D institutes, state-owned companies, manufactory, and private domestic firms. While industrial companies differ in terms of functions and business activities, they all need to have a close relationship with educational and intellectual resources. This causes more demand on associated facilities and social services in high-technology zones than in traditional manufacturing districts. Consequently, high-technology zones have more varied land areas, involving business, commercial, industry, research, and educational elements.

The mix of areas differs significantly according to individual HIDZ development goals. While the HIDZs that focus on single R&D development have relatively pure industrial and educational uses, other HIDZs that intend to become new townships have multiple urban functions. Generally, the single-use parks are located near educational resources within an urban area. Their land use includes universities, technology, business buildings, and specialized science incubators. They may have university and specialized science parks within the area. The university parks, established around universities and research institutes, aim to transfer the research achievement to commercial products, take advantage of educational intelligence, and establish high-technology enterprises. Specialized science parks have distinct industrial types that emphasize private local enterprises. The incubators are places that foster the growth of qualified, small, high-

technology firms. They also provide students with numerous resources with which to establish their companies. By expanding the area and the demands of residents and employees, land use is diversified with additional commercial, housing, and social services.

In terms of spatial clusters, there are three types of HIDZ in the city: single cluster; scattered clusters with one dominant center; and evenly scattered clusters. Over two-thirds of the national HIDZs are single large-scale zones located within the city's boundary. With advances in high technology, municipal governments have established several new high-technology parks elsewhere in their cities. These zones, together with the original high-technology zone, constitute the entire HIDZ. The original zone is still the largest and dominant zone. Beijing's Zhongguancun Science Park is an example. This science park started from the original development of Haidian Park, which is located in Northwest Beijing near several universities. It also served as the leader in Zhongguancun Science Park. Over time, Beijing developed six other parks dispersed throughout the city. These are specialized parks supporting Haidian Park. Another type of HIDZ consists of several high-technology parks. Among these parks, there is no geographic relationship. Usually the city is large and is divided into several districts. These high-technology parks were planned and developed separately. They are based in their own district, each with their respective industrial focuses, and are relatively small in scale. When applying for a national HIDZ, the municipal government combines them to achieve a larger size and a higher economic outcome. For instance, Shanghai High-Technology Industrial Park is composed of six dispersed high-technology zones. Among them, Zhangjiang High-Technology Industrial Park is located in Pudong New Area, Shanghai University Science

Park is located within the center of the city, near the universities, and Jiading Private Company High-Technology Agglomeration Zone is a cluster of domestic private companies located in one of Shanghai's new towns.

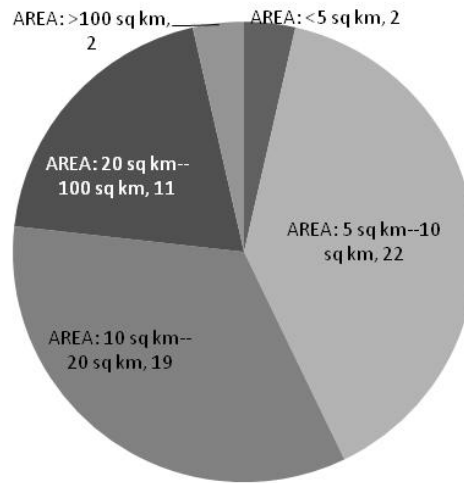


Figure 2.3: HIDZs with Different Range of Area

In terms of land use, Chinese national HIDZs are larger in scale than many other international science parks. As of 2009, the total approved area of national HIDZs is 1180 km², with an average area of 21 km². This contrasts with other international science parks, where approximately 80% of the parks have surface areas less than 1 km².¹ In Chinese cities, many municipal governments seek short-term benefits by selling land to high-technology parks, or gaining as much land as possible in the initial stages. This land will be used for future real estate development. Despite the rapid development process, the actual constructed area of HIDZs is much less than the approved area. Increasing the efficiency of land use and avoiding land waste have become key issues in developing HIDZ sustainability.

Despite their large scale, the size of Chinese national HIDZ areas varies significantly. Hainan High-Technology Industrial Park's 2.77 km² is the smallest zone,

while Beijing's Zhongguancun Science Park's 232 km² is the largest zone. The single zone of Haidian Park, which is the dominant park in Beijing ZGC, has 133 km² area and is 48 times the area of Hainan's zone. This variation is associated with location and the availability of land resources in the city. Those HIDZs that are located in urban areas with abundant educational and industrial resources have less usable land for further development. Consequently, these HIDZs occupy relatively small land areas, integrated into their city's original area. However, after exhausting the development possibilities, some HIDZs relocate to larger sites on the fringe or in suburban districts. The majority of isolated HIDZs have plenty of space, although there are a few exceptions. For instance, in cities like Shenzhen, Haidian, and Xiamen, which are located between the coast and the mountains, HIDZs have few usable land resources, and they tend to increase their density and the intensity of land development.

3. Typology and Planning Strategies Interventions

3.1 Four Types

HIDZs are versatile in adopting physical planning strategies in a wide range of types, locations, local contexts, and sizes. Since municipal governments manage and implement HIDZs' planning actions, the HIDZs' development goals are determined through their interaction with the cities. Nonetheless, the scan reveals some common management strategies among the 57 national HIDZs. They fall into four templates: (1) mixed-use-oriented development with a location integrated in an existing urban area; (2) single-use-oriented development with a location integrated in an existing urban area; (3)

mixed-use-oriented development with a location isolated from the original city; and (4) single-use-oriented development with a location isolated from the city.

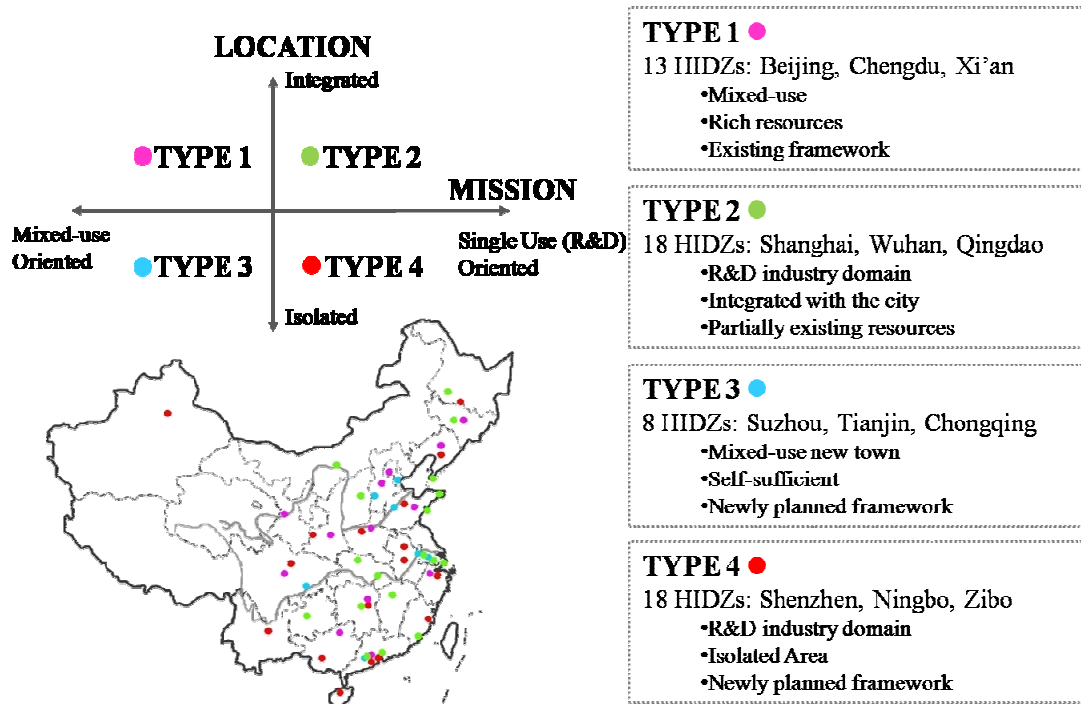


Figure 2.4: A Typology of National HIDZs, Locations, Features, and Examples

The four types of national HIDZs do not significantly differ from each other in terms of their spatial distribution in China, the city, GDP, HIDZ GDP, HIDZ area size, or city population. However, the four types have distinct characteristics with regard to goals, types of local resources, and locations. These characteristics largely determine their planning approaches.

Located in existing urban areas, Type 1, Mixed-Use and Integrated, has distinct advantages, such as the abundance of educational or industrial resources that support the origination of high-tech parks. There are 13 national HIDZs that belong to this type. Their mixed-use goal has led to land uses that include multiple functions, rather than a single research and production function. Thus, the key challenge of planning strategies is

to balance the multiple interests among existing institutes, landowners, and various potential functional facilities.

Type 2, Single-Use and Integrated, benefits from the abundance of existing urban infrastructure. There are 18 national HIDZs in this type. The single-use mission leads to the construction of a series of individual, specialized science parks and research bases. Thus, this type needs to coordinate with the surrounding urban area to address social service issues.

Type 3, Mixed-Use and Isolated, has eight HIDZs. They originate from a high-technology industrial district, and gradually incorporate residents and other urban functions with employment opportunities. Finally, they achieve a self-sufficient new township model as a sub-center of the original city. The construction cost of an entirely new high-technology-based community is high at the beginning (due to the need for infrastructure), which also affects the possible rate of return.

Type 4, Single-Use and Isolated, creates a single research and high-technology industrial district at a distance from the center of the city. The major tasks of planning are to arrange industrial and educational uses, and to address the funding, commuting, and transportation issues so as to maintain the connection with its city. These sites are constructed close to harbors, airports, and transport ports; as a result, they benefit from convenient transportation.

3.2 Discussion of Planning Strategies

Each type of HIDZ has tailored the planning strategies in different ways to meet their needs. The planning and management activities refer to: (1) the various ways plans

work, such as the agendas, policies, visions, designs, and strategies; and (2) the process of implementation, including legislation, construction, and maintenance. Since the inner motivations of planning actions are development goals and tasks, and the knowledge of local circumstances, HIDZs' planning activities can be summarized as having six dimensions: (1) site selection, (2) land development approaches, (3) planning and management system, (4) land use plan and strategies, (5) transit program and implementation, and (6) open space design and construction.

- **Site Selection**

The park's site selection is largely based on whether there is an abundance of existing resources or already formed clusters of high-technology enterprises. The planners proposed HIDZs in urban areas, aiming to fully use urban infrastructure and facilities to incubate specialized small enterprises, such as Type 1 and Type 2. They are located near universities and research institutes. They are either placed in the revitalized industrial areas or near ports and transportation hubs. Since these types of parks have a strong dependence on the city structure, their construction is closely linked with the reconstruction of infrastructure and the urban revitalization process. The construction and environmental improvement of its surrounding urban area directly affects the pace of the park's development. The complexity of issues emerging during urbanization, such as the replacement of old households and the exchange of land functions, has a significant impact on the development of these high-technology parks.

The site selection of HIDZs in urban fringe areas is closely related to the spatial development of cities. As a top-down, guided governmental activity, site selection largely depends on the city-level decision makers' knowledge of both the urban development

plan and the local advantages. The municipality takes on the planning of the high-technology zone, integrating its plan into the city's comprehensive plan. Generally, the mission of suburban HIDZ is to develop as a sub-center of the city. For instance, Tianjin Binhai High-Technology Industrial Zone is located to the east of Tianjin City, lying in the juncture of the Beijing-Tianjin City Belt and the eastern seaboard of Tianjin, right on the east development axis of Tianjin's new town development direction. The construction of this new district is one important step toward facilitating Tianjin's urban-rural development and establishing a new sub-center of Tianjin.

To sum up, the development of an HIDZ is an important part of the city, closely related to other functional districts in the city. The construction of HIDZs results in a large number of changes to the city's spatial development by filling up urban areas with new industrial land uses, impacting traffic, the physical environment, the infrastructure, and people's commuting behaviors, as well as replacing farmland and village residences in urban fringe areas.

- **Land Development Approaches**

Local government and administrative committees take charge of the land development of HIDZs. At the beginning of development, land was the only capital of high-technology parks. The committee assigned development corporations to take charge of the land development process as shown in Figure 2.5. Theoretically, with the support of the city government, the land development company buys land at a low price from the government, and then develops the land using mortgaging and money loans from the bank. This process creates two products: one is the usable land that can be distributed for detailed planning and construction; the other one is the basic infrastructure.²

Type 3 and Type 4, in which HIDZs develop from farmland, face much higher costs than the other two types, because they have to construct new infrastructure and facilities. The administrative committees and land development companies need to increase revenue to cover the high cost. A common way is to redistribute land and sell parcels to assignees—the high-technology enterprises in HIDZs. However, keen competition with the high-technology parks has led many HIDZ committees to reduce the sale price of land to attract more business investments. Consequently, other than long-term revenue from the taxation of enterprises, the committees begin to seek some short-term revenue resources. For instance, developing non-industrial land has become a way to increase revenue. The committee sells non-industrial land by auction, which increases the land price. At the same time, many real estate speculators buy the land for the purpose of developing a high-technology enterprise with a low price, but gain large profits by changing the land use for further speculations.

Multiple factors impact the use of the land-development approach. While increasing the level of governmental control is important in the initial land phasing steps, the network involving multiple land ownerships has meant long-term negotiation and has led land development to maintain a balance among these various interests. Compared with single-use high-technology parks, the mixed-use parks have to address more complex issues, such as phasing steps among different uses, and the investment sequence in different functions.

- **Planning and Management System**

The Chinese planning regulations regard the planning of high-technology parks as a sub-district plan that is under the city's comprehensive plan. Since 1982, China has

implemented an administrative system with five levels, namely, the central government; provincial governments (provinces, autonomous regions and municipalities, special administrative regions); prefecture-level governments (prefecture-level cities, autonomous prefectures and leagues); county governments (municipal districts, county-level cities, counties, autonomous counties, banners, autonomous banners, special economic zones, forest zones); and township governments (townships, nationality townships, and towns). At present, there is a planning system with four administrative levels: central government, provincial governments, municipal and county governments, and township governments. The planning of HIDZs is one part of the district planning that is attached to the comprehensive planning by the municipal government authority and followed by statutory and amendatory detailed planning procedure.

In 1989, the City Planning Act of the People's Republic of China established a set of basic systems regarding modern urban planning and management in China. One important scheme is "one letter and two permits": Guideline Letter for Site Selection (GLSS), Planning Permit for Land Development (PPLD), and Planning Permit for Construction Engineering (PPCE). The law states that in all urban development activities, the land may be allocated by the land administrative authority only after the developer has obtained the PPLD. If the state-owned land-use right is obtained through paid leasing, then the planning conditions of the approved urban plan and site plan shall be the premises for leasing and the issuance of the PPLD. For any construction of buildings, structures, roads, pipelines, or other projects, the PPCE must be obtained before the actual construction takes place.³

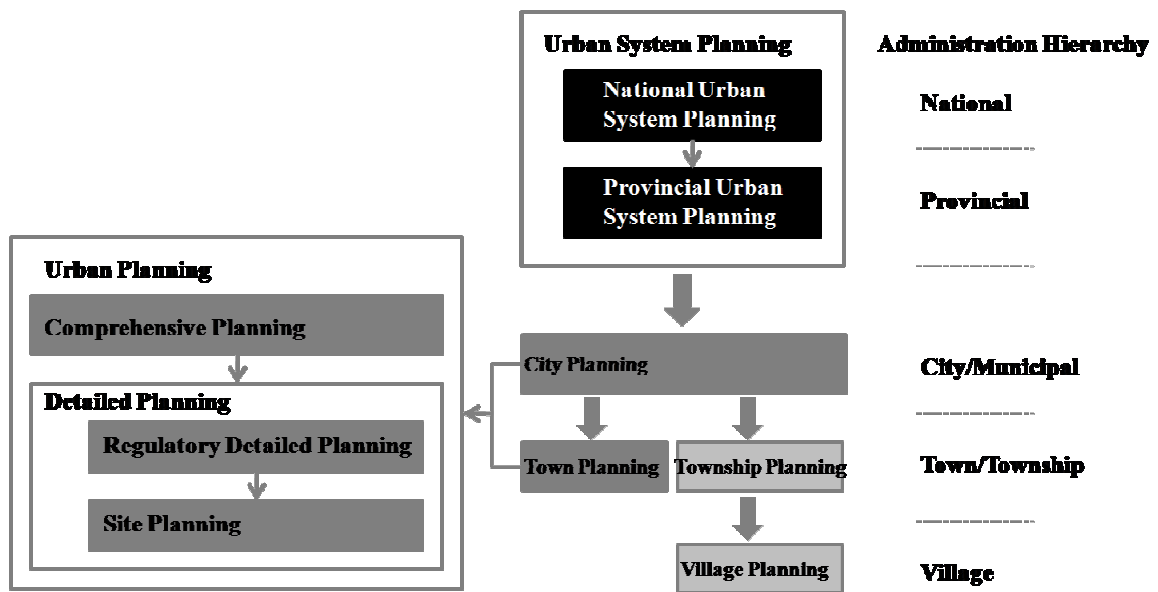


Figure 2.6: Chinese Planning System
Source: Mao, et al, "The State of China's Cities," 41.

As a specific development type, however, HIDZs implement the planning system in a variety of ways, due to the different relationships among the HIDZ management committee, the local government, and the upper-level government. There is no unified approach for carrying out planning procedures. Generally, most of the committees in Type 3 and Type 4 have independent planning and management authority. While the pros to this independence are the committees' power and the assurance that policies be carried out on time, the cons are that the committees have to take into account all kinds of administrative and social tasks, which reduces the concentration on affairs of developing high technology. Contrarily, the HIDZs in Type 1 and Type 2 are subordinated to district-level administrative agencies. Most of the management agencies of these HIDZs are responsible for high-technology development, leaving social affairs, such as housing, public health, and community development, to the local government. This distribution of

responsibilities has facilitated innovation and industrial development. However, it takes a long time to achieve consensus between committees and the local government on the approval of policies. The control level of the HIDZ development committee during the implementation process hence reduces.

- **Land-Use Plan and Strategies**

Land-use patterns differ between mixed-use HIDZs and single-use HIDZs. While the single industrial district often appears to be organized as a pattern of grids and blocks, the multi-use-oriented high-technology parks have much more organically arranged functions, especially those parks located in existing urban areas. The land-use plan of the former type is largely influenced by modern rational design principles that aim to achieve average land parcel size, and flexibility in phasing development. The latter type's land-use pattern is determined by the road networks in existing urban areas.

The different land-division patterns have different impacts on industrial production and human activities. The grids and blocks pattern regards industrial parcel arrangement as the priority; hence, this type benefits transportation and provides convenient manipulation of these parcels. The mixed-use high-technology parks take people's work, life, and communication activities into account; thus, the accessibility among different functions is essential to people's daily lives.

The planning agencies of HIDZs adopt a series of land-use regulations to manage the changes in land use. Different from the isolated HIDZs that simply use phasing steps to control the expansion, HIDZs integrated in city areas slowly follow the original city's fabric to change or infill functions parcel by parcel. Some of them use land and regulations to reserve green land or vacant blocks for future use, while other lands are at

the center of linear growth along a major transit spine. The levels of subdivision are also diverse in different timing of development. Land functions are under a sketchy arrangement in the primary land-use plan, but become more and more detailed from the mandatory detailed plan to urban design, and, finally, to site plans.

- **Transit Program and Implementation**

The primary concerns of the transit program in HIDZs include two aspects: transit ways and road system design. The types of logistics and the flow of people determine multiple transit ways. As an industrial district, HIDZs regard logistics as a significant element. They place increasing accessibility to airports, seaports, and developing highways as the priority in infrastructure construction. The information infrastructure, including internet, electronic wires, and cables, are much more important in HIDZs than in traditional industrial districts. With regard to the flow of people, HIDZs focus on two factors. First, most workers in high-technology industrial parks commute on public transit. The subway lines and lots of circulation ways inside parks, such as shuttle buses and public trolleys, are established for a better connection between various specialized parks and service facilities. Second, business trade activities play an important role in current Chinese HIDZs, more so than in other factories and research bases. Most of the enterprises and employers choose cars as their major transit vehicles, for convenience. With the increasing development of high-technology companies, the increase of car flow brings additional traffic pressure to science parks, especially ones that are built in existing urban areas.

In terms of road systems, the National Code of Transport Planning (1995) stipulates the hierarchy of roads with corresponding width of roads and speed of vehicle,

density of public bus stations, width of pedestrian ways, and design of parking and associated facilities. In this regulation, the road hierarchy includes four types: expressway (80km/h, 40–45 meters, 6–8 lanes), primary arterial (60km/h, 45–55 meters, 6–8 lanes), secondary arterial (40 km/h, 40–50 meters, 4–6 lanes), and branch road (30 km/h, 15–30 meter, 3–4 lanes).⁴ HIDZs use additional levels of categorization, beyond those used in single-function parks, such as internal small streets in neighborhoods that correspond to the multiple land-use functions. Comparably, single-use-oriented HIDZs have relatively evenly distributed arteries with the same width design.

Table 2.2: Road Hierarchy in National Requirement

Dimension	City Size and Population (thousands of people)		Expressway	Primary Arterial	Secondary Arterial	Branch Road
Vehicle Speed (km/h)	Big City	>2,000	80	60	40	30
		<2,000	60-80	40-60	40	30
	Medium City		-	40	40	30
Density of Road Network (km/km ²)	Big City	>2,000	0.4-0.5	0.8-1.2	1.2-1.4	3-4
		<2,000	0.3-0.4	0.8-1.2	1.2-1.4	3-4
	Medium City		-	1.0-1.2	1.2-1.4	3-4
Lanes	Big City	>2,000	6-8	6-8	4-6	3-4
		<2,000	4-6	4-6	4-6	2
	Medium City		-	4	2-4	2
15-30Width (m)	Big City	>2,000	40-45	45-55	40-50	15-30
		<2,000	35-40	40-50	30-45	15-20
	Medium City		-	35-45	30-40	15-20

Source: National Code of Transport Planning (1995)

While national codes regulate the density of the road network, there is no detailed research on road layouts and block sizes. In most of the HIDZs, especially the isolated ones located in urban fringe areas, blocks surrounded by a main artery are approximately 500–700 meter in width and length; this is two to three times the measurement of blocks in Western countries. The professionals and decision makers propose large blocks and structures and wide roads with the aim of establishing a sense of order and dignity in the

districts. However, in mixed-use HIDZs, the large block is not welcoming for residents and employees.

- **Open Space**

The use of place-making strategies aims to create multiple kinds of public spaces for human exchanges and daily activities. While the functions and uses of public space are different according to different service goals and district users, the main intention of HIDZs' public space is to attract investment, companies, and their employees. The public space includes plazas, civic parks, pedestrian walkways, tree-lined avenues, greenbelts, and public facilities. These are all aimed at creating low-carbon, mixed-use environments to meet the demands of high-technology firms. For instance, the national HIDZs have much higher green space ratios than other types of development zones; the main entrance plazas of HIDZs and specialized parks are strong symbols; the civic parks are placed along the riverside, transit stops, and major stations. There are also public gathering plazas, places for exercise, food courts, restaurant squares, badminton courts, and basketball courts. Additionally, a variety of facilities are proposed to create the desired image and culture of high-technology parks, including sculptures, cultural signals, and landscape elements.

Admittedly, the design of landscape and public space garners less attention than the construction of the infrastructure, building density, and road system. However, by considering green sustainability, Chinese HIDZs have gradually stepped through the initial growth phase and moved toward a mature stage. The requirement for energy efficiency, low carbon use, and emission reduction has mandated significant tasks regarding green spaces, as well as on traffic control. With increasing residences and

urban functions in high-technology parks, both place-making and human activities have become important elements in the contemporary and future development of high-technology parks.

3.3 Case Selection

Different development missions and specific relations between high-technology parks and their cities have yielded four different types of HIDZs and their correspondingly different adoption of planning strategies. The implementation of planning strategies is impacted by a series of factors, including local resources, power of enterprises, type of planning agency, legal control and regulation, and users. All these elements intertwine to form a brief background for the planning and management of national HIDZs.

To really understand how HIDZs are planned, and the effectiveness of planning strategies, we need to take a close look at several cases. Based on the historical evolution of national HIDZs and the typology summarized from general surveys, this book intends to select HIDZ examples according to the following main criteria: (1) cases representing samples across each of the four types of HIDZs; (2) cases representing samples across different levels of local resources and city features; (3) cases with rich information in terms of planning approaches and assessable outcomes; and (4) cases serving as exceptional models for the majority of HIDZs, and thus having generalizable lessons for future practices. This study selected four cases for in-depth discussion and comparison: Beijing Haidian Park of Zhongguancun Science Park (ZGC), Shanghai Zhangjiang High-

Technology Industrial Park (ZJ), Suzhou Industrial Park (SIP), and Shenzhen High-Technology Industrial Park (SHIP).

While the complexity of factors, interests, policies, and contextual forces makes it difficult to untangle the planning mechanisms that operate within the HIDZs and to trace how these mechanisms yield quite different spatial configurations on the ground, these difficulties are somewhat eased in a more controlled comparison of the four cases by the similarities in their overarching evolutionary, social, and political contexts. First, created in the early 1990s, all four HIDZs received state preferential policies in supporting high-technology firms and land taxations. Through two decades, the physical development of each has taken place under the adoption of a series of planning strategies, consisting of multiple projects including specialized parks, educational institutes, incubators, and associated facilities. Each uses a series of regulated physical planning systems: city-level comprehensive planning, part of sub-district planning, land development process, detailed planning, and site planning. All four HIDZs perform well above average in socioeconomic development, ranking in the top five in national evaluations of HIDZs in 1992 and 2008. Each became a large and regionally influential high-technology industrial zone, serving as a model for implementing planning activities and legislating development behaviors in high-technology parks, learned or simulated by a majority of other national HIDZs and municipal HIDZs. Furthermore, the four HIDZs are similar in organizational structure and planning activities. Appointed commissions governed all four zones, although there were subtle but important variations between them in terms of commission structure, composition, and distribution of responsibilities.

Nevertheless, the four HIDZs offer enough significant variations to make comparisons among them a fertile source for new insights into the planning activities in contemporary high-technology industrial parks. Because they are located in different cities in different regions of China, they grew in different contexts and were shaped by different initiatives and markets. The cities they are located in have developed unique characters and political cultures that act as important forces on the HIDZs. Beijing has an abundance of universities and educational institutes. Thus many high-technology firms were created by research institutes and local graduates. As an influential global city, Beijing receives significant international investment and interest from high-technology companies. Shanghai has been famous for its influence over finance, commerce, and business trade since the early 20th century. State and municipal governments have placed great emphasis on stimulating Shanghai's high-technology development with supportive programs, policies, and funding. The cooperation between the governments in China and Singapore placed the project in Suzhou, thus giving birth to Suzhou Industrial Park, with its international influence on investment and the influx of high-technology companies. The economic development of the Shenzhen Economic Zone provides high-technology firms fertile resources, involving convenient international trade approaches, a labor market with a large migrant population, and free business environments with a market economy.

These four cases represent different HIDZ development missions. These four HIDZs are representative of many others throughout China that sought to generate suitable sources of revenues by diversifying distinct development missions. Beginning in the early 1990s, HIDZs assumed the primary responsibility for the development of high

technology and served as economic growth anchors in their respective cities. But the variation in local resources and contexts has led to different focuses in their later developments. Beijing Zhongguancun Science Park aims to fully utilize the abundant research resources intellectual resources to transform the research into products, thereby creating a self-innovation center in China. Shanghai Zhangjiang High-Technology Industrial Park has been proposed as a high-tech branch belonging to the entire economic structure of Pudong New Area, serving as a high-technology—especially the IC and software industrial—district, which can compete with other places in China. Conversely, Suzhou Industrial Park took a path toward a new urbanized township with mixed urban functions, rather than pure high-technology industry. The advantages of the Yangtze River Delta area and Singapore’s support facilitated SIP’s industrial development. The increasing employment opportunities in SIP made the new township program possible to implement. Shenzhen’s advanced market-economy environment catalyzed the boom in domestic private companies. Thus, the main focus of Shenzhen High-Technology Industrial Park is the capacity for local innovation and high-technology development.

Moreover, the physical characteristics of the four HIDZs are also quite different. Beijing, being the largest area among national HIDZs, is located on the northwest of the Fourth Ring Road in Beijing, infilling the mixed-used urban fabric and expanding toward suburban areas. Zhangjiang High-Technology Park is one of the six dispersed science parks in Shanghai. It is located in Pudong New Area and was constructed as a single-use-oriented industrial park surrounding Zhangjiang Town. Suzhou Industrial Park is an independent, self-sufficient, new town to the east of the city’s center. Shenzhen High-Technology Industrial Park is far away from downtown and was developed as an isolated

high-technology industrial base for research and development. These four HIDZs serve as models for other high-technology parks by tailoring planning strategies to respond to specific local circumstances.

Table 2.3: Characteristics of Four Selected Cases

Criteria	Beijing ZGC	Shanghai ZJ	Suzhou SIP	Shenzhen SHIP
Sustained Involvement in Planning	Yes (since 1989)	Yes (since 1992)	Yes (since 1994)	Yes (since 1996)
Completed More than One Project	Yes	Yes	Yes	Yes
Used Various Physical Planning Strategies	Yes (General Planning System; Land Use; Land Development; Site Plans)	Yes (General Planning System; Planning Agency; Land Use; Land Development)	Yes (General Planning System; Planning Agency; Land Use; Land Development; Site Plans; Urban Design)	Yes (General Planning System; Planning Agency; Land Use; Land Development)
Exemplary in Socioeconomic Development⁵	Yes (rank top 5)	Yes (rank top 5)	Yes (rank top 5)	Yes (rank top 5)
Expected Development Mission	Medium-mixed-use	Medium-single R&D use	Mixed-use new township focus	Single R&D use
Relationship with Cities	Integrated	Integrated	Isolated	Isolated
Size and Scale	Largest 133 sq km	25 sq km	80 sq km	Smallest 11.52 sq km
Geographic Location in China	Northeast	Middle east	Middle east	South
Initial Key Resources	Abundant Educational Resources; strong state-owned enterprises sector	Weak educational resources; strong policy support and guidance;	Weak educational resources; strong international cooperation supports;	Weak educational resources; strong special zone policy supports; strong private domestic enterprise sector

¹ IASP, "Survey of International Science Parks 2006–2007."

² Pi, *Introduction of Chinese Economic Development Zones*.

³ Mao, et al, "*The States of China's Cities*."

⁴ *National Code of Transport Planning* (1995).

⁵ Evaluation of national High-Technology Industrial Development Zones by Ministry of Science and Technology, P. R. China, 2008

CHAPTER 3: BEIJING ZHONGGUANCUN HAIDIAN PARK

1. An Overview

If a casual observer were to be asked what China's "Silicon Valley" is, they almost certainly would mention Zhongguancun Science Park (ZGC for short) in Beijing. Zhongguancun Science Park is the epitome of national high-tech industrial zones in China with its prominent economic growth and considerable construction volume. Since Beijing implemented the strategy of "invigorating the country through science, technology, and education" in the 1980s, the city has placed more emphasis on high-technology industries. The planning agency of Beijing intended to "establish ZGC as the demonstration base for national scientific and technological innovations".¹ Compared to two decades ago when there were only 527 companies with an annual income of \$2.5 million in Zhongguancun, as of 2008, there were 20,000 high-technology companies, with an entire income of \$146 billion.² The region has also been experiencing a growth rate of more than 30% per year. At present, ZGC has become one of the most important growth points in the capital's economic development, as it contributes 36% of the total gross industrial output value of Beijing. Furthermore, it serves as a model for other national HIDZs, with its business income of industry, trade, and technology accounting for 18% of the total income of all Chinese HIDZs in 2008.³

Zhongguancun Science Park represents the Type 1 of national HIDZs—intensively landscaped and comprehensively planned sites centered upon research institutes, filled with national enterprises and institutions, existing as a relatively mature market with commercial activities, central focuses on high-technologies and information,

and populated by professional human resources. ZGC consists of seven geographically dispersed zones in different locations in Beijing. Among them, Haidian Park, located in the northwest of Beijing, is much larger than the other six zones. The entire Zhongguancun Science Park originated from the 75 km² high-density urban part of Haidian Park, which also includes a 300 km² suburban area as an expansion of the urban region. In this urban area, there are 70 institutions of higher learning, including Tsinghua University and Peking University, and over 230 research institutes, as exemplified by the Chinese Academy of Science (CAS) and Chinese Academy of Engineering (CAE). Over one third of the top academics in China live and work here. Among the 940,000 employees in ZGC, people with doctoral degrees account for 1%, those with master's degrees account for 7%, and bachelor degree holders account for 38% of the total amount.⁴ The advantage of human and high-tech research resources have attracted many international companies and domestic enterprises to locate their technology research institutes or R&D centers in this region, such as Microsoft, IBM, Intel, Lenovo, Founder, and Ufida.

As a representative Type 1 HIDZ that developed on an existing urban area with mixed-use functions, Haidian Park in ZGC needs to arrange various land ownerships during the land development process. Many universities and institutes are under the direct administration of the central government. For instance, while Tsinghua University, Peking University, and CAS are located in Haidian District, the two universities are under the management of the Ministry of Education of China, whereas CAS is directly guided by the State Council. None are managed under the jurisdiction of Haidian District Administration or Zhongguancun Science Park Development Committee. Additionally,

various state-owned, CAS-owned, and CAE-owned institutes were moved to Haidian District long before the science park was established. This complicated administrative relationship among the multiple colleges and institutes has made land exchanging and re-planning of Haidian Park difficult.



Map 3.1: Beijing ZGC Park: one zone, seven parks
 Source: Development Record 1980-2009, 2010, translated by author

2. History of Beijing Zhongguancun Science Park

2.1 Original Haidian “Northwest Cultural and Educational Area”

Located in the northwest area of Beijing as part of Haidian District, Zhongguancun used to be a village with a cluster of royal landscapes, as exemplified by the Summer Palace. Since the early 20th century when both Tsinghua University and Peking University were established, Haidian District has become a commercial village, as most of the universities and institutes have served their populations on their campuses. Haidian District did not begin its large construction of research institutes until the establishment of P. R. China in 1949. The planning of Beijing in May 1949 was conducted through a series of ideas involving the development of industry in Beijing; locating colleges and institutes in Haidian District; and moving the Chinese Academy of Science to Zhongguancun area.

This planning vision was intended to create a university sector in Haidian District. It defined Zhongguancun in Haidian as a “Northwest Cultural and Educational Area.” Various college and research institutes gradually clustered there, aiming to use the shared equipment and faculty resources.

However, the planning and construction lacked both management and technical guidance. The infrastructure lagged far behind the housing and institute construction, resulting in repeated constructions and disordered traffic conditions; the lack of an implementation mechanism led to each institute planning its own land without considering its connection to the surrounding areas. Without land use control, many

institutes also extended their land boundaries far beyond their needs. These early situations left barriers to later development and management.

2.2 Evolution of the Beijing City Comprehensive Plan

After a period of suspended execution,⁵ city planning in Beijing got on the right track. The municipal government clarified the high-technology development vision on the Northwest Cultural and Educational Area, and developed a series of policies, plans, and regulations. Under its market economy, however, the government has no longer been the only controlling factor on the spatial flow and agglomeration of resources. The market-based profit maximization has influenced the self-choices of enterprises and individuals. The two forces intertwined together to form the development context of Zhongguancun Science Park.

- **Beijing Comprehensive Planning in 1983**

In November 1981, the Beijing municipality reestablished the Beijing City Planning Commission and began the comprehensive planning of Beijing.⁶ Unlike previous planning ideas that emphasized establishing an “economic center” or “industrial center,” the comprehensive plan criticized the overemphasis on industry and ignorance of natural resources and the environment. This new plan strengthened the principles of having a green city and the importance of improving the quality of the physical environment. The plan also extended Beijing city’s administrative boundary to release the pressure caused by a rapidly increasing population in the downtown area. Under the guidance of the comprehensive plan from 1982 to 1984, Haidian District finished its land use plan for the Northwest Cultural and Educational Area.

- **Development Experimental Zone for New Tech and Industry**

In the 1980s, when the Beijing Comprehensive Plan proposed a business service center in Zhongguancun Village, many technology companies emerged in Haidian District. Those scientists and engineers, most of whom graduated from the universities in Haidian District and were later study-abroad returnees, explored various ways to adapt the mode of Silicon Valley or Route 128 to China. Retail electronic stores assembled along the main streets in Zhongguancun, which aroused the attention of the government and academia. The China Academy of Science set up a development center with research and industry departments to support this development. Later, the Beijing City Planning Commission organized a series of institutes to compose a research group to investigate the newly emerged enterprises and to conduct planning and design research in Zhongguancun.⁷ The investigation led to the establishment of a science park in Zhongguancun, with unified planning and rational land distribution.⁸

In 1988, as a response to the prominent automatic development of the Zhongguancun area, the State Council officially proposed the Zhongguancun area as the first national high-tech industrial zone in China and named it the “Beijing Development Experimental Zone for New Technology and Industry.” The related regulation delineated an area of approximately 100 km² with the Northwest Cultural and Educational Area as its center. Since then, it has experienced rapid development.

- **Amendment: 1993 Beijing Comprehensive Plan**

From 1981 to 1991, the planning neither followed the rapid urban development to make adjustments to the high-technology industry agglomeration in Zhongguancun, nor undertook any effective programs to preserve open space. Thus, the Beijing government

started to amend the previous comprehensive plan in 1991. The amendment of the Beijing Comprehensive Plan in 1993 emphasized the importance of developing science and technology in Zhongguancun, and focused on taking full advantage of the educational resources in Zhongguancun. This amendment proposed to continually extend the city boundaries and establish a high-technology industrial zone in Haidian District. However, the actual development rate was much faster than planned. Without detailed regulations and control mechanisms, the plan was still just an archaic blueprint of the construction rather than a tool of control and adjustment.

2.3 Historical Evolution of Zhongguancun Science Park

The development of ZSP can be divided into three stages: (1) “Zhongguancun Electronic Street” (1980-1988), (2) “Development Experimental Zone for New Technology and Industry” (1988-1999), and (3) “Zhongguancun Science Park” periods (1999-present).⁹

Table 3.1: Timeline of Beijing ZGC Park

YEAR	EVENTS
1980s	Boom of Electronic Street
1988	Establishment of Beijing Development Experimental Zone for New Tech and Industry
1991	First market pavilion for electronic products opened
1994.3	Add Fengtai Park and Changping Park into ZGC, to form “one zone, three parks”
1999	Add Electronic Park and Yizhuang Park into ZGC, to form “one zone, five parks” Change name to “Zhongguancun Science Park”
2001	Add Desheng Park and Yonghe Park, forming “one zone, seven parks”

- **“Zhongguancun Electronic Street” Period (1980-1988)**

During this period, Zhongguancun area was still a place with clusters of private enterprises that were developed from the bottom-up. The high-technology firms formed an “Electronic Street,” demonstrating the huge energy of transforming science and technology into production, and hence attracted the attention of the municipal government and urban management department. The so-called “Electronic Street” referred to a main avenue, Baiyi Road, in the Zhongguancun area, with a variety of E-commerce stores gathering along both sides of the road, and selling computers, hardware, and software. Most of the stores were one or two-story, reused, existing shops and small houses. In spite of their specific economic vitality, these temporary buildings sprawled everywhere with neither order nor consideration of building appearances, even occupying lots of urban open space and green areas.

- **“Development Experimental Zone” Period (1988-1999)**

With the establishment of the “Beijing Development Experimental Zone for New Tech and Industry,” Zhongguancun transitioned from automatic activity into a stage with plans, management, and policy. While the original experimental zone was located in Haidian Park, the State Scientific and Technological Commission approved adding four more zones into the experimental zone, with two added in 1994 and another two in 1997. The original Development Experimental Zone was renamed Haidian Park, which is the largest zone. Since then, the experimental zone has become a cluster of five individual dispersed zones. Moreover, the Beijing municipal government established an appointed agency, the Experimental Zone Development Committee, in 1997 to manage the development affairs in the zone.

From 1988 to 1999, Zhongguancun was the fastest growing construction area in Beijing. Zhongguancun's first market pavilion for electronic products opened in 1991, showing that the form of trading and exchange had shifted from the previous individual shop fronts to joint operation at large-scale counters. Both Peking Science Park and Tsinghua Science Park were established in short time periods with over 107,000 sq ft areas of building and related services. Moreover, Baiyi Road (now Zhongguancun Main Avenue) was reconstructed with an enhanced capability for infrastructure in 1997. The land use and distribution also changed. Compared with a highly increased rate of public service land use from 1% in 1984 to 9.78% in 1995, the proportion of industrially used land declined from 14.2% in 1984 to 6.58% in 1995.¹⁰ Several commercial services with over 21,000 m² areas each were built, and have formed an important business center in Haidian District. Many sports and cultural facilities including Haidian Book City, Haidian Theatre, and Haidian Gymnasium, as well as over 30 small residential neighborhoods, were constructed in this area.¹¹

- **“Zhongguancun Science Park” Period (1999-present)**

After a decade of rapid development, Zhongguancun had accumulated sufficient experience in developing science parks, and was prepared to undertake the responsibility of leading high-technology development in China since 1990. In 1999, the State Council renamed the “Development Experimental Zone for New Technology and Industry” to “Zhongguancun Science Park.” The experimental zone committee was changed to the Zhongguancun Development Committee. According to the Comprehensive Plan of ZGC by the Beijing Municipal Institute of City Planning and Design in 2000, it consists of five parks, among which Haidian Park is the largest and most important. In 2001, ZGC

increased another two zones, located in Xicheng District and Chaoyang District, illustrating that ZGC finally includes seven dispersed individual zones in Beijing.

After entering into the “Zhongguancun Science Park” period, both the municipal government and local district government enhance their emphases on the construction of physical environments. The Haidian government has made a significant effort to transform Baiyi Road again. The reconstruction included demolishing old houses with the total amount of 46,568 m² area buildings between the road lines, and removing over 100 households-residents, parts of Haidian district-level and municipal-level institutes, and over 500 science and technology enterprises. This government-guided construction effectively solved the arrears of infrastructure, enhanced the accessibility, and improved the quality of the environment. The opening of both the North Forth Ring Road in 2000, and the No. 13 light rail west line in 2002 benefited the northern expansion of ZGC, as well as real estate development along the traffic line. With the construction of Zhongguancun West Zone, Chinese Academy of Science (CAS) Science City, Software Park, and several university science parks, ZSP has truly become a “large construction site.”

3. Planning Strategies and Implementation

3.1 Planning Administrative System

In 1997, the Beijing municipality government appointed a group of staff members to form the Zhongguancun Management Committee. The construction leading group in municipality, with the mayor as the head, supervises the work of Zhongguancun

Management Committee.¹² The committee takes charge of proposing development plans and implementing construction in Zhongguancun Science Park. Since Zhongguancun Science Park consists of a variety of high-technology parks, there are sub-management committees in each high-technology park that undertake the development responsibilities, respectively. For instance, Haidian Park Development Committee is one of the branches of Zhongguancun Management Committee, and it undertakes the development affairs such as land use plan, project approval, and land assignment in Haidian Park.

Such organization has experienced a series of adjustments in the past. In the period of the development experimental zone, the Haidian Experiment Zone Development Committee took charge of the entire development. After “one ZGC Zone consisting five Parks” was set up in 1999, the Haidian Park Development Committee became a sub-department under Zhongguancun Management Committee. Regarding the much more important role of Haidian Park than others, in 2001, the Beijing municipality decided to combine the Zhongguancun Management Committee and Haidian Park Development Committee. However, this combination dissolved after two years, and currently, the Zhongguancun Management Committee organizes all seven branches including Haidian Park’s.¹³

However, the Haidian Park Development Committee does not directly lead the enterprises in Haidian Park. Instead, the corporate tax income is submitted to the local Haidian District government. The Haidian Park Development Committee concentrates on the tasks of planning approval, building permits, and construction permits, leaving the social affairs to local government. The committee has played a significant role in preferential strategies, plans, and park programs, financing and investment, developing

incubators and specific parks, and approval of high-tech enterprises. The local government takes charge of the public services such as health care, civil affairs, and residential neighborhoods. In land assembling and infrastructure process, the committee, Haidian District government, and Beijing municipal government coordinate together to appoint private land developers to undertake the construction responsibilities.

In retrospect, while government organizations have played a dominant role in planning and managing the development of Haidian Park, an organic systematic cooperation system has not yet formed among the government, enterprise, university, and research. Besides the management organization, there are a great deal of non-governmental associations, such as the Beijing Zhongguancun Enterprises Credit Promotion Association, Beijing Technology Market Association, and Entrepreneurial Advisory Committee. While the Haidian Park Development Committee takes charge of “planning, coordinating, supervising, and service,” those associations, representing the interests of companies, provide related market report and enterprise comments on development for the agency. However, in reality, it is the government and experts who decide the land use and planning, with a lack of opinions and restrictions from other players. Furthermore, since the Zhongguancun Management Committee does not have exact administrative right to manage each sub-divided zone’s affairs except for affording strategies and policies, it is hard to coordinate among the seven zones in terms of sharing information and investment sources. Thus, the branch zones focus their own interests representing local districts, respectively, regardless of the overall coordinated development of the entire Zhongguancun Science Park.

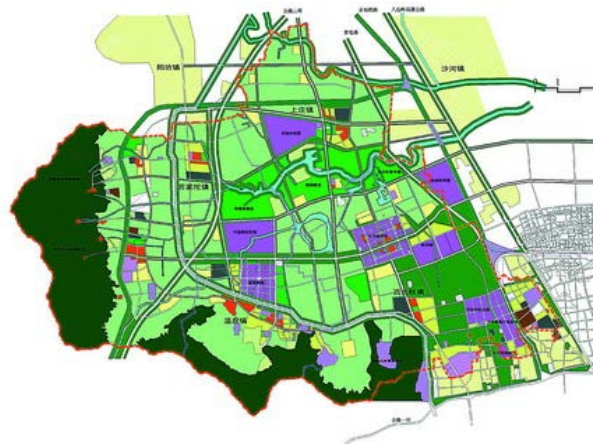
3.2 Land Use in Haidian Park

As noted previously, Haidian Park consists of two parts: the original urban area, and the later-expanded suburban area. The urban area is a 75 km² district with mixed uses. The land use plan of Haidian Park proposed several key blocks in this urban area, involving technology innovation centers and business centers. The business center, exemplified by Zhongguancun West Zone, is a place for business trading and exchange, product exhibition, public service center, and large high-tech enterprises. There are various business buildings in the West Zone. The blocks around universities and research institutes are used for university science parks and incubators, attracting thousands of high-technology companies. Currently, the urban area has a high rate of land development intensity, and thus, lacks potential space for further development. As a result, Haidian Park has gradually expanded its boundary toward the northwest suburban area.

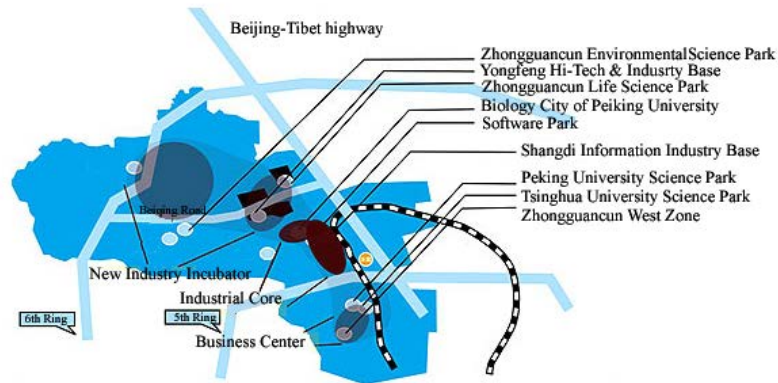
Today's Haidian Park occupies a 300 km² suburban area, within which 60 km² areas are constructed land for science parks. The suburban area has a much lower development density than the urban area in Haidian Park. The land use plan proposed several specialized parks in this area, with each park surrounded by large-scale green and rural space. Since this area is located in the greenbelt of Beijing City defined by a comprehensive plan, only 1/5 of the space is used for science park construction. The land use plan also requires a series of building indices, such as the building height and FAR on this land. Thus most of the buildings are no more than four floors in this area.



Map 3.2: Current Land Use of Haidian Park
 Source: Beijing Zhongguancun Science Park
 Development Record 1980-2009, 2010.



Map 3.3: Suburban Area of Haidian Park
 Source: Ibid.



Map 3.4: Locations of Key Clusters in Haidian Park
 Source: Ibid.

Such a large-scale land use plan cannot be completed in a short time period. Therefore, the Haidian Park Development Committee and Haidian District government have adopted a series of approaches to achieve this large-scale project. In 1994, the Haidian District government proposed a 10 km-long functional belt in Zhongguancun Science Park. This plan, conducted later by Beijing Planning and Design Institute in 1995, includes the following functional areas: 200,000 m² public building area along Chengfu Road, 150,000 m² high-technology building area nearby Peking University, 150,000 m² business building in West Zone, 100,000 m² high-technology building along the

Zhongguancun main avenue, 50,000 m² high-technology building nearby Renmin University, and 130,000 m² high-technology building nearby other three research institutes.¹⁴ This high-technology functional line was completed by the year 2000, and largely improved the environment of the urban area in Haidian Park. A second phase of large construction was from 2000 to 2005, when the parks extended toward suburban areas.

3.3 Land Development Approaches

The Haidian Park Development Committee commissioned land development corporations to take charge of the first step of land development, which is to assemble land and construct infrastructure as well as a road system. Some of the corporations are university-owned companies; others are private or semi-private development companies. Under the policies in the Zhongguancun Science Park District Plan, the Haidian Park Development Committee leases the undeveloped land as well as rights to attract investment of these corporations. After the construction of infrastructure and public facility improvements, these corporations sublease or self-develop the parcels of lands with site planning and construction.

For example, in Zhongguancun West Zone, the lack of initial capital has led the Haidian Park Development Committee and Haidian District government to entrust several large corporations that had governmental background and relationships, such as *Shouchuang*, *Haikai*, and *Zhongguancun Science and Technology Co, Ltd.*, to compose *Beijing Science Park Development (Group) Co., Ltd.* to develop the infrastructure. After operation, the government promised 8% of the profits to these corporations. Besides,

Peking University and Tsinghua University develop their own university science park independently; the project of *Beijing Science City* is the charge of Chinese Academy of Science; and several individual parks in the Expansion Area belong to the *Haidian Science Park Development Co., Ltd* under the guidance of Haidian District government. Most of the corporations were original state-owned institutes or agencies, and thus have their respective political supports. While this intricate situation results in confusion for land development to the extent of infrastructure coordination, there is no more appropriate way to deal with this rapidly-developing context in which each enterprise, university, and research institute has strong discourse power on land development.

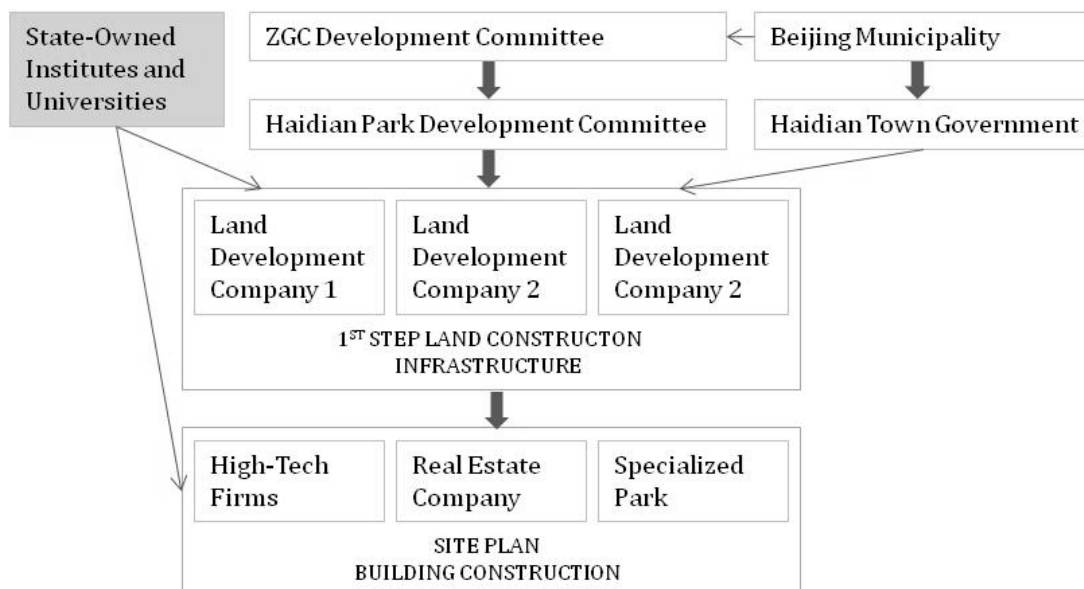


Figure 3.1: Land Development Organization of Haidian Park

The “Regulations of the Zhongguancun Science Park” require that “first step land development in the ZGC shall proceed according to ZGC's unified construction plan.”¹⁵

In principle, the first step land development includes the assembly of commercial, residential, and industrial land, as well as the public service of infrastructure, such as

traffic, electricity, water, drainage, telecommunication, cable, gas, and natural land consolidation. However, the regulations do not clarify the actual mandates in first step land development. In many districts in Haidian Park, especially those in urban areas, the infrastructures are under the control of state trade monopoly, which have not perfectly followed the local government requirements. This makes sector difficult effectively coordinate on the construction of electricity power and other key elements.

3.4 Programming in Transit and Open Space

During the rapid construction time period between 1999 and 2005, there was an investment of over 2.9 billion dollars on construction or redevelopment of the road system in Haidian Park. More than 40 roads over 93 miles¹⁶ in length have been built, such as Zhongguancun South Road and the Forth Ring Road. The Zhongguancun Main Avenue (previous Baiyi Road) was also widened. Haidian Park also constructed several subway and light rails connecting Zhongguancun with other important districts in Beijing.

With its annual 10% growth rate in the number of automobiles, however, Haidian Park has become one of the most crowded places in Beijing. The traffic congestion is still a severe issue, despite the construction efforts. The increased length and area of roads cannot satisfy the demand of the increasing number of passengers and cargo flow. Moreover, while the subway system has been completely developed, cars still dominate most of the business activities in the high-tech industrial park, which cause difficulties for public traffic use to solve the congestion.

Besides, some irrational traffic designs and management also aggravate the congestion. In order to enhance accessibility, there is a systematic bus traffic network in

the Zhongguancun area. However, over-crowded bus stations in important regions often bring negative impacts. For instance, more than 30 bus stations gathered in front of People's University of China, which is right at the intersection of Zhongguancun Main Avenue and Third Ring Road. During rush hour, the frequently shifting-line buses and large passenger flows sharpened the crowded situation. Moreover, there are too many crossroads in Center Area. There are around 15 intersections and 10 traffic lights on Zhongguancun Main Avenue with short distances between one another, significantly reducing the speed of cars.

In suburban area, there is a lag between rapidly constructed infrastructure within each specialized science park and the slowly developed traffic roads. While the corporations of specialized parks constructed their respective parks, the Beijing municipality government and Haidian Park Committee took charge of the external traffic network at a much slower rate because they gave priority to urban area construction. The lack of abundant available connections now causes congestion in the suburban area regardless of the low density, and hence increases the time cost of companies and employees.

With urban expansion, Haidian Park has thus gradually transitioned from an original small commercial town into a mixed-use urban area. Compared with those high-tech industrial zones in newly constructed areas, the existing urban sites with increasing traffic volume but old road networks have a larger transportation challenge for science parks. It may not be possible to solve the traffic congestion, except by limiting cars, devoting the streets to transit, and ensuring that a large percentage of people arrive by public transit. Thus, the municipal government announced the control of trade market of

automobiles, and reduced the price of public transit in late 2010. The program's effectiveness will still require additional time to assess.

3.5 Site Planning for Specialized Science Parks

The site planning for specific science parks within Haidian Park is conducted by private companies and organizations. This mode meets the current demands of Haidian Park. With the rapid pace of development and construction, it would be too late to start site planning and development at Haidian Park until all the land's infrastructure construction is complete. Since the individual science parks are managed by different companies, they have distinct features and demands in site planning. For instance, Zhongguancun West Zone and University Science Parks perform as business and research centers, Software Park is constructed as a reprinted version of Car Park and incubators, and Shanghai Information Industry Base is a modern industry facility. Moreover, the individual land development process gives each park its own business characteristics, and hence it is easy to attract investments. Zhongguancun Aviation Scientific Park is located in Center Area of Haidian with a 43.5 acres site area. Inside the site, one story manufactory and 4-6 story office buildings erected in the 1970s sit behind scrubby gardens, and are environed by high-rises in surrounding areas. The detailed plan successfully transferred such a small and congested position into an advantage of the "Silent Valley." The distinct features of the park, involving proper building layout, design of green shelters, entrance setting, and cultural design such as aviation landscape walls in open space, have successfully attracted a variety of companies and institutes.

However, there is a lack of basic unified design guidelines for all the science parks, which has resulted in several deficiencies in the science parks' design. While there are multiple features and types of different parks, the urban appearances are somewhat cluttered and lack a unified design. Many parks only focus on their own internal design regardless of how this coordinates or integrates with the surrounding areas. Each park is developed as an independent island isolated by wide roads and walls. Currently, the partial design and development of individual parks largely exceeds the various parks' pace of coordination.



Figure 3.2: Rendering Picture of Tsinghua University Park
Source: ZGC Website <http://www.zgc.gov.cn>



Figure 3.3: Tsinghua University Park
Source: Author 2010



Map 3.5: Zhongguancun Software Park
Source: *Beijing Zhongguancun Science Park Record 1980-2009, 2010.*



Figure 3.4: Rendering Picture of ZGC Software Park
Source: ZGC Website Development

Lacking design experiences, many science parks just slavishly copied the modes of science parks in Europe and the United States without adaption. For instance, since the employees in European and American science parks always drive to work, their parks followed a vehicle-oriented design principle. While there are public traffic stations at the park entrances, there is no transit circulation within the large-scale special parks. However, most of the employees in Haidian Park commute to work through public transit. This design hence has forced employees to walk a long distance to work in such a large-scale area.

4. Achievements and Features

4.1 Business Real Estate in Center Area

The high-technology real estate development in Haidian Park has two types: the business buildings rentable for high-technology firms, and the self-constructed specialized incubators or parks in suburban areas. Compared with specialized parks, most of the business buildings and trade retail plazas are constructed in urban areas in Haidian Park. To date, there is a construction area of 4.5 million m² in Haidian Park's urban area, most of which is comprised of office buildings and public service facilities.¹⁷

- **The Growth of Business Real Estate**

A majority of the high-technology companies in Beijing are concentrated in Haidian Park. Specifically, Shanghai Zhangjiang High-Technology Park and Shenzhen High-Technology Industrial Park have 27.3% and 34.2% of the amount of high-technology companies in their cities respectively. Over 96% of the high-tech companies in Beijing are located in Haidian Park, focused on developing the software industry and

the information service industry, which is represented by the integrated circuit industry. There are a series of influential international companies that locate their own headquarters or research centers in Haidian Park. The agglomerations of branches of large international companies benefit local districts with both their funds and global business network. Beside, thousands of other small to medium high-technology companies account for over 60% of the office building users in Haidian Park.

Currently, the office markets in ZGC have three parts: Zhongguancun West Zone, Zhongguancun East Zone, and the rest of the park. Among them, the West Zone is a business center with the largest office building supply and highest annual rent price at \$25 /sf.¹⁸ The clients in West Zone vary considerably, covering fields such as science and technology, education, media, and finance. While only some large domestic corporations buy the buildings, 60% to 70% of the office buildings in ZSP are rented by medium to large companies such as international corporations and the world's top-500 companies.

The office market in Haidian Park's urban area recently faced a downturn between 2003 and 2005 when the large supply of office buildings far exceeded the absorption rate. In 2004, the construction area was over 800,000 m², while in the previous several years the total area was only 300,000 m². The large lag between supply and demand caused high vacancy rates in the Zhongguancun area, with over 1 million m² of vacant area by the end of 2004, and a 33.2% vacancy rate.¹⁹ With the adjustment strategies of city planning through reducing the supply and focusing on infrastructure construction, by the end of 2009 the vacancy rate in the Zhongguancun area had fallen to 8.9%, which is far lower than the average rate of 19.9% in the Beijing office market. The

business environment and improving physical environment have gradually increased clients, as proved by the large number of releasing and expansion activities.

While it is the nature of real estate that development companies are eager to flood the market when there is high demand, and work off the vacant space over a few years, the rental price did not reduce as a result of the office building surplus. Rather, the rent and sale price of office buildings and the electronic market in the Zhongguancun Center Area kept rising, which to some extent, threatened the survival of many small high-tech enterprises. In 2009, the annual rental price of 5A office building in Center Area achieved \$50/sf, with an average annual rent of overall office buildings in Haidian Park's urban area at \$27.5/sf.²⁰ However, at that time the average annual rent for office buildings in Beijing was \$25/sf. Most of the small high-tech companies and research enterprises cannot afford such expensive rental costs, and thus have moved toward suburban districts with lower rents. Other small business companies have gathered in crowded commercial and residential buildings with poorer conditions.

Besides the direct impact, another impact that the increased price brought to Zhongguancun area real estate is indirect but even larger. The former president of *Sina Corporation*, Zhidong Wang described a vivid metaphor: "In the past Zhongguancun was the information center of China... now it is more like a large trade market... Despite lots of funds and strategies from state and municipality, we found that there is no software product but a large real estate project... Such kind of diversity is not suitable for high technology".²¹

Thus, the development of business real estate in Zhongguancun has, to some extent, interfered with the high-technology enterprises' ability to stay on the right track.

Admittedly, some early real estate development is necessary at the beginning stage of a high-tech industrial park so as to enhance the quality and value of the entire environment. However, when real estate developers gained the land profits from preferential strategies, the burden of high rent and land prices is shifted to those high-tech enterprises seeking places to develop. Such a situation has aggravated the innovation circumstances for small to medium companies in this area. Perhaps the development entity or the city shall have the responsibility to create places with limited prices, or to reduce rental costs for developers housing startup companies, but a formula needs to be devised.

- **Development of the Electronic Product Trade Market**

The boom of electronic trade business is one of the most specific and obvious features in Haidian Park. There are nine first-generation pavilions for business exchange with 2,000 m² of land, respectively. Three large markets with areas ranging from 20,000 to 70,000 m² are established as the second-generation after the Haidian District government proposed the vision of “upgrading market and industry” in 1999.²² With the continual growth and success of the electronic product trade market, the third-generation of trade retail buildings with a much larger area was constructed subsequently. Those new buildings are large-scale high rises with multiple functions involving business, commercial, science and technology exhibition, electronic products trading, recreation, and catering.

Unfortunately, this white-hot boom of electronic retail plazas has produced a series of problems. First, the repeated construction of electronic market buildings is a waste of resources. One building area of the third-generation market has exceeded the

total amount of all second-generation buildings. Contrarily, the trend of the electronic product market is not as stable as building construction. In 2008, when the sale of electronic products was at its lowest ebb, many companies had to sublease, leave, or seek sharing.

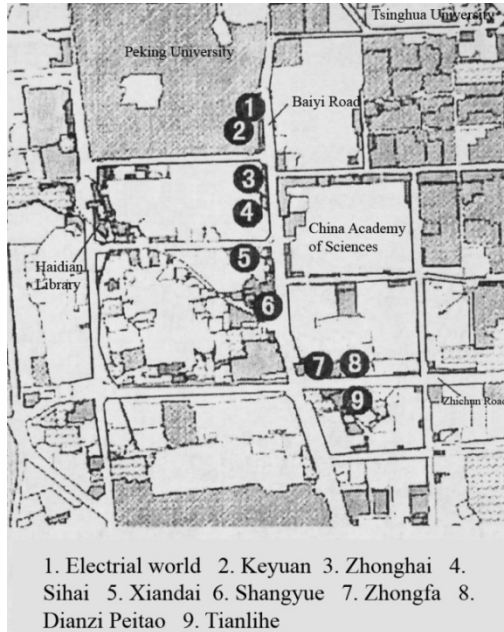
Table 3.2: List of Electronic Market Plazas

NAME OF ELECTRONIC TRADE PLAZA	AREA (m ²)	OPEN TIME
First Generation		
ZGC Electronic Trade Market	1,700	1991
Electronic World	1,500	1993
Keyuan	1,500	1996
Zhongfa	800	1994
Xiandai	3,900	1996
Shangyue	1,500	1997
Zhonghai	2,0000	1998
Second Generation		
Guigu	42,000	1999.5
Taipingyang	41,600	1999.19
Hailong	20,000	1999.12
Third Generation		
Dinghao	100,000	2002
Kemao	100,000	2002

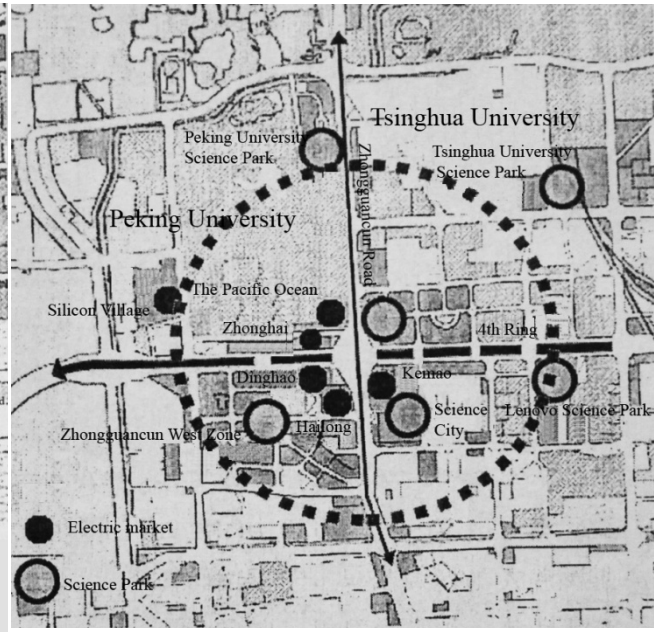
Source: Micro 98 World online, 2000, [http:// www.pcworld.com.cn](http://www.pcworld.com.cn); Dongxue Yu, *Observation of Electronic Market in ZGC*, February, 2002, <http://www.ccidnet.com>

Moreover, there is no comprehensive consideration of the connection and function distribution among those markets, which causes unnecessary competition. For instance, the E-Commerce buildings' construction in Dinghao, Kemao was a competition for the previous buildings of *Guigu*, *Saibo* on the southwest side of Peking University. In 2003, *Saibo* E-Commerce had to leave Zhongguancun, in 2003, and *Guigu* is still in a relative downturn. Most of the principal E-Commerce buildings are gathered in the core area of Zhongguancun, which lacks an effective traffic design, and hence, is the most congested area of Haidian Park. The E-Commerce buildings, as a major source of

passenger and cargo flows, undoubtedly caused traffic congestion and worsened the environment of this district.



Map 3.6: Location of 1st Generation of Market
Source: Feng Ni, "Spatial Development of High-Technology Industrial Parks: Zhongguancun Science Park as an Example." PhD Thesis, Tsinghua University, 2003



Map 3.7: Location of Electronic Trade Places
Source: Ibid

Several strategies have been adopted to solve these problems. By mixing tenants and compressing the business area, the ZGC management committee has gradually adjusted the environment and electronic industry in Haidian Park. The plan aims to move some low-end electronic market places elsewhere, and transfer more space for high technology and finance uses. As investigated in late 2010, the major E-Commerce building, *Hailong*, finished turning its 12-16 floors into office spaces, and providing some rent support to its tenants. At present, adjustments are still in progress.

4.2 An Example of Regulation Changes: Zhongguancun West Zone

After the construction of infrastructure, the land development corporations have sublet or sold their land construction rights to high-technology companies. These companies propose the site plans based on the Statutory Detailed Plan and get approvals by the Haidian Park Development Committee. Considering the rapid development of high-technology parks, the developers are allowed to make some adjustments to the regulations in the Statutory Plan. However, current practices have illustrated too many differences after construction when compared with the adjusted plan.

Zhongguancun West Zone, a 0.52 km² area, is located in the center area of Haidian District, built with the vision of being the “business center of Haidian Park.” After the construction of infrastructure under the comprehensive land use plan, the land development corporations and committee found that there had been a large change from the previous scheme due to the significant office building construction in surrounding areas. Consequently, keeping the original land use functions and the total ground floor area of buildings, new Amendatory Detailed Plan of West Zone adjusted the height, FAR, and volume of buildings on some unconstructed sites. The plan properly increases the area of commercial and public facilities, adds connections with rail stations, and further optimizes the traffic organization to meet the increasing traffic pressures in the surrounding area.

After implementation, however, the total amount of open space, retail plazas, and buildings increased from 1,300,000 to 1,500,000 m² (most of the additional areas are underground). Most of the architectural design of buildings exceeded their planned volume. The planned ground bus traffic and the second-floor penetration corridors were

not implemented, and the traffic congestion still remains a huge problem. Some infrastructure facilities, such as cooling towers, have been arranged in the center area of green space. Those gaps in the proposed schemes and transportation setbacks delayed the process of attracting investments and companies to some extent.

Several factors resulted in these disregarded practices. While various scholars and planning institutes participated in the process of planning, design, and adjustment, there is a lack of investigation of clients, public participation, research on behaviors of use, and features of high-tech enterprises. Hence, there are still significant changes that need to be made in later constructions. Another reason is that the plan lacks a control index that can be easily followed during implementation rather than FAR, green space ratio, and height. However, there is no guideline as to what forms of green spaces can and should adopt, or where the infrastructure facilities should be located. Thus, it is difficult to maintain the consistency of the development mission through a variety of plans that have been proposed and implemented by different sectors.

4.3 Changes in Land Functions

The change of land function is critical in development process. In actual development, many developers changed the land functions after acquiring the right to land construction. While at the beginning, a large part of land in ZGC was assigned as industrial use land, most of the developers change the previous industrial land into commercial or residential uses in later development to increase profit. These behaviors put the development and construction of many places in Haidian Park into disorder, and derailed the land use plans.



Map 3.8: Site Plan of Zhongguancun West Zone
 Source: ZGC Website <http://www.zgc.gov.cn>



Figure 3.5: Zhongguancun West Zone
 Source: Ibid



Figure 3.6-3.8: Zhongguancun West Zone
 Source: Ibid

The motivations for changing land functions can be explained in economic, governmental system, and legislation aspects. First of all, the differences in comparative profit between different land uses drive most industrial land adjustments. The sale price of industrial land is much lower than the price of other uses. Many developers profited significantly through paying fewer fees for industrial lands from government and later transferring them for other uses, which have much higher profits. Due to lack of planning controls at the beginning of the development, this behavior caused the over-construction of commercial and business land, but resulted in few high-tech industrial uses in development zones. Second, since local governments have tight budgets, land sale

becomes a key source of income for local governments. After selling or leasing lands and obtaining a great profit, the science park committee takes charge of the management affairs. Hence, the government is not concerned with what the developers actually do with the land. Thirdly, the “Law of the People’s Republic of China on Administration of the Urban Real Estates” clarifies that the user needs to get approval from the city planning department of the local government and municipality before changing the land function. However, the legislation does not explicitly describe to what extent land function can be changed, and in what context. Thus, many land use transitions are approved through social networking instead of rigid scientific study.

To address this phenomenon, the comprehensive plan of ZSP proposed a strict qualification examination on the use of approval sites. Through the scientific land use plan and system of industrial land supply, the plan aims to change the situation of selling land for short-term profit regardless of further land development. In the 2000s, the Beijing municipality published related regulations, which require adjusting the land price according to the status quo every 2 years to maintain consistency with the real estate market. This effectively solved the irrational price differences among land uses.

4.4 Housing Supply

- **Reconstruction of dwellings for teachers and staff**

During the time of the planned economy, the universities and research institutes constructed dwellings and related public facilities for their own teachers and staff. These houses are located near the institutes and universities. With the transition towards a market economy, housing allocation began its capitalization process in the late 1980s.

However, the residents in the university-provided housings only have the living and utilization rights of the housing without housing property, and cannot sell the residences personally. The expansion of educational institutes largely increased the housing demand in university staff; while on the other hand, in order to avoid speculation of housing real estate, national strategies have paused the construction of housing in the Zhongguancun area and have stopped approving housing projects in Center Area since 2000. Thus, many research institutes have had to reconstruct old buildings and develop new housing in places far from the urban area in Haidian Park.

The rapid growth of land price is another factor that drives the universities and research institutes to appoint real estate developers to develop the land for commercial and business uses, and compensate their residents or move them to constructed houses in the suburban area. Take the reconstruction of Zhongguancun Red House as an example. It is the first reconstruction project in Haidian Park undertaken by Chinese Academy of Science. These old dormitories, constructed in the 1950s, are low quality buildings, but have complete infrastructure and livable environments. At the beginning of the process, the reconstruction was accepted by the research faculties and staff. As the project continued, however, the residents began to reject the requirement of displacement.²³ Most of the opponents are not satisfied with the compensation, and do not want to move to suburban areas, which are in poorly developed and inconvenient environments. While they have argued the compensation price is much lower than the land value before it was transformed into commercial and business uses, there was no legal land price assessment system at that time.

An underlying factor making the reconstruction of old houses difficult is that some institutes and their residents sold their houses and use rights to other public citizens. These people cannot obtain relative compensation or replaced houses during the reconstruction process because they are neither teachers nor retired staff. For example, by the end of 1999, over 3,000 apartments in Peking University had been sold, accounting for 81% of the university's housing. Consequently, the residents of the dwellings vary considerably: some are original teachers and staff, some are public employees, and others are retired staffs who view the apartment as a social benefit from the universities. This diversity has enhanced the level of difficulty of the reconstruction process.

At last, the Zhongguancun Red House project took eight years to finish, and the removing and replacing process was not completed until 2009, which is much longer than the expected schedule. During this period, the CAS has constructed some apartments as well as associated facilities in the suburban area to replace some of the residents. A majority of original residents have now moved back to Red House after paying a negotiable price under a formed land price assessment system.

Nevertheless, the conflicts between original residents and developers are unavoidable if the systematic regulations on transferring and developing residential land are still lacking. The rising value of housing real estate in the Zhongguancun area entirely changed the original land price system. From the perspective of development entities and universities, the reconstruction project does not merely aim to extend development space, but to change the residential land for other high-value land uses. For the residents, the old houses become an effective tool for gathering profits by selling them at higher values. It

is necessary to establish a legal system to regulation this process and to achieve consistency between two sides.

- **Students and Employees**

The lack of student dormitories is another urgent problem in Zhongguancun. In addition to the increased universities and the expansion of existing ones, many private schools and training centers are rapidly being concentrated in Zhongguancun, resulting in a severe shortage of student dormitories. Thus, many private development entities have begun to hastily construct student apartments. However, neither the Comprehensive Plan in Beijing 2004-2020 nor the Comprehensive Plan of Haidian Park in ZGC has plans on the scale of educational land development. The disordered construction without planning brought huge pressure to the environment in Zhongguancun.

Moreover, the graduates, employees, and some traders significantly dominate the rent housing market in Zhongguancun. Distinct from average people, they have similar characteristics: seeking to rent housing nearby work or study places; having low incomes and thus not able to afford the high price of houses; frequently commuting with public traffic. The rentable apartments and student dormitories compose their living places.

Thus, many graduates and employees have to seek proper places to live with affordable prices. The low income class has to live in the fringe villages at the north side of the suburban area. Despite a high-level education, they have to experience hard lives in the same way that farmers do. The county of Tangjialing is such a typical place. The villagers continue developing in crowded spaces to profit from rent. During rush hour, hundreds of commuters are squashed together in transit buses just like sardines in a tin. The so-called “Ant Tribe” group has become a rigorous social problem in Haidian Park.

Tangjialing Village is one of these examples. Located to the north of Beijing Haidian Park, this small-scale village originally had 3,000 residents and it was a place where people could complete walking around in less than one hour. Currently, it has over 50,000 migrants, most of which are students and workers in Haidian Park. The houses vary greatly in size, from small rooms of a few square meters to large rooms over 10 m². The environment is in extremely bad quality.

5. Lessons

5.1 Interaction between the City and the High-Technology Park

The planning and design of Zhongguancun Science Park is closely related to the entire development plan of Beijing city in terms of site selection, impacts of plans, and land use distribution. Zhongguancun Science Park is not merely a single project, but a key element in developing the entire city. Located in urban areas, Haidian Park gained rapid development with an abundance of supportive factors, such as well-planned urban development strategies, concentrated intellectual resources, plenty of labor resources, and complete infrastructure. In turn, the rapid economic growth of Haidian Park has led this northwest cultural area to become one of the most important areas in Beijing.

There is an active and effective relationship between Haidian Park and the development of policy for the entire city of Beijing. It is the “Electronic Street’s” bottom-up development that first demonstrated the prominent power of the science and technology enterprises’ agglomeration, which then gained the government’s support to develop the Zhongguancun area as the city’s high-tech industrial center. On the other

hand, a successful science park is not and cannot be a “stand alone” venture. It is intimately connected to and involved in the implementation of national and regional innovation policies. Without a comprehensive plan and government guidance, it would be hard for the previous electronic street to transform into today’s top high-tech industrial zone.

The amendment of city planning has effectively guided the development of ZGC through land assignment, improved infrastructure and transportation, increased building construction, and enhanced public facilities. According to the over-rapid urban development rate, however, to some extent, the planning still lacks well-implemented and up-to-date measures. As such, this has left plenty of areas for improvement. For instance, Haidian Park lacks an effective organization to deal with needs like housing for students and workers. Furthermore, while multiple roadways and light rail lines have been constructed to connect Haidian Park with other districts in Beijing, the traffic congestion within the park requires additional time to be solved.

5.2 Changes in Natural Resources and the Cultural Environment

In addition to the business and high-technology industries, the cultural environment is a key feature of Zhongguancun Science Park. The cultural environment of ZGC contains not only the royal gardens and places of historical interest, but also the university culture and business commercial lifestyle.

Many research institutes and universities have developed surrounding vacant or low efficiency land into University Science Parks. The construction of Tsinghua University Park reused the land with original disorganized construction, and brought

business activities and high-quality environments. Peking University Software Park appeals to high-technology companies not only due to its safety, complete infrastructure, and convenient physical environment, but also because it is a cultural place with various exhibitions, studios, museums, and famous bookstores. The cultural and commercial real estate development has shown an organic combination of university culture and business, and has attracted a large number of students and employees.

However, the development of Haidian Park has threatened the natural environment. The increased high-rises broke the skyline of some royal gardens; the irrational road and traffic design divided the landscape into separate parcels without internal connections; the expansion of the urban area replaced the original natural resources surrounding Summer Palace, such as rivers, water systems, and paddies. It is necessary to propose building guidelines and environmental regulations to control the construction behaviors.

5.3 Legislation and Regulation for Approval

Planning control and environmental construction are in need of regulation and relative legislations. Thus, Zhongguancun Science Park has been at the forefront of the national HIDZs in the legislation of management. Beijing municipality promulgated "Regulations of the Zhongguancun Science Park" in 2001, which has provided the legal basis and guidelines for the future development and activities of high-technology enterprises. The park is now moving at a vigorous pace to promote technological innovation in accordance with the principle of "Bold innovation in the areas shall not be banned by the law."²⁴ This is the first legal regulation for science and technology parks in

China. Rather than a pure administrative legislation, the “Regulations of the ZGC” are more like comprehensive ordinances involving the economy, science and technology, education, and administration.²⁵

Research shows that up until now, the large enterprises have tended to prefer the innovative environment of the district rather than specific support strategies.²⁶ With regard to planning management, the innovative environment includes the convenient approval process of projects, complete construction of infrastructure, public service, cultural atmosphere, and physical environment.

Consequently, the planning committee has intensified the approval of planning and construction. The Zhongguancun Management Committee and Haidian Park Development Committee have decentralized their power of approval on some planning, design, and construction activities to the local related departments. In the past, many applications initially had to obtain approval in the district government, and then apply further to the municipal department. The “Regulations of the ZGC” streamlined the application process in aspects of housing construction project reports, construction permits, planning approvals, evaluations on constructed projects, and reviewing fire and security, among others. For instance, the application for a construction permit was reduced from an original processing time of 250 business days to 84 days. The main approval aspects in initial land development have reduced from 49 to 20.

To sum up, during the development process, the Zhongguancun Science Park Development Committee also faced a series of challenges involving the support of high-technology development, addressing residential and commuting issues, avoiding traffic

congestion in this mixed-use urban area, and controlling expansion toward suburban areas. For instance, the development of science parks and high-technology enterprises has resulted in increasingly high land prices, thus attracting many real estate developers but limiting smaller high-technology firms. The construction of business buildings has brought additional traffic volume to this district as well. Moreover, a majority of employees have to choose long-distance commuting rather than residing in this area. Many institutes also transfer their residential lands into commercial use for more profit, causing the original residents to be displaced.

The ZGC Committee implements a series of planning strategies to address these problems, involving endorsing regulations to limit non-high technology real estate development, management and organization, establishing a land use development system, and improving public-transit and road construction. As a pioneer of national HIDZ, ZGC's experiences with approaches to planning have been adopted by many other HIDZs with similar characteristics and, more importantly, provide lessons for further practices.

¹ *Beijing High-Technology Industrial Development Plan 2001-2006*.

² *Beijing Zhongguancun Science Park Development Record 1980-2009*. (2010)

³ National Bureau of Statistics of China, ed, *China High-Technology Industry Development Yearbook 2008* (2009).

⁴ *Beijing Haidian Park Development Yearbook*. 2009.

⁵ From 1966 to 1976 there was a comprehensive reform movement in China initiated by Mao Zedong in 1965 to eliminate counterrevolutionary elements in the country's institutions and leadership. It was characterized by political zealotry, purges of intellectuals, and social and economic chaos. This movement caused city planning to suspend execution, and the construction of Northwest Area to bog down during this period.

⁶ "*Development Record 1980-2009*", 91. the head of the committee was Mayor Jiao, Ruoyu.

⁷ *Ibid*, 91. the group includes Tsinghua University, Peking University, CAS, CSE, etc.

⁸ *Ibid*, 363.

⁹ *Ibid*, 2.

¹⁰ *Ibid*, 408.

¹¹ *Ibid*, 679.

¹² *Ibid*, 91. In 2009, Zhao, Fengtong, the president of standing committee of Beijing municipal was arranged to be the party leader of Haidian District and the party leader of Zhongguancun Science Park Development Committee.

¹³ *Beijing Haidian Park Development Yearbook*, 2002, 718

¹⁴ “*Development Record 1980-2009*”, the other three research institutes are Chinese Academy of Agriculture, Beijing Institute of Technology, and the fifth institute of China Aerospace Corporation.

¹⁵ *Regulations of Zhongguancun Science Park*. 2001.

¹⁶ *Beijing Haidian Park Development Yearbook*, 2006.

¹⁷ Dushiguangyu Co. Ltd. ed. *Report of Zhongguancun Science Park Real Estate Market, 2008-2010*.

¹⁸ *Ibid*.

¹⁹ *Ibid*. In this report, in 2009, the average vacancy rate of 5-A office buildings in Beijing is 13.4%, and 3.8% in CBD.

²⁰ *Ibid*. The average rent price of 5-A office buildings is \$25/sf per year in 2009.

²¹ Zhongguancun Online, “Interview of Zhidong Wang”, (2001), <http://news.zol.com.cn>.

²² *Beijing Youth Daily*, April 13, 2010.

²³ “*Development Record 1980-2009*”.

²⁴ “*Regulations of Zhongguancun Science Park*.” 2001.

²⁵ Jun Chen and Bin Fan, "Highlights in Regulation of Zhongguancun Science Park." *Beijing's View* (2001).

²⁶ Tihua Jing and Zihzong Liu, "From Development Zone to a New Town: Beijing Zhongguancun Science Park." *Beijing Planning View* 1 (2006).

CHAPTER 4: SHANGHAI ZHANGJIANG HIGH-TECHNOLOGY PARK

1. An Overview

Shanghai Zhangjiang High-Technology Park (ZJ) represents a Type 2 national High-Tech Industrial Zone (HIDZ), integrated into urban areas and developed into a single high-technology research and development (R&D) zone. Zhangjiang, located in the middle of Pudong New Area, has a planned area of 25 km² and sits 9 km away from the Lujiazui Financial Trade Zone around Century Park, which includes several key state-level industrial bases, such as Pudong Software Park, Integrated Circuits (IC) Industrial Park, and Biomedical Industrial Base. High-technology development accounts for over 60 percent of the land use. With 125,600 workers, Zhangjiang High-Technology Park produced ¥42.14 billion GDP in 2008, accounting for over 50 percent of the entire GDP of Shanghai National HIDZ.

Governmental support in introducing investment and funding resources has contributed importantly to Zhangjiang's success. Founded in 1992, Zhangjiang High-Tech Park did not see development until August 1999, when the Shanghai Municipal Committee and Municipal Government created a new strategy, "Focus on Zhangjiang," and identified the IC industry, software industry, and biomedicine as the foremost industries of the Park which would play a leading role in innovation.

ZJ Park, together with five other high-tech parks, comprises the national HIDZ in Shanghai, renamed "Shanghai Zhangjiang HIDZ" in 2006 (also called "Big Zhangjiang"). The five parks include: Caohejing New Technology Development District, Shanghai

University Science Park, China Textile Technology City, Jinqiao Modern Technology Park, and Jiading Private Company High-Technology Agglomeration Zone. The concept of a big group of national HIDZs in Shanghai began in the early 1990s. From 1991 to 1998, six high-tech parks successively joined this group. Different from Beijing Zhongguancun Science Park dominated by Haidian Park, no one park dominates the HIDZ in Shanghai. Rather, the six parks, located in separate areas, have their own respective management and remain isolated from each other with regard to industrial development and management. After the land adjustment of the Development Zones in 1999, the planned area of ZJ Park increased from the original 5 km² into 25 km². Hence, the entire HIDZ area increased from 22.1 km² to 42.1 km².



Map 4.1: Shanghai ZJ Park and Other 5 Dispersed Parks
 Source: Author draws based on Shanghai map, 2010.

While located within Pudong Area, the area included only the original Zhangjiang town and a few villages during the early stages of the Zhangjiang High-Technology Park. A small town, Zhangjiang did not afford enough infrastructure and road support for the new development; hence, new construction makes up most of ZJ Park's industrial uses. Moreover, since the Pudong Area experienced a short development period, few research and educational resources existed in this district. However, ZJ Park tailored a series of strategies to overcome these deficiencies and enhanced the development intensity of high-technology industries as an R&D- oriented park. With extension, ZJ Park also developed many associated functions to address housing and living issues of workers, providing useful experience for other similar HIDZs.

2. Historical Evolution

While Zhangjiang High-Technology Park belongs to the “Big Zhangjiang,” the six dispersed parks have had isolated development and serve each district, respectively. Thus, compared with the evolution of the entire Shanghai national HIDZ, Pudong New Area, the location of ZJ Park, has had a more significant impact in Zhangjiang's development.

2.1 Development of Pudong New Area

The triangular Pudong Area sits to the east of the old city of Shanghai, across the Huangpu River. In the first half of 20th century, while Shanghai ruled as an international metropolis, the Pudong Area formed a vast farmland and brown field area of warehouses filled with oilcans. In the early 20th century, two plans arose for, the “East Harbor Plan” and the “Big Shanghai Plan.” Taking lessons from Washington, D.C., and Chicago, the

plans aimed to establish a harbor and a new district in Pudong Area. However, subsequent economic crises and wars stymied implementation of the plans.

Since 1990, when the Central Party Committee and the State Council announced the opening and development of Pudong, the Pudong New Area has achieved sustained, fast, and sound economic development. Investment from home and abroad has poured into the new area. Historically, Pudong's development had five stages: (1) 1984–early 1990, the preparation stage; (2) 1990–1991, the beginning of Pudong's opening and development; (3) 1992–1995, infrastructure construction; (4) 1996–2000, functional development together with infrastructure construction; and (5) 2000 to the present, rapid development through city management and construction completion. In a short 19 years, a dramatic change has taken place in Pudong—from farmlands to towering buildings and from out-of-the-way villages to prosperous urban area.¹

The 1999–2020 Comprehensive Plan of Shanghai Municipality designates Pudong Development as an area leading Shanghai City towards “an international metropolis and one of the world's economic, trading and shipping centers.” Consequently, Pudong Area proposed a spatial development pattern consisting of one axis and three corridors. The main axis, the west-east development line of high-speed communication, connects Pudong International Airport and Hongqiao International Airport. Corridor 1, Huangpu Riverside Corridor, has the Lujiazui Financial Trade Zone as its core and focuses on the modern service industry; Corridor 2, Middle Development Corridor, consists of ZJ Park and other state-level development areas and focuses on high-technology and manufacturing industries. Corridor 3, the Seaside Corridor, emphasizes logistics and industry surrounding the harbor.



Map 4.2: One Axis, Three Corridors in Pudong Area
 Source: *1999–2020 Comprehensive Plan of Shanghai Municipality*

Under this spatial pattern, four state-level development areas exist, including Lujiazui Financial Trade Zone, Zhangjiang Hi-tech Park Zone, Jinqiao Export Processing Zone, and Waigaoqiao Bonded Zone. Each development district has its own distinct functional concerns. Lujiazui Financial Trade Zone, designated as the new financial hub of modern China, sits at the western tip of the Pudong district. ZJ Park focuses on development of the IC industry, the software industry, and biomedicine. Jinqiao Export Processing Zone is the center of modern manufacturing, and Waigaoqiao Bonded Zone, the harbor area, involves imports and exports. In 2004, with two newly added zones—Sanlin Area for the 2010 World Expo and Chuansha New Town, the Pudong Area grew to include six main functional areas.

The development of ZJ Park largely relies on the Pudong New Area that provides economic bases and functional support to ZJ and guarantees that ZJ pursues high-technology industries. Lujiazui Financial Trade Zone represents the direct financial source for ZJ Park. As Shanghai’s new commercial and business center, it has also introduced other enterprises into the Pudong Area and spread the word about Zhangjiang.

Waigaoqiao Bonded Zone and Jinqiao Export Processing Zone serve as manufacturing and foreign trade service centers for Zhangjiang High-Technology Park. The original Zhangjiang Town provides the residential area for Zhangjiang’s workers.

2.2 Development of Zhangjiang High-Technology Park

- **First Seven Years (1992–1999)**

In its first seven years, from 1992 to 1999, ZJ Park experienced very slow development. In 1992, ZJ Park Development Company was established, indicating the beginning of ZJ Park. After the State Council approved ZJ Park as part of a national HIDZ, the Pudong New Area government proposed two years for construction of infrastructure for ZJ Park. However, due to lack of motivation, ZJ remained a farmland two years later.

Table 4.1: Events of Shanghai ZJ Park from 1992 to 1999

1992.7.28	Zhangjiang High-tech Park Development Company was established
1993.12.30	First Highway: Longdong Avenue opened to traffic
1994.5.16	First foreign funded venture: Roche China entered Zhangjiang
1995.1.10	The first incubator base was established
1996.8	The first state –level industrial base: State Biotech and Pharmaceutical Industrial Base in Shanghai was established
1997.9.14	Pudong Software Park started
1998.10.29	The first state-level research center: chinese National Human Genome Center at Shanghai was established
1999.8.26	The strategy of “Focus on Zhangjiang” was announced

ZJ Park has gradually established several industrial bases since 1994 when it signed its first foreign-funded venture with Roche China under the auspices of the Pudong New Area government. However, most of the industrial projects faced terminations and adjustments in later years, as exemplified by the experience of Pudong Software Park. Established in July 1992, Shanghai Pudong Software Co. Ltd was called Shanghai Pudong Software Company. However, till 1998, the company had difficulty in issuing wages and returning bank loans while the employees labored in an old facility. The real planning and construction of the software park did not start until 1997 when Shanghai Municipality and the former Ministry of Information Industry jointly established Shanghai Pudong Software Co. Ltd. Since that time, Pudong Software Park has turned a corner toward the state-level software industrial bases under funding support from both national and local governments.

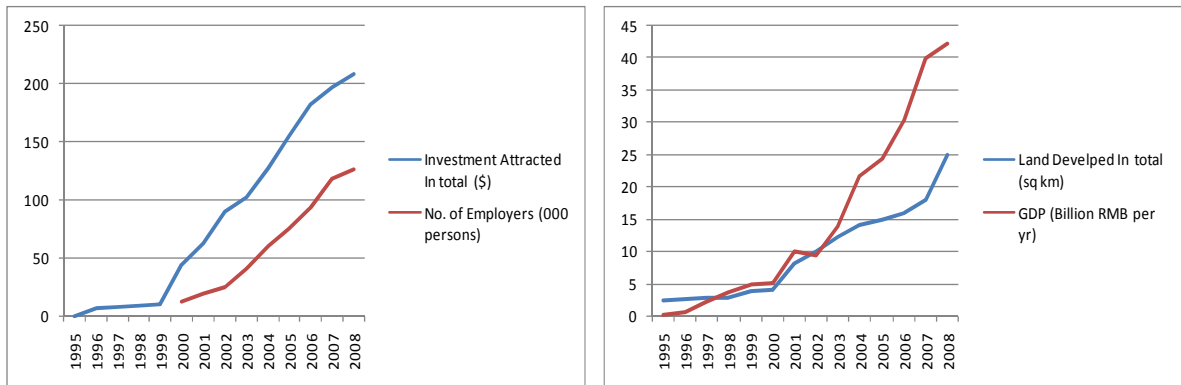


Figure 4.1: 1995-2008 Development Indicators of ZJ Park
Source: Shanghai Statistics Yearbook 1995-2009.

From 1992 to 1999, ZJ Park only extended its land area from 2.33 km² to 2.8 km². The growth rate of the GDP and increasing numbers of enterprises was slow. However, Zhangjiang High-tech Park has preliminarily established the framework for bases in the biomedical and information industries. Moreover, construction of the physical

environment formed a solid base for further development. By 1998, ZJ Park had completed the landscape construction of two boulevards and established green parking and several public places.

- **“Focus on Zhangjiang” Strategy**

The improvement of Zhangjiang’s development occurred in 1999, a year that also marked the tenth year of Pudong New Area’s development. With the remarkable achievement of Pudong, officials began to consider where to concentrate their efforts for the next ten years. Since ZJ’s development lagged far behind the other development zones in Pudong, the Shanghai Municipal Committee and Municipal Government decided to gather more resources to promote the development of Zhangjiang High-tech Park. As Renjie Qian, former secretary of the Party Committee of Zhangjiang Development Area in Shanghai and former president of Shanghai Zhangjiang ZJ Park Development Co. Ltd, stated, “Because Pudong Development is an important national policy, as a center area of Pudong Area, the decision to develop Zhangjiang High-Technology Park is a key strategy under state governmental guidance.”² As mentioned earlier, in 1999 the Shanghai Municipal Committee and Municipal Government announced the strategy, “Focus on Zhangjiang,” and identified IC and software industries as well as biomedicine as leading industries of the Park that would play a leading role in innovation.

The motivation for Zhangjiang differs from either Silicon Valley or even Beijing’s Zhongguancun Science Park. Silicon Valley arose organically with various enterprises. Zhongguancun Science Park had many scientists gathered together to create an innovation environment at first, and then attracted the attention of the government.

Zhangjiang, however, was a product of systematic governmental. The “Focus on Zhangjiang” strategy expresses the top-down support from the state government. The strategy explicitly required ZJ Park to concentrate on high-technology industries for economic effects of agglomeration to leave flexible space for further development.

With the intellectual resources and investments provided by the government, ZJ Park has achieved rapid development. For example, many key state-level industrial bases subsequently entered ZJ Park, such as State Biotech and Pharmaceutical Industrial Base, National Information Industry Base, National IC Industry Base, and State Software Industrial Base. Zhangjiang has many incubators and pioneer parks created for overseas graduates to start their companies.. The first phase and second phase of Pudong Software Park came about in 2000 and 2002, respectively, in a land area of 120,000 m². By 2007, 750 enterprises had taken root in this park, including over 200 companies focused on the software industries involving financing, telecommunications, and information security.

From 2000 to 2005, the increased industrial lands of ZJ Park attracted foreign investments at the rate of 1.5 billion dollars per km².³ In the year 2004, personal income in the park achieved 69,000 dollars. The two indicators had achieved the same level as Taiwan Hsinchu Science Park by 1999. In 2008, Zhangjiang had 125,600 employees. The GDP of ZJ Park was ¥42.14 billion, with total business income of ¥83.97 billion.

3. Key Strategies

3.1 Land Use Plan and Phasing

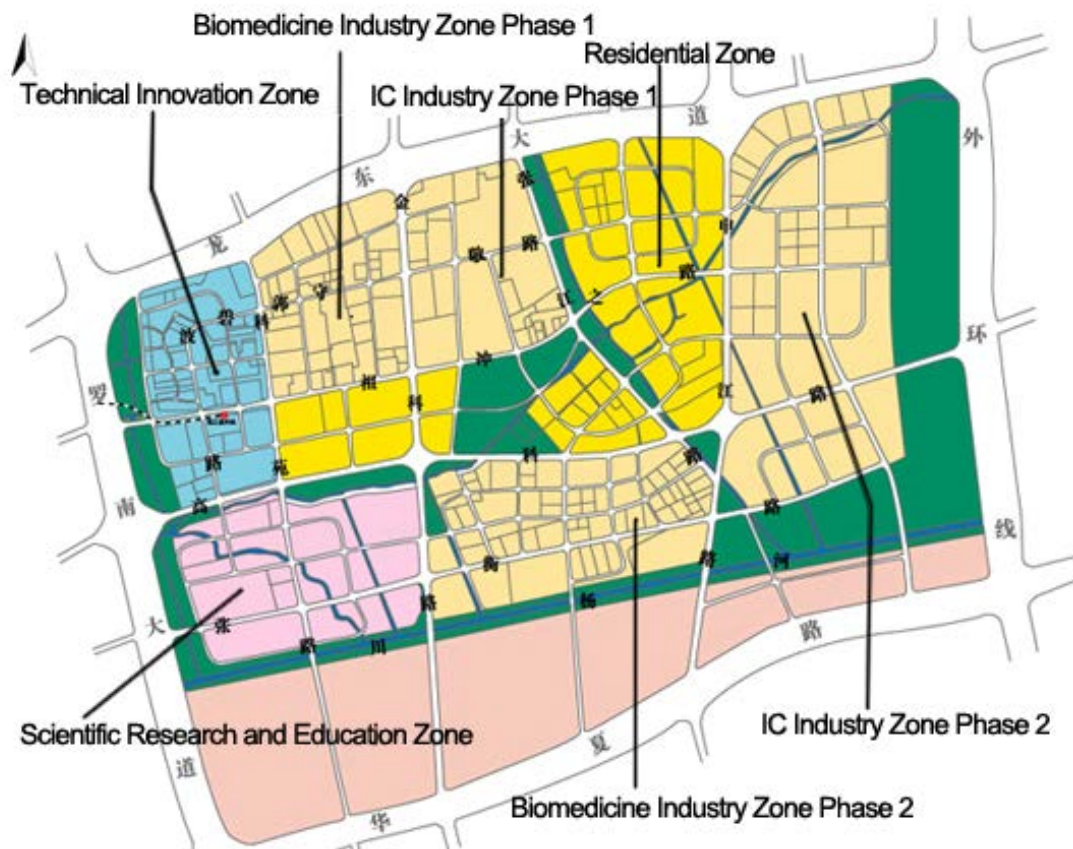
ZJ Park has had a three-phase plan. In 1992, Shanghai Municipality adjusted the planned area of Zhangjiang High-Technology Park to 5 km². Later in 1999, the strategy of “Focus on Zhangjiang” extended its range to 17 km². An area of 17 km² called the “North District” of Zhangjiang, represents the core area of ZJ. In the year 2000, ZJ extended an additional 8 km² land area to the south and thus reached the total planned area of 25 km². The additional area included the “Middle District” of Zhangjiang. The North District has been completely developed, and the Middle District is under construction. The *2010 Zhangjiang High-Technology Park Plan* proposed a South District to the south of the Middle District, consisting of the surrounding new towns. The South District, planned as the server to ZJ Park, will include a residential service center, small industrial bases, and logistics bases.

The North District, the most important industrial area in ZJ Park, consists of many complete functional zones: the Technical Innovation Zone, the High-Tech Industry Zone, the Scientific Research and Education Zone, and the Residential Zone.

The Technical Innovation Zone, a key zone started with the implementation of “Focus on Zhangjiang,” primarily involves innovation incubation for tens of universities and R&D institutions and also provides office areas for some hi-tech companies. The central part of the zone, planned as a service center in the functional zone, occupies an area of 1 km².



Map 4.3: Three Phased Districts of ZJ Park
 Source: ZJ Park Website <http://www.zjpark.com>



Map 4.4: Land Distribution of ZJ Park (North District)
 Source: Ibid.

The Hi-tech Industry Zone comprises two phases of the Biomedicine Industry Zones and two phases of the IC Industry Zone. Biomedicine Industry Zone (Phase 1) sits to the south of Longdong Avenue, to the west of Jinke Road, to the north of Zuchongzhi Road, and to the east of Keyuan Road, occupying an area of 1.5km². The Biomedicine Industry Zone (Phase 2) is adjacent to the arterial Gaoke Road, with a total area of 1.5km². The five roads in the Park give it a checkered pattern and connect it with the arterial Gaoke Road, Jinxie Road, and Zhangheng Road, thus forming a convenient roadway system. The IC Industry Zone (Phase 1) is to the south of Longdong Avenue, to the east of Jinke Road, to the north of Zuchongzhi Road, and to the west of Zhangjiang Road, occupying an area of 1.5km². The IC Industry Zone (Phase 2) is about 2.74km² with Subway Line No. 2 going through it. The Park will be divided by three traverse arteries from east to west and one vertical artery from south to north.

The Scientific Research and Education Zone takes advantage of the national light source project and attracts more scientific research institutions and postgraduate schools of science and engineering universities and colleges. In addition, the Scientific Research and Education Zone has a residential service zone to the north, which provides necessary residential services to researchers, professors, and students.

The Residential service center, located alongside Jinke Road, at the intersection of Zuchongzhi Road and Subway Line No. 2, offers an independent residential area with infrastructure. The Residential Zone also includes the Residential Zone (Phase 1 and 2) and two migration bases at the Park. This zone was developed based on the original Zhangjiang Town, a relatively lower-quality environment. The town's limited housing cannot provide for the residential demands of the over 125,600 workers in ZJ. Thus,

many employees commute to surrounding residential areas in Pudong. The *2010 Plan* also proposes the South District to solve the residential needs.

3.2 Land Development

Two entities directly lead ZJ's development affairs. One is ZJ Park Development Committee, appointed by both Shanghai municipality government and Pudong Area Development Committee, taking charge of delivering policies and strategies of upper governments; another is ZJ Park Development Company, which was established as a semi-public company in charge of land development and construction of infrastructures. The ZJ Park Development Company played an important role in initial land development with tight initial capital. With the maturity of ZJ's development, ZJ Park Development Company faced a transformation from governmental agent to private real estate developer.

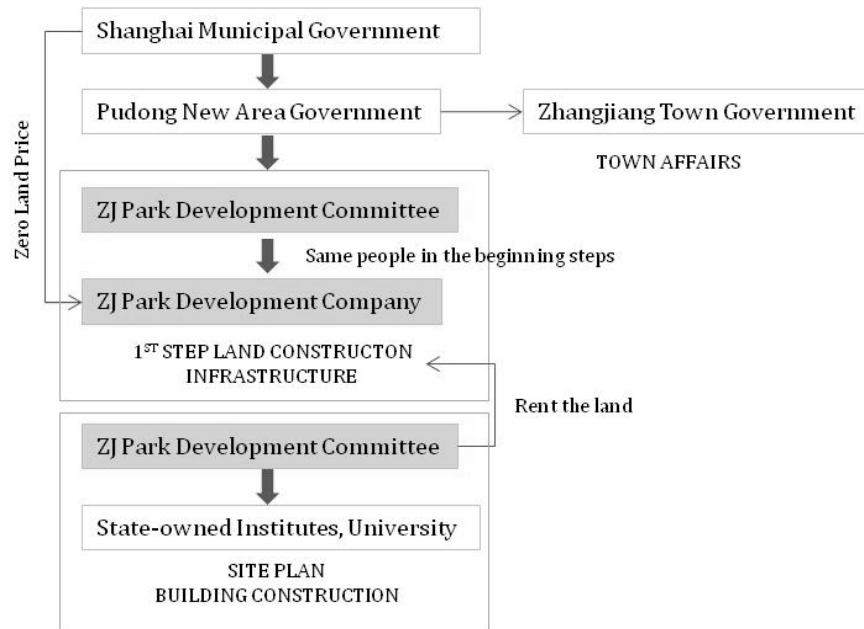


Figure 4.2: Land Development Organization of Shanghai ZJ Park

- **Initial Land Development Agreement**

In 1992, the government's financial condition could not allow for the construction of ZJ Park. The entire income of the Pudong Area Committee was only ¥1.2 million with no extra capital to invest in infrastructure. Thus, the government transferred the burden of infrastructure investment to the ZJ Park Development Company in a creative way.

Shanghai Land Management Bureau and ZJ Park Company signed the *Zhangjiang High-Technology Park Development Company Regulations and Agreement of Transferring Land Use Right of ZJ Park* in 1992. As interpreted in the agreement, Shanghai Municipal Finance Department assessed the cost of land rights transfer at ¥0.25 billion. The Pudong Area Committee paid this amount of capital to ZJ Park Company with a check as a governmental sponsor. Meanwhile, the Company bought the land use rights from the municipal government at the same amount of capital with the check. Thus, the development company gained the land use rights at zero cost, and the government successfully transferred the task of infrastructure construction to the development company.

This development by zero-capital rollover highlights a particular Chinese approach to high-technology parks: the government lacks the initial capital for construction but has great power in controlling land use rights. Through this approach, the government legally transfers the development responsibility to the development company. As some scholars said,⁴ “In Chinese High-Tech Park development... it is a typical phenomenon that the government appoints the development company to take the

responsibility of both costs and benefits. The land development process has become a production procedure of commodity.”

- **Transformation of the Development Company**

At the beginning of development in ZJ Park, both the ZJ committee and the development company had the same mission—to carry out land development and construction on behalf of the Shanghai municipality government and Pudong Area government. With the completion of infrastructure and distribution of land parcel by parcel, however, the development company began to seek new ways to achieve economic benefits rather than simply relying on land leasing. On the other hand, the specific identity of ZJ Development Company as a governmental agency has led it to include real estate services and public facilities into its operations.

The operations of real estate largely depend on user demands. Currently, the high-technology enterprises in ZJ Park involve three types: IC industrial companies, biomedical research and production manufacturing, and software companies. Distinct from the traditional industrial companies, these high-tech enterprises have several specific characteristics: (1) most of them experience rapid growth with large quantities; (2) the larger enterprises have multiple ways of financial support from international investment, governmental support, and domestic capital infusion; (3) they have strong profitability with Net Profit Margin around 20–30 percent; and (5) more and more international companies have located their headquarters in ZJ Park, such as GE, Dupont, and IBM.⁵ In general, these clients need increasingly large-scale facilities, especially for high-technology research and development to support the entire industrial chain, with fewer concerns about price issues.

Consequently, ZJ Development Company has mainly transferred its operation tasks to two fields: (1) the real estate property developed for high-technology enterprises, and (2) public facilities as well as high-end real estate services. In terms of real estate property, ZJ Company provides the enterprises a series of tailored properties, such as headquarters, research and development centers, training and educational bases, and industrial incubators. Given the amount of time construction would take for all these properties, ZJ Company purchased over 130,000 m² of rentable properties in 2006. Since then, the rental rate of real estate property of the ZJ Company has been at 95 percent, becoming a strong capital source for the company's development and other operations. Moreover, hotels offered another new field for ZJ Park Development Company. Regarding high-technology and business enterprises as its major clients, the ZJ Development Company provides high-end hotel facilities and services and has achieved an almost 100 percent occupancy rate at their business hotels.

Under the guidance of the government, ZJ Development Company also provides specific services for medium to small high-tech enterprises. These companies just beginning their development often find themselves in an unstable status, requiring financial investment as well as facilities support. Thus, in addition to the Pudong Area government's providing funding support and bringing in board funding for them, ZJ Development Company provides a series of services involving consulting, industrial value assessment, development report, and stockholder investments.

3.3 Government Management

When the land development companies transitioned to real estate-based operations, the roles of the government and committees changed as well during the development process of ZJ Park. The major responsibilities of Zhangjiang High-Technology Industrial Park Committees have changed from originally representing preferential policies, to construction, planning management, and granting approvals.

First, the Pudong Area government enacted a series of legislation and preferential strategies to attract more funding and research institutes and to regulate the planning, management, and construction of ZJ Park. In 2001, Shanghai Municipality issued the *Several Provisions of Shanghai Municipality Promoting the Development of Zhangjiang High Technology Park*. The *Provisions* encourage foreign institutions to set up venture capital enterprises in the Park.⁶ Qualified applicants are entitled to streamlined procedures for incorporation in the Park.⁷ Multiple-exit permits are made available to the personnel of the enterprises in the Park under the simplified application procedures for overseas business travel.⁸ The *Provisions* also outline the management structure of the Park, which includes a project appraisal commission largely consisting of professionals. This represents the first official regulation of construction at ZJ Parks.

In terms of construction management, the development committee offers a support series to high-tech companies. The government affords direct rent subsidy to high-tech enterprises located in the software Park, aiming to reduce entrepreneurs' initial investments. The development committee also provides long-term land concessions to basic scientific research projects. In the meantime, the regulations require the committee to give some high-tech enterprises with self-innovation capability and high-growth

character both land and rent concessions through options or shares. These measure serve to promote high-tech enterprises' rapid growth within three to five years.

The process of adjustment of planning approval evidenced the growth of planning management in ZJ Park. Since ZJ Committee does not have the administrative power for planning and construction, all the projects should get the approval of the Pudong Area government and planning department. Before the year 2000, when Pudong Area established its local government, all the projects had to get a permit from Shanghai Municipality, resulting in a very long approval process. In addition, ZJ Park not only includes Zhangjiang Town, but also covers several other villages and small towns. The multiple layers of organization brought difficulty and complexity to the implementation process. Thus, Shanghai Municipality and Pudong Area government authorized ZJ Park Committee to take charge of approving all the plans and projects in 2001. After that, the committee established a planning approval platform to enhance efficiency of the approval process. It also abbreviated the approval forms from 87 items to 38.

3.4 Transit Program

The Shanghai municipal government and Pudong Area selected the location of ZJ Park as the middle area of Pudong for its average distance to several other functional zones and aimed to extend Pudong Area toward the south. However, in the beginning ZJ Park comprised farmland without convenient connections to surrounding areas.

Consequently, the transit program of ZJ Park responded with three major aims in mind:

(1) to enhance the accessibility from surrounding key zones into Zhangjiang; (2) to strengthen the ties with several important resources lacking in the park; and (3) to benefit

flow and circulation within the park. Multiple ways are used to achieve the three strengths.

In terms of a road system, ZJ Park connects with the inner-ring road through the Longdong Avenue to the north of the park, an important channel connecting the inner-ring road and Pudong International Airport. The Luonan Avenue to the south of the park, another main road, connects the inner-ring road and outer-ring road. The subway No. 2 line from Hongqiao International Airport to Pudong International Airport passes through ZJ Park as well, with three stops in the park. The subway line also connects several key places in Shanghai, such as the Century Park, Lujiazui Financial Trade Zone, and the People's Square, providing high efficiency for people in Zhangjiang.

Shanghai ZJ Park lacks educational resources and universities. At the beginning of construction when few research bases and institutes had moved into the park, Pudong Area government constructed two public transit lines, which connect Fudan University and Shanghai Jiaotong University to the park, intending to bring higher accessibility for educational resources to ZJ Park.

Moreover, more than 50 bus lines cross Zhangjiang, over 10 of which are the main bus lines in the Park. In 2006, Zhangjiang High-tech Park opened a trolley line, which is 10 km in length with an investment of ¥600,000,000. The origin of the line is the same as Subway Line No. 2's Zhangjiang Station, with the terminus at the north of the IC Industry Zone (Phase 2). The trolley line has 15 stops. The average distance between two stops is about 620 meters. In total, nine trolleys run in the park with intervening times of eight minutes. The trolley line covers almost all the major industrial bases, research

institutes, hospitals, and residential areas. The transit program reorganized the original bus lines to cover the remaining areas of the park.



Map 4.5: Road Network of ZJ Park and Surrounding Area
Source: Author draws based on Shanghai map 2010.



Map 4.6: Trolley and Subway Lines in ZJ Park
Source: ZJ Park Website <http://www.zjpark.com>

Figure 4.3-4.5: Trolley, Shuttle, and Subway
Source: Taken by Author in 2010.

4. Outcomes and Features

4.1 Planning Adjustment

ZJ Park has experienced many adjustments when facing problems throughout the development process, and the corresponding measures taken have provided the lessons and references for other parks. The first structural planning of Zhangjiang High-Technology Park began in December 1992. This plan divided the Park's land use into three parallel zones from west to east: Service and Research Zone, Industrial Zone, and Residential Zone. The Industrial Zone was placed in the middle, occupying two-thirds of the entire area, completely separating the Service and Research Zone from the Residential Zone. This plan separated the land use functions of the park and simply wedged industrial use together with other land uses. Because of ZJ Park's slow development in the early years due to lack of investment and projects, this plan was not implemented.

The *1995 Amendatory Structural Plan of Zhangjiang High-tech Park* made big changes to the previous plan, and formed the present framework of Zhangjiang. It increased the residential area from 0.8 km² to 1.7 km², and also enhanced the ratio of research and education of the whole area. Instead of the former parallel style of land use, this plan extended the residential use to the center of the park. It established a grid-like road network instead of the previous ring road, strengthening the links among different functional zones. The plan proposed rail lines into the park setting up multiple stations and placing several commercial centers around the stations. Also, each functional zone has a small service center.

The 1995 plan was perfectly implemented except for the northwest functional zone, which was proposed as a commercial and residential use with high-rise buildings. At that time, commercial activities were happening in Lujiazui Financial Trade Zone, and Zhangjiang Park only attracted some research bases and manufacturers, which did not provide enough users for either the commercial buildings or high-rise housing. This area was changed into Technical Innovation Zone in a later amended plan in 1999, with low-rise buildings as incubators and standard office spaces for young high-technology enterprises.

The amended plan in 1999 and 2000 extended the construction area to 25 km², with most of the added areas used for research bases and educational institutes. Currently, the research and educational uses occupy a quarter of the entire park's surface area, highlighting the research characteristics of ZJ Park.



Map 4.7: Land Use in ZJ Park
Source: ZJ Park Website <http://www.zjpark.com>

During the implementation process, however, an amendment changed block size and FAR in 2000. The previous plan imitated the pattern of Silicon Valley, with its low-rise buildings and green gardens. Thus, the initial plan set up each block with 5–10 hectares, and the amended plan in 2000 required the FAR of research and educational zone to be less than 0.55, and the FAR of Technology Innovation Zone to be less than 0.85. However, the low-density, “Silicon Valley land development style” does not fully apply to Zhangjiang. While the size of block can satisfy most small high-technology enterprises, many research bases, manufacturers, and educational institutes require larger and more isolated sites of around 20 hectares. Moreover, Zhangjiang’s mature and rapid development requires a large amount of construction and high intensity land use. Thus, currently most sites in ZJ Park have changed the FAR to 1.2 or 2.

While the construction of each zone was adjusted during the implementation process due market conditions, the basic framework and structure of ZJ Park was set up through the initial plans and kept the R&D characteristics of Zhangjiang Park. While ZJ Park was established around the original town, most of the expansion took place in farm lands. Thus ZJ Park has had more opportunities to create a green environment rather than filling up urbanized areas. The design of green space was considered in the development, and landscaping was programmed into each functional zone and planned along the river and road network. Both the 1995 plan and the later amended plan explicitly required areas of green space of no less than 40 percent of the total land area and the ratio of green space in each functional zone is higher than its counterpart in Shanghai’s requirements.

4.2 Design of Open Space

Currently, five major high-tech areas and eight industrial bases comprise the innovation system of R&D in ZJ Park. The five major high-tech areas include: research and development centers; headquarters of high-tech international companies; branches of top-level educational institutes in Zhangjiang; an overseas talent agglomeration area; and an incubator for medium to small high-tech enterprises. The eight industrial bases include areas for: software, bank cards, LCDs, modern medical appliances, IC, biomedical, national information security, and cultural recreation. These parks are differentiated by product types. Different from Beijing Zhongguancun Science Park, which has common electronic streets or business buildings for rent, ZJ Park consists of these individual parks designed and constructed separately.

While each individual park has a high-quality physical environment, the landscapes become their backyard view, which cannot be shared as public open space. Pudong Software Park proposed a central plaza with a dining hall surrounded by a cluster of standard incubators. Zhangjiang IC Industrial Zone established a dozen middle-rise buildings for over 200 IC industrial companies, and placed the buildings within a garden-style environment separated from surrounding areas by walls. Zhangjiang Third Phase Software Park created a small lake within its boundary from a nearby river, and created a backyard landscape shared with surrounding several buildings. One hardly notices this lake from outside.



Figure 4.6-4.8: Green Space. While Parks have internal great landscape, it cannot be seen from outside (Author 2010)



Figure 4.9-4.11: Roads. The roads are wide with lots of green space but in lack of facilities; science parks and neighborhoods are separated by walls (Author 2010)



Figure 4.12-4.14: Specialized Parks: Pudong Software Park, its landscape and facilities (Author 2010)



Figure 4.15-4.17: View of Zhangjiang Town: commercial and housing, in low quality (Author 2010)



Figure 4.18-4.20: Green space along riverside and roadside (Author 2010)

Moreover, while ZJ Park has a high ratio of green areas, the green landscape along the roads and river systems lack human activities. Most of the roads have deep green space along both sides. but walls separate them from the individual specialized parks. One seldom sees people walking on the pedestrian streets. The central area of ZJ Park, Zhangjiang town, has only a few commercial and retail stores set along one or two streets, but the facilities are of poor quality and fail to match the culture of high-technology industries that the Pudong Area government and ZJ Park Committee intended. It would be better to either increase the connection of individual parks with outside areas or place more entertainment or recreation facilities in the green spaces, which offer great possibility for basketball or tennis courtyards.

4.3 The Island: Housing and Associated Facilities

While ZJ Park was planned to integrate into the Pudong Area, it developed as single R&D uses. Thus it has few residential, business, and commercial uses and public services within the park. Despite the fact that Zhangjiang is known as a place full of talent, the staffs work far from the city center and have no leisure life there. As of the end of 2008, the population of workers had reached 120,000, with more than three-quarters of them having college degrees. Most of them have science and engineering backgrounds and work in the IT business. The male to female ratio is 3:2. Since most of the buildings are factories and office buildings, when night falls, Zhangjiang High-tech Park resembles a black island in Pudong Area, with employees going elsewhere to live their lives. For the vast majority of people who live in Shanghai, Zhangjiang represents a far-away and wild place with only high technologies and industries. When people speak about the rapid

development of Pudong in recent years, they focus more on Lujiazui Financial Trade District.

Four kinds of users need housing in Zhangjiang High-Technology Park. The first type, the villager and farmers, came from the original farmland, now used for high-technology industry. The ZJ Park plan created multiple affordable housing units to the east of the park and displaced these people there. A second type includes the employees and managers of research institutes and high-technology companies. With relative higher income than normal workers, most of them drive to work, and choose to live in high-end residential places elsewhere in Shanghai; however, they still need a few apartments inside ZJ Park some weeks. The third type, the students and faculty, belong to research institutes or educational university branches in ZJ Park. Their dormitories are included in the construction of each university or college area. The last type, the most important but easily ignored group, is the middle-income and low-income laborers and employees of high-technology companies and manufacturers. They represent the largest population in need of housing inside the park to avoid over-long commuting distances.

In the initial plan, ZJ Park could get support and facilities from the surrounding areas. However, when ZJ Park extended its area from the initial 5 km² to 25 km² but kept the same scale of residential and commercial uses as before, the employees had much longer commuting distances, and their needs for commercial and business became much more urgent.

To reverse this situation, Shanghai municipality planned to increase the real estate construction in surrounding areas so as to create an attractive living space for the workers. At present, Zhangjiang High-tech Park has 2,751 apartments with an area of 177,000 m²

and 13,000 people capacity. It planned to start additional construction of 9,850 apartments at the end of 2010 to accommodate an additional 17,000 people. For example, the Zhangjiang Jiangdong Personnel Apartment can accommodate 3,000 people with rent of only ¥500 per month. The development committee also offers the employee ¥200 stipends every month. The apartments will make full use of various resources for market operations, such as a new dining center of 3,000 m² and staff recreation centers to supplement regional activities.

In addition, companies also increased their supporting facilities for the employees. For example, Semiconductor Manufacturing International of China (SMIC) constructed complete services and facilities, intending to let their employees know that they can have a good life with the company. Most of the employees in SMIC live in nearby staff apartments within a walking distance. The apartment building has a swimming pool, a fitness center and other equipment. It is fully decorated and comes with a low rent of only ¥400 to ¥500 RMB per month. It includes supermarkets, fast food shops, steak houses, and bakeries close to the apartments. Shanghai Supercomputer Center (SSC) offers hot water for staff to take showers at work. SSC invited local residents to provide breakfast and lunch for the employees. As for the dinners, the workers always take the public shuttle, which is the most frequently used bus line in ZJ Park, to the restaurants in the Park or surrounding areas, but most of them do not leave Pudong Area.

While some commercial areas and food courts have been established around three subway stations in ZJ Park, the current commercial land uses cannot satisfy the increasing population and high-technology companies. Thus the plan in 2010 proposed a series of business and recreation facilities for the extended Middle District of Zhangjiang,

which is connected to the city center city by the subway and a large number of transit lines. The plan also proposed several mixed-use new towns in South District of Zhangjiang to provide living spaces for the employees. Moreover, the residents living in ZJ Park are mainly engaged in the high-end technology industry; while laborers with medium to low income levels choose to live in the neighboring areas.

4.4 Industrial Chain

Intellectual resources make up the crucial factor for the construction of ZJ Park and for enhancing industrial levels. To form an intellectual pool, ZJ Park adopted a new mode of “remote human resource” to attract human resources. For example, Zhangjiang formed an advisory committee consisting of 21 reputable scientists, of which 10 are academicians, to provide advice for the development of the Biomedical Industry. These experts, invited to Zhangjiang Park to give lectures periodically, received support to establish research laboratories in ZJ Park. Because Zhangjiang lacks universities and other educational institutes to cultivate human resources, the introduction of remote talent provided intellectual resources for the park at its early stage. Gradually, with the increasing development of Zhangjiang, there are now 12 branches of educational institutes in ZJ Park. More and more overseas students have returned to Zhangjiang to start their careers. One student can bring several or dozens of related personnel back to the area.

While ZJ Park orients toward an R&D-oriented HIDZ, multiple functional steps within the industrial chain range from initial scientific research to the final manufacturing production. Without key leading enterprises, ZJ Park formed a complete industrial

network involving research bases, enterprises, and governments. For instance, in 1996, Shanghai Municipality and the State Department jointly established the State Biotech and Pharmaceutical Industrial Base in Shanghai. One year later, ZJ Park developed the first and the only national center for drug screening in China. According to the strategy of “Focus on Zhangjiang,” Shanghai Institute of Materia Medica, Chinese Academy of Science, relocated to Zhangjiang. This relocation brought Institute of Materia Medica more space for development and also motivated the development of Zhangjiang’s biomedical industry. After this relocation, many other key research institutes moved to Zhangjiang, such as the School of Pharmacy of Fudan University and Shanghai Traditional Chinese Medicine University (TCM). By 2003, Shanghai Institute of Materia Medica had formed a system of biomedical innovation together with other several state research institutes. In November 2003, when the TCM relocated to ZJ Park, it brought research on Traditional Chinese Medicine into the development plan of biomedical industry. In addition, the Shanghai Museum of TCM opened in 2004 for all the residents and students. The museum consists of the history of Traditional Chinese Medicine, an exhibition hall of Chinese Medicine, and a history museum and widely publicizes science education to the public.

Such an active industrial chain not only benefits ZJ Park’s internal development, but more importantly, has formed an active interaction between ZJ Park and Lujiazui Financial Trade Zone: ZJ Park provides the software and electronic industry needed by the financial industry. The commercial and business areas in Lujiazui Zone can in turn fully provide financial investment in these industries and promote the level of industry agglomeration in Zhangjiang.

5. Lessons

5.1 Regard Government Domain as a Key Element

Zhangjiang is not only a product of government planning but also the outcome of state strategy. In the loop of Zhangjiang's development, it seems that the drivers are technology, projects, and companies. However, these are not the "growth engine" that played the decisive role of the loop. Instead, when looking into this in depth, the key factors underlying the development process that surface include a series of arrangements on resources, industries, and land value. Based on understanding the context of Pudong and Zhangjiang, Shanghai Municipality made the arrangements to stimulate Zhangjiang to develop as a science and technology anchor for the entire region.

Choosing Zhangjiang as the location of the anchor also closely relates to the development vision of the Pudong New Area. When developing a science park, choosing a site with convenience transit, and nature environment is a critical first step. Zhangjiang is located in the center of the Pudong New Area. When Pudong became the focus of Shanghai, it emphasized that Zhangjiang can definitely benefit Pudong's development. On the other hand, Zhangjiang also has an advantage with the large undeveloped space to the south. Compared with science parks in urban areas with limited land resources, Zhangjiang has plenty of space for further extension. Even though currently Zhangjiang is only one industry-based part integrated in the Pudong New Area, a trend still exists to develop toward a science-based new town with complete functions. This is the Zhangjiang plan, but it also matches the vision of the Pudong New Area.

Furthermore, the mode of land development under the guidance of the government is consistent with China's situation. It is also useful for those science parks with strong government support but lacking financial support to start. Historically, at the beginning of development, the composition of both development committee and land development company included the same people, which is a specific characteristic in Chinese new district development. Later, with the completion of the first step of land development, both infrastructure and usable land are produced, and both government and the development company need to transform their operations.

5.2 Making Necessary Transformations during the Process

- **Transformation of Government**

When a science park has developed to a certain stable stage, the role of government needs to transfer from leading the market back to serving the market. In ZJ Park, the *Shanghai Municipality Promoting the Development of Zhangjiang High Technology Park Several Provisions* carried out the government's preferential policies according to the regulations. It thus ensured the sustainability of government policies. The government steps back to provide public facilities and services. It left the rights of investment and construction to the development companies and enterprises. Through decentralization of administrative authority, both the efficiency of planning approval and the capacity of self-management of science parks are enhanced greatly. Moreover, with the emergence of more and more agencies and independent sectors, a management network has been established to separate different social affairs.

- **Transformation of the Development Company**

ZJ Park Development Company serves as the main development body of ZJ Park and thus carries both the mission of applying state strategy and getting economic profit through land development. As a development company, it must pursue economic interests. Meanwhile, on behalf of the government, it has responsibility for the construction and management of Zhangjiang High-Technology Park. At the beginning stage, working as a land development company together with Shanghai Municipality, Zhangjiang High-Tech Park Development Company completed the first cash flow and construction from raw land to usable land. As the industry grew larger, the company gradually transitioned its main business toward real estate properties and high-end services. It also worked continually as the bridge between government and the small and medium enterprises in need of financial and property support. ZJ Park Development Company helps the individual enterprises by integrating their needs and reflecting these on to the government, to get their needs addressed.

- **Industrial Networking**

During the restructuring of industries, the development of the R&D chain is a crucial factor for a science park. One weakness of ZJ Park was that it lacked sufficient research institutes and large leading enterprises in its beginning stages. However, ZJ Park successfully created a complete industrial network involving different steps in the industrial chain. “Focus on Zhangjiang” introduced a large number of national and world-class research institutes and educational university branches, thus attracting more and more enterprises to settle their research centers in Zhangjiang. The agglomeration of high-level educational and research institutes helped the high-tech enterprises in Zhangjiang to get various techniques, intellectual resources, and equipment easily.

5.3 Suggestions for Planning Guidelines

- **Size Hierarchy of Site**

A major difference between high-technology parks and traditional industrial districts high-tech parks has highly correlated industries and enterprises. They often form a complete industry system with explicit hierarchy around a particular industrial field. With regard to the physical planning, accordingly, the sizes of sites vary greatly. For those major industrial sites, a large scale is more flexible for further development and distribution. It can also prevent the entire road network structure's destruction in later development.

However, some large-scale sites without roads crossing through them performed as a block in ZJ Park. Separated from surrounding areas, it has streets but a lack of human activities. Zhangjiang High-Technology Park needs further detailed regulations on land size to avoid either over-large segregation or too-small parcels unsuitable for large enterprises and research bases.

- **Mixed-use Function**

The enterprises and clients of high-tech parks also differ from traditional industrial districts. As analyzed above, such parks need specific real estate property and service facilities such as research bases, incubators, hotels, and standard factories. The types of property service provided by ZJ Park Development Company are great references for other science parks. In 2008, the ratio of research staff to the entire employees was up to 20 percent, and staffs with college degrees make up over 50 percent of the entire population. Commuters with regular schedules always have irregular

working hours and flexible working places. Accordingly, it is necessary to propose more communications and recreation space and more leisure facilities for them. Moreover, compared with centralized settings, it is more suitable to place these facilities within individual building to provide a uniform service range. Currently, ZJ Park has not sufficiently considered mixed-use functions and the arrangement of those facilities.

- **Diversify Housing Types and Open Spaces**

Residential construction should simply use the general regulations on residential district planning. General residential communities have a minimum required quota for public services and facilities. The public services consist of eight elements to satisfy the basic life demand of residents: education, health care, culture, sports, business service, community management service, social welfare, transit, and public utilities. For instance, traditional regulations for residential community planning have requirements on the areas of kindergartens, elementary schools, and high schools per 1,000 residents. ZJ Park's four types of housing—relocation housing for the farmers, high-level condos for managers and talents, dormitories for employees and students, and apartments for white-collar employees—have distinct demands on unit design and public service. For example, the latter two types do not need as many areas for kindergartens or schools as the first two types in that they have fewer families. Consequently, the physical planning of high-tech parks should consider the diversification of user types and thus propose various targeted site plans.

Physical planning is important in the development of high-tech parks. In Zhangjiang High-Technology Park, what the planners did most frequently in the first several years included “making videos, creating models, and telling stories.”⁹ Making videos means that they continually showed the blueprints and plans through videos and slides to visitors and potential investors. They used models to show them Zhangjiang’s district plan, land use plan, and site plans. Moreover, they also recommended the site to visitors and described the design, preferential policies, and development visions. In the process, the planning became a marketing tool—a way of persuading high government officials and investors of the quality of environment, through images and models of the park.

Moreover, the planning and design of high-technology parks should not only be a blueprint of how the district should be physically developed, but also provide strategies for the park’s spatial development. The multiple ways it serves include counseling the Development Committee, providing government the physical platform for discussion, offering advice and suggestions for legislation and regulation, arranging land resources for further regional development, and attracting more investments and enterprises.

¹ *Pudong Yearbook*, 2001.

² Jun Ming, *The National Mission: Focus on Zhangjiang* (Shanghai: Shanghai Science and Technology Literature Press, 2009), 34.

³ *Shanghai Statistics Yearbook, 2000-2005*

⁴ Wansong Sun, *High-Tech Development Area Innovation and Competition Power* (Beijing: Chinese Economy Press, 2006); Ming, *The National Mission*, 36.

⁵ *Zhangjiang High-Technology Development Company Annual Report, 2007.01*

⁶ *Several Provisions of Shanghai Municipality Promoting the Development of ZJ Park*, Article 15

⁷ *Ibid*, Article 6

⁸ *Ibid*, Article 13.

⁹ Ming, *The National Mission*, 61.

CHAPTER 5: SUZHOU INDUSTRIAL PARK

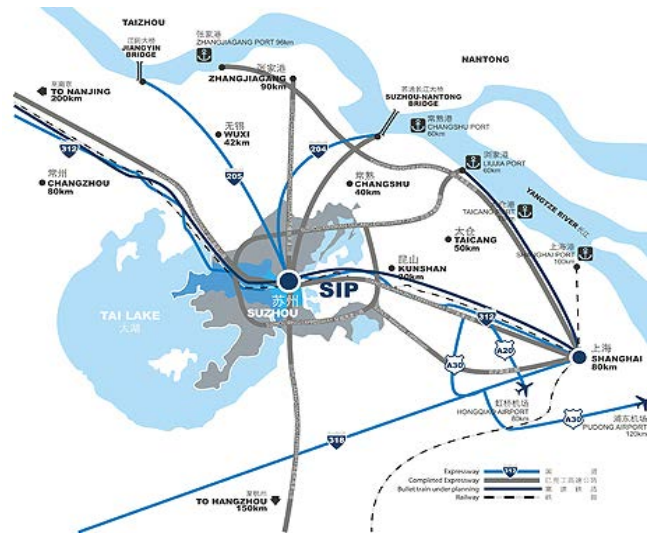
1. Brief Introduction

Suzhou Industrial Park (SIP), representing a Type 3 HIDZ, is a new isolated but self-sufficient mixed-use district. Compared with other science parks, SIP diversifies to include residential, commercial, and business developments, thus functioning more like a livable new town rather than a single-use high-tech park.

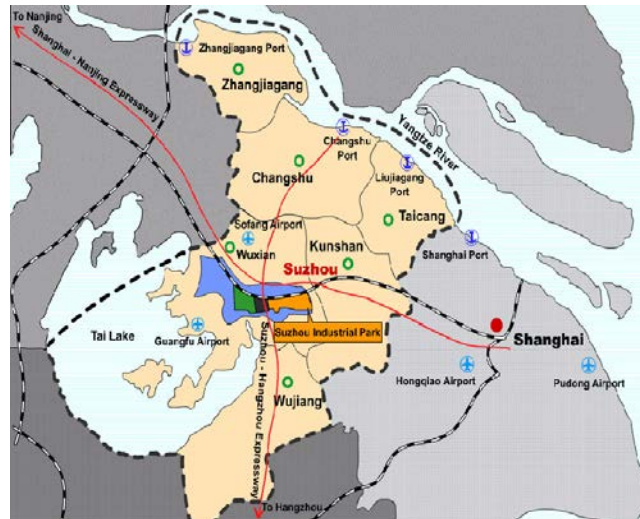
SIP is a cooperative project between the Chinese and Singaporean governments. It was established in February 1994 and covered a total area of 288 km², 80 km² of which are in the China-Singapore Cooperation Zone. SIP lies to the east of Suzhou's old downtown and is connected to several major cities in the Yangtze River Delta area through its well-developed network of highways, railways, waterways, and airlines. The comprehensive plans of Suzhou has positioned SIP as a "New Township" that aims to develop SIP as one of the most important high-tech economic-based headquarters in China as well as a cultural and commercial center.

During the past decade, SIP has seen quick development with chief economic indices growing at around 30% rate. It has become an important economic anchor in regional area, contributing around 16% to Suzhou's GDP with only 3.4% of the total land and 5% of the total population of the city. In 2003, SIP exceeded the rate of growth of the Suzhou Municipality of 1993 in all economic targets, effectively building up another Suzhou Municipality in a span of ten years. With its rapid development rate and a series of competitive industrial companies, Suzhou Industrial Park has become one of the most successful models of science parks in China.

As a mixed-use industrial park, SIP successfully integrates industrial areas with residential and recreational spaces. Sixteen years after its inception, it has nearly 300,000 employees, and over 130,000 residents. The Jinji Lake inside Suzhou Industrial Park has become one of the biggest urban lake parks in China, providing citizens numerous social and commercial services with a surrounding recreational plaza, waterfront landscape, and culture exhibition centers.



Map 5.1: Regional Map of Suzhou and SIP I
 Source: SIP Website <http://www.sipac.gov.cn>



Map 5.2: Regional Map of Suzhou and SIP II
 Source: Ibid.

Its success is largely due to borrowing experiences of new town planning and management from Singapore. The Suzhou Industrial Park Administrative Committee applied the lessons from those models into a local context to form a series of planning management principles, modes, and approaches. The planning strategies adopted in Suzhou Industrial Park have four main levels: governmental management; land development processes (phasing and timing of land development); planning structures (a series of plans of SIP and flexible land use); and planning content (in terms of spatial arrangement, programs of each functional area, and design guidelines). As an exemplar of a high technology-based development, SIP has formed many useful experiences in planning management system and principles of planning and design that are worthy for integration into other science parks in China.

2. Historical Evolution

2.1 Preparation (1992-1994)

As China's modernization drive gained momentum in the late 1980s, many Chinese delegations visited Singapore, a Southeast Asian nation that achieved seeming economic miracles within 30 years of its independence. The Chinese visitors were eager to learn modern management methods while Singapore was also planning its own Economic Regionalization at that time and hence focused on overseas investment.

The motivation of SIP started in September 1992 when Senior Minister Lee Kwan Yew of Singapore led a delegation to China and expressed the intent to cooperate with China on setting up a model for the adaptation of Singapore's own developments.

Through subsequent consultations and site surveys for joint development and construction, the two sides finally decided to develop a modern industrial park in Suzhou. On February 11, 1994, the State Council issued “Approval on Issues Concerning the Development and Construction of Suzhou Industrial Park”,¹ giving official approval on cooperation between Suzhou and Singapore in the development of Suzhou Industrial Park. The China-Singapore Suzhou Industrial Park (CS-SIP, later SIP) was thus born on February 26, 1994 when both China and Singapore signed the Agreement on the Joint Development of Suzhou Industrial Park in Beijing. The Agreement planned to develop a China-Singapore Cooperation Zone within a 70 km² area to the east of Suzhou. On March 1, 1994, the “6-utility-access” infrastructure construction was started.

Both governments established the China-Singapore Joint Steering Council to ensure the implementation of the Agreement. Co-directed by China and Singapore, current co-directors are Mr. Wang Qishan, the Vice Premier of China, and Mr. Wong Kan Seng, the Deputy Prime Minister of Singapore. The Suzhou Municipality and Ministry of Trade and Industry in Singapore joined together to form the Bilateral Working Committee to carry out policies made in the Joint Steering Council. The main development body was the China-Singapore Suzhou Industrial Park Development Co. Ltd (CSSD). On Aug 13, 1994, the CSSD was officially established with the approval of National Administration of Industry and Commerce with US\$50 million in registered capital and a total investment of US\$100 million, with the Singapore Consortium holding 65% and the Chinese Consortium holding 35% of the equity shares.²

China and Singapore joined together to attract foreign investment. On April 21, 1994, the first joint investment promotion delegation of China and Singapore set off for

Europe. Singapore used its global network resources to raise international public awareness of SIP. For instance, Prime Minister Goh Chok Tong, and Lee Kuan Yew promoted the investment personally. In 1995, sixteen Fortune 500 companies contributed funds to SIP, becoming the first group of multinational companies investing in SIP. The companies included Comfort of Singapore; Hitachi Global, Fujitsu Global, and Sumitomo Bakelite in Japan; Samsung in Korea; GE, Lilly Pharmaceutical, and BD from the United States; Siemens in Germany; and L'Oreal in France.

Cooperation between the countries even extended through education. Singapore also shared planning management expertise and design and construction software and approaches by training Chinese professionals. On April 20, 1994, the first group of trainees for SIP (planning and construction delegations) was dispatched to Singapore, marking the official start of adapting Singapore's experiences into SIP.

2.2 Joint-Cooperation (1994-2000)

During 1994 to 2000, SIP finished construction of the infrastructure in the first phase district. Since it had city planning and management experience from Singapore, SIP Administrative Committee created the master development plan for SIP and subsequent subdivision plans. Therefore, the major work during this period included infrastructure construction, building major facilities for water, electricity, and heating, displacement of farmers, and construction of standard factories and commercial and residential buildings.

Major investment promotions occurred during this time as well. When the Singapore government used its global network to bring international investment to

Suzhou, China’s government provided lots of preferential policies to attract the companies. The State Council accorded SIP with relevant jurisdictional rights and a series of preferential policies by issuing eight circulars³ with the following main points: to have the authority to approve large-scale projects; to have fully authorized administrative rights in foreign affairs; to set up a provident fund system based on personal contribution saving accounts; to enjoy policies on experimental integrated bonded zones; to enjoy the policies on technologically advanced tertiary enterprises in experimental areas and service outsourcing demonstration bases of China; to enjoy preferential policies of national HIDZs; and to implement all the supportive financial policies of the central government.

Table 5.1: Timeline and Events of SIP

STEP	PERIOD	EVENTS
Preparation	1992-1994	<ul style="list-style-type: none"> • In 1992, the idea of developing a modern industrial township with Singapore experience was broached. • In 1993, Suzhou City was selected as the location for this project. • 1994.2.26 Chinese Vice Premier Li Lanqing and Singapore Senior Minister Lee Kuan Yew signed the Agreement on the Joint Development of Suzhou Industrial Park in Beijing. • Singapore governments led in introducing lots of world top 700 companies to invest in SIP • Planners and governmental officials received training in Singapore
Joint-Cooperation	1994-2000	<ul style="list-style-type: none"> • In 1994, China-Singapore Suzhou Industrial Park Development Group Co., Ltd (abbreviated as CSSD) was established for land development and infrastructure construction • Producing master plan, phasing plan, and a series of subdivision plans • Finish infrastructure construction of first phase 12 sq km area by CSSD • A new round of multinational companies investment in SIP
Self-Development	2001-present	<ul style="list-style-type: none"> • In 2001, the Singapore consortium lowered its stake to 35 percent, raising the Chinese consortium's stake to 65 percent from 35 percent in CSSD • Starting 2nd and 3rd phase development • A series of cultural and commercial facilities and buildings finished • 2008.6.30 CSSD was re-organized to accelerate the pace of market-drive internationalization and scaled operation

The infrastructure construction and advanced preferential policies led to a dramatic increase of foreign investment in 1998. Compared with the initial funding campaign in 1995, this second round of foreign investment has several distinct features. Most of the existing companies largely increased their investments. Many companies, such as Samsung, Fujitsu, and Sumitomo, set up several subsidiaries in SIP, and several companies began to establish individual research and development institutes in the park as well. For instance, Emerson Electric in Suzhou set up its Climate Technologies R&D Center. The investment of Fortune 500 companies in SIP thus contributed to economic development through increasing the amount of GDP, accumulated taxes, utilized foreign capital, and registered RMB capital.

However, the park was built almost simultaneously with the competing Suzhou New District (SND) industrial park, located to the west of Suzhou old downtown. SND was established in 1992 to be a national HIDZ too. Compared with SIP's development process in which the Suzhou government had only 35% stake, the government had direct leadership on SND's development. Thus the municipal government paid more attention to SND, leaving the affairs of SIP to Singaporeans. However, since SIP had a negative net-income during the first several years, its developers were not satisfied by the Suzhou government's ignorance.

2.3 Self-Development (2001-Present)

Suzhou Industrial Park transitioned into a self-development stage in 2001 and continues to develop to this day. After incurring losses of some US\$90 million over 5 years, the Singapore consortium lowered its stake to 35 percent, raising the Chinese

consortium's stake to 65 percent from 35 percent and reducing the Singaporean share area from a planned 70 km² to a first phase with 8 km². The Chinese appointed Wang Jinhua, vice-mayor of Suzhou and the former manager of the New District, as the new chief executive of SIP. In 2001, one year after Singapore lowered its stake, the park made its first profit of \$3.8 million. After three consecutive profit-making years, CSSD had written off all previous losses by the end of 2003.

Two main factors have led SIP to make a profit since 2001. One is the change of emphasis of the Suzhou Municipality from SND to SIP, with devoting more investments and leadership in order to benefit SIP's development. Another reason is that, until 2001, the construction of the Phase 1 district was almost completed, and the site started to accumulate economic product and finally made profits. Based on experiences learned from Singapore, SIP developed an independent planning system. Since then, Suzhou's local government began to play a more important role in leading construction and development of SIP than Singaporean side.

However, training from Singapore continues. Chinese personnel receive training in Singapore in successive groups. As of the end of 2008, fifty special training programs have been conducted for over 1,500 trainees in 118 groups, helping formulate 85 statutory documents to lead the development and planning Suzhou Industrial Park.

During this time, SIP began to diversify into a mixed-use property. On March 23, 2001, the Suzhou Municipal Government and Party held a meeting to mobilize efforts for the acceleration of SIP development and construction, signaling the start of SIP's next two phases. In the park's tenth anniversary in 2004, SIP shifted its focus from labor-intensive manufacturing to both modern technological innovation, and the services. This

shift included expansion of the software industry, outsourcing, and nanotechnology. Moreover, the planners wished to make SIP a more livable community and constructed a large amount of housing and a series of cultural and recreational facilities, such as a science and technology cultural center, an international exhibition center, recreation commercial plazas, and neighborhood centers.

3. Planning Strategies

3.1 Administrative Management

- **Dissociation of Administrative Body and Development Body**

In Suzhou Industrial Park, the administrative body and development body have explicitly separated their responsibilities. In traditional industrial parks, the Administrative Committee takes charge of all the land development and construction of parks, but here the Suzhou Industrial Park Administrative Committee only has administrative functions. The main development body, CSSD, is responsible for land development and construction. Some HIDZs have a government-appointed development company to take charge of land development, yet the two entities have the same people in each committee. By contrast, the committee and development company SIP are separated from each other. Just as the Suzhou Industrial Park is a cooperative project between the Chinese and Singaporean governments, CSSD is a joint venture between the two countries. This settlement involves both parties in the construction of SIP. However, as a China-owned industrial park, the sovereignty of SIP belongs exclusively to China government. As the agency of the government of Suzhou Municipality, the Suzhou

Industrial Park Administrative Committee represents the government in carrying out public affairs, planning management, and social service.

The Suzhou Municipality accords the Plan and Construction Bureau under the Suzhou Industrial Park Administrative Committee to model planning and management of SIP upon Singapore's experiences. The main tasks of the Plan and Construction Bureau include to direct and to approve a series of plans for the SIP; to establish planning management and technical approaches under Singapore's guidance; and to review and to approve land development and site plans reported by CSSD. The selection of planning professionals was under rigid review and is the result of a competitive process. Most of the professionals have received training on planning skills in Singapore, thus providing scientific base for planning decisions. The administrative leadership of the Committee is responsible for some vital plans, giving authority to city planning decisions.

- **Role of the Administrative Agency: Business as Priority**

The administrative agency of SIP has transformed its role from "leading" to "serving" and then again into a "steering" group. During the planned economy era in 1980s, entire city planning and development strategies of other countries were under the leadership of a single administrative government. In the 1990s, under the influence of capital market, private management was gradually involved in the decision-making process. The government agency gradually changed its role to serve enterprises and the public. However, the recent economic crisis has led to a readjustment of the government's role from server to manager again. Through directing city planning, establishing management mechanisms, and regulating construction and land development,

both the government and planning agencies play an active role in SIP's latest development.

Within the planning strategies of SIP, regarding business as a priority is an important principle. In Singapore, multinational companies are important drivers of economic growth. The government provides a well-developed environment of high quality places and infrastructure to attract companies and more investments. SIP also applied this business-oriented principle into planning and management process. For instance, when the SARS virus overran China in April and May 2003, all the construction workers had to receive at least one-month segregation and physical exams before getting trained and then working at SIP. At that time, companies in SIP were in dire need of over ten thousand construction workers but the spaces for segregation are limited, thus leading to a serious delay of construction and development. SIP Administrative Committee creatively transferred the use of built standard factories into segregation centers and also arranged training programs during the period of segregation. This approach largely reduced the waiting time and reduced costs for companies.

- **Approaches**

Several techniques were used to bolster or to streamline development of SIP. SIP Administrative Committee used a series of approaches to achieve concise and effective management. First of all, in order to form a concise, unified, and efficient management system, SIP Administrative Committee has set up sixteen bureaus and one secretarial office with only one hundred officials. Each bureau in the Committee corresponds to four or five municipality-level bureaus. The director and key officials in the secretarial office are nominated by the Suzhou Municipality Government and Party; all the other officials

and professionals are selected through public competition and examinations. The range of the Committee's jurisdiction covers the China-Singapore Cooperation Zone and its surrounding five villages and towns.

SIP Administrative Committee also created a one-stop project-approval service to increase the effectiveness and efficiency of approving projects. The service also provided checklist for applicants to self-check whether they have met the requirements of planning techniques. The approaches are tiny, yet they effectively reduced wasted time and unnecessary repetition. According to the survey, 60% of applications accepted approvals immediately, 30% of them get approved within two to three working days, and the rest of the applications are completed in no longer than seven working days.

Moreover, statutory documents and the great power of chief planners have guaranteed a strong scientific base for planning decisions. SIP Administrative Committee has formulated over sixty statutory documents of planning requirements to support management. There are four levels of planning decision-making positions: the planner, the director of the Plan and Construction Bureau, the Chief Planner, and the director of Committee. Distinct from traditional industrial districts where planning decisions are usually made by governmental officials and directors, SIP authorized the Chief Planner strong power in plan-making and management. The committee director only deal with important cases of non-compliance and appeals. This separation of responsibilities effectively avoids situations where planners have to change plans according to leadership's political concerns.

3.2 Land Development Steps and Approaches

SIP added an “agency sector” in land development steps, an important innovation that is different from normal industrial districts. In traditional industrial districts, land developers apply for approvals of projects with site selection reports and site plans. After approval, the Land and Real Estate Bureau signed the agreement to transfer the right of land use to each land developer respectively. In Suzhou Industrial Park, though, the Administrative Committee transferred large areas of phased districts to CSSD at one time and provided CSSD land planning and construction permits. This approach granted CSSD the rights of negotiating site selection and site plans with individual developers and added bargaining chips for attracting investment.

In addition, SIP adopted Singapore's “plan first, build later; underground first, ground later” principle to implement construction. This principle emphasizes the importance of plans in guiding construction and requires building infrastructure first to provide a solid base for investment environment. According to Ma Minglong, party secretary of SIP, “This meant that we had to inject large amounts of money in the initial phase. But it helped us to avoid the situations of rebuilding the roads frequently in the future. This sequence and detailed planning have gained many appraisals and acknowledgements, not only from China and Singapore, but also from other countries, such as the former British premier, Tony Blair.”⁴

This approach largely enhanced consistency during the implementation process. In some industrial districts, where making plans takes a long time, the government cannot wait and sell the land ahead of time; thus the Land and Real Estate Bureau approves land use permits based on which developer can afford the high rental price. It does not

consider whether the site selection and land use is appropriate. Conversely, SIP effectively controlled the entire land layout through an advanced unified plan, ensuring the quality of the environment.



Figure 5.1: Land Development Organization of SIP

Moreover, a complete infrastructure ensures the land value of SIP. While in some industrial districts the administrative committee reduces land price to attract more investments, CSSD has invested over 30 billion RMB into infrastructure construction, raising the land price as high as US\$60/m². The director of Economic and Trade Development Bureau has no right to reduce any land price for companies.

High price and strict plan requirement successfully attracted over 12,000 enterprises from inside and outside of China, including nearly eighty Fortune 500 companies. Compared with those small to medium investors focusing on labor density, high-tech-based multinational companies emphasize comprehensive advantages of investment environments. The advantages include preferential policies; completed infrastructure with high construction quality; qualified labor workers; well-developed

traffic networks; effective planning approval services; and well-enacted regulations. The physical environment is worthy of the high land price because the development meets the standard of the “9 Utilities and Leveled Land.”⁵

3.3 Planning Structure

One key notion that SIP officials adopted from Singapore was to set out all the development plans in careful detail right from the start and to stick with these blueprints during rapid development. The master plan of SIP got its approval in 1994; the sequential master and land use plans of the Phase 1 District were finished in 1995 by the Plan and Construction Bureau of the SIP Administrative Committee, Singapore Construction Ministry, and several international design consultant companies. Even though the initial plan was to develop an 8 km² area, SIP finished a master plan of 70 km² at one time that had detailed a land use plan and regulations. Later, SIP was clearly demarcated according to the different urban design of each important functional area, including the Jinji lakeside Area, the Central Business District, the Science Hub, and the Dushu Lake Higher Education Park.

This emphasis on planning structure is a significant turnaround from China's practices, which tend to focus less on planning and more on actual construction. Despite using several levels of planning in many cities, few of the planners created effective detailed plans and strictly implemented urban designs and regulations. In SIP, more than US\$7 million were pumped in during the early days of development to draw up the initial plans and blueprint. Under supervision of Singaporean experts, SIP strictly enacted the plan system to make the master plan and sequentially-phased plans with urban designs in

important parcels of land, leading SIP to become a well-developed urban space and physical environment. Thus Secretary Ma says the results show that this bold move—which set a precedent in China—was the right one.

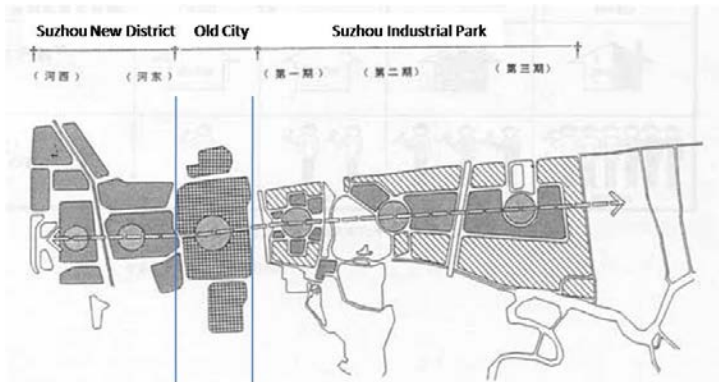
- **Approaches of Dynamic Planning**

Under the complete plan system, SIP Administrative Committee achieved dynamic development through phasing development; the concept of the “land bank”; and reviewing plans over time.

SIP divided the plan of a 600,000 person population into three phases. Each phased district equals the scale of a Singaporean new town. The Phase 1 District, which started construction in 1994, is an 8 km² area located between Suzhou’s original downtown and Jinji Lake in the center of SIP, aiming to develop this phase as a commercial and business center with industrial support for manufacturing. As the closest phase to downtown, the Phase 1 District reduced the construction cost through extending downtown’s infrastructure network into the new district and shortening the commuting distance for employees. Phase 2, located to the east of Jinji Lake, is a high-tech industrial district with a corresponding residential area. The proposed Phase 3 is a large-scale processing industrial area with a population of 300,000.

The land use plan of SIP uses the concept of “land bank” to aid future development. Land bank refers to propose the blank lands with an uncertain function in the initial land use plan. In some areas, the land can be temporarily planned as green landscape according to surrounding lakes, rivers, commercial centers, or transit stations; it can then be built up for other uses such as a visitor center, a public riverside park, parking, or a plaza. Some blank lands are even developed as temporary industrial areas.

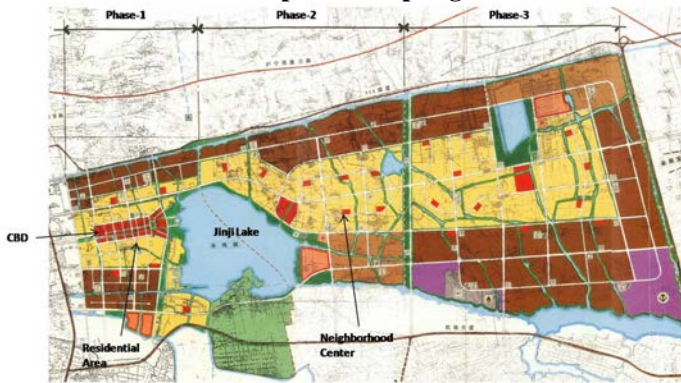
According to SIP's development mission, these sites will become commercial or business service land in ten to fifteen years.



Map 5.3: Location of SIP to Suzhou City and Suzhou New District
Source: SIP Website <http://www.sipac.gov.cn>



Figure 5.2: Models of First Phase
Source: Taken by Author in 2010.



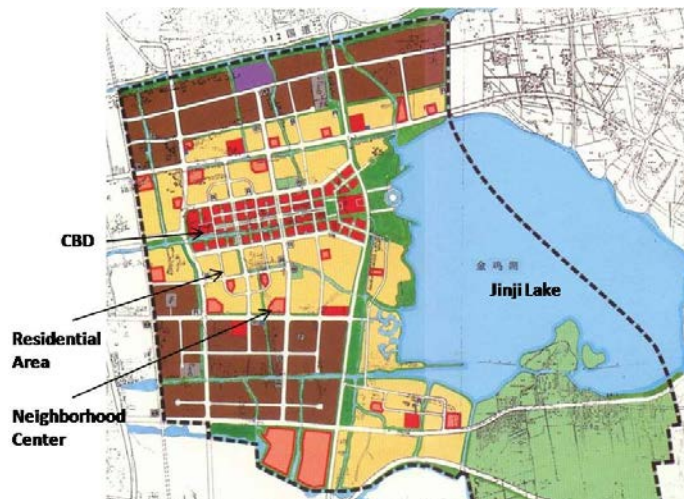
Map 5.4: Phasing Development of SIP
Source: Ibid.



Figure 5.3: Housings in SIP I
Source: Ibid.



Figure 5.4: Housings in SIP II
Source: Ibid.



Map 5.5: Land Use Map of Phase 1 District
Source: Ibid.



Figure 5.5: Industrial Area
Source: Ibid.

Over time, the Planning and Construction Bureau of SIP have made constant adjustments to the master plans based on SIP's growth. Even by keeping the basic network structure, the current master plan increased from its original 70 km² area to 80 km². The change lowered the proportion of manufacturing to other industries but raised the space set aside to develop the modern technology sector and residential and public facilities.

3.4 Land Use Pattern

Since the mission of SIP is a self-sufficient new township, SIP followed the basic rule of city growth. It attracted investment and created job opportunities first to bring an increased population into the district; it then developed housing and relevant commercial and public service to promote the growth of the entire district. With regard to the land use pattern, the master plan of SIP arranges commercial and business areas in the center of a park that is adjacent to Jinji Lake. Commercial and business areas surround residential communities that are also encompassed by light industrial areas. The Central Business District (CBD) area is fully segregated from housing; the development of land starts from industrial areas and then moves inward. In this pattern, residential areas are closely linked with either industrial areas where people work or commercial areas and public facilities. Moreover, the land value of the Jinji Lake landscape can be maximized when developed together with commercial and business areas, leading to future extended profits.

The arrangement of varying proportions of different land use functions is also based on predictions of the demands of a new town with 600,000 residents. The populations of Phase 1, Phase 2, and Phase 3 are 100,000, 200,000, and 300,000,

respectively. Among the land uses, industrial areas has the largest proportion with 33%, followed by residential land at 25%, roads at 15%, green landscape and river areas at 14%, and other facility and service areas at 10%. The proportion of land functions is different in each phasing district. For instance, the Phase 1 District has lower industrial land but higher commercial and business use than the other two phases.

Notably, despite segregation of different land use functions, residential and commercial areas have a much higher level of mixed-use purposes than industrial districts. The blank land planned in those areas plays an important role in merging functions together. For example, there are many commercial and residential apartments in commercial areas, while neighborhood centers are located within residential areas. Open spaces, such as green landscape, wetland, rivers, and public plazas, are widely dispersed within those areas. Moreover, the relevant independence of the industrial areas more or less resembles the atmosphere of what science parks look like in Singapore.

4. Construction of SIP

4.1 Infrastructure Focused on Long-Term Benefits

During the construction process, SIP spent more on infrastructure than normal HIDZs in an effort to secure more benefits over a longer period of time. For instance, SIP is located in a low-lying area. When planning construction, Singaporean experts insisted on level land one meter higher than normal construction. This suggestion was controversial at that time since it would cost twice the price of labor than normal leveling. The leveled land was finally finished under the Singaporean sector's insistence. One year

later in 1995, Suzhou City suffered a large flooding disaster, but the Phase 1 District of SIP still kept its normal construction pace without any damage, which counteracted the additional construction cost.

Similarly, for selecting trees along Jinji Road, a 2.7 km long main road in SIP, Singaporean experts set high standards for planting trees in terms of height and thickness of trees and type of soil. This approach ensured that all trees would survive over time that in turn would save the cost of changing and maintenance. SIP also replaced the old digging machines for plumbing with new ones to dig a 9 m depth instead of the normal 5 m so all of the needed pipes could be laid at once to avoid the damage of exposure, avoiding the need for a future re-dig.

4.2 Central Business District

Distinct from the old concept of the central urban area, where different business functions mixed together and there were several social interactions, CBD in Suzhou Industrial Park focuses on high-level business offices and hotels. The CBD starts east of Suzhou's original downtown and extends towards the center of SIP with increased land area by the Jinji lakeside. Covering an area of 1 km², CBD consists of dozens of land parcels. Each parcel is 80 meters wide by 100 meters long. Commercial and residential buildings are located at the outer fringe of CBD that then merges surrounding residential areas with CBD.

Located in the center of SIP, the high-rise buildings serve as the symbol of Suzhou Industrial Park. While the height of the buildings is limited in the west part of CBD due to skyline control of Suzhou's original downtown, building height inside CBD

is unfettered. As a result, the high-rise image is easily recognized from both the Shanghai-Ningbo Highways and railways at the north and west sides of SIP, illustrating the city's image of a new township.



Map 5.6: Site Plan of CBD
 Source: Kuang Shi, *Urban Design in the Global Perspective* (Beijing: China Architectural and Industrial Press, 2006).



Figure 5.6: Current Construction of CBD
 Source: Google earth



Figure 5.7: Planned Skyline of CBD
 Source: Shi, *Urban Design in the Global Perspective*.



Figure 5.8: Bird View of SIP
 Source: Ibid.



Figure 5.9: Model of CBD
 Source: Taken by Author in 2010



Figure 5.10: Actual Construction of CBD by 2005
 Source: Shi, *Urban Design in the Global Perspective*.

Besides typical setback distance and FAR requirements, the design guideline of land parcels in CBD has additional requirements for façades and boundaries of buildings

along the streets. For example, building boundaries along main avenues and public plazas should completely attach to the setback line. Moreover, all driveways should be placed on branch streets instead of main avenues. All the first four floors of buildings in CBD are commercial and business use, forming a unified vision with a strong commercial atmosphere. Those detailed requirements have led to visual consistency on main roads in the CBD.

However, the entire CBD lacks activities and social opportunities. With less than half of high-rise buildings finished and only one open space (Century Park), there is a limited flux of people and business activities. By contrast, Yuanrong Plaza, located to the east of Jinji Lake in the Phase 2 District, has attracted people with its fashion shows, commercial shops, restaurants, and varied recreational facilities. Yuanrong Plaza is designed as a shopping center with river crossings throughout the mall. In the surrounding area, there is a Ferris wheel park and home discount shops (like IKEA from Scandinavia and the Home Depot from the US). After playing and shopping in those places by day, people tend to select Yuanrong Plaza for dinner or for other evening activities. This distinction reduces CBD's exchange activities, and makes it necessary for CBD to propose more commercial uses.

4.3 Residential Neighborhood Center

Resembling Singapore's new town plan principles, SIP's residential areas are divided into three residential districts. Each district includes thirty to one hundred thousand households, each consisting of five neighborhoods. The master plan sets up seventeen "neighborhood centers" in each residential area. Each neighborhood center

serves 500 m radius that includes 8,500 households. All public and commercial facilities are concentrated in neighborhood center and are constructed by the Plan and Construct Bureau of the SIP Administrative Committee.

Currently there are seven neighborhood centers established in SIP. The first neighborhood center, Xincheng Plaza, is an 18,000 m², five-story building established in 1998. It hosts a supermarket, bank, post office, restaurant, laundry, hair salon, pharmacy, car maintenance center, clinics, and many other public services. Subsequent neighborhood centers have added hotels and convention centers and include a series of buildings with open parks rather than a single building.

The construction of neighborhood centers has brought convenience services to the communities in one central location instead of traditional commercial storefronts on the first and second floors of residential buildings. Since the land use plan separated housing from other types of buildings, residents are the only users of these areas. As a result, only small restaurants and supermarket chains can survive over time. In some other neighborhoods in the industrial district, developers set retail along the streets, yet the stores are low quality and do not have proper management or maintenance. The chaotic façade of shops along the street conflicts with the high-quality of the modern residential high-rise buildings. The neighborhood center has thus served residents by providing services within walking distance, which effectively reduces wasted land resources and attracts people with its localized concentration of retail that is sufficient to meet consumer demand.

4.4 Industrial Areas

Industrial areas with high logistical demands are arranged on the north and south sides of SIP and closely connected to main traffic arteries, including the 312 Highway, the Shanghai-Hangzhou Highway, the Beijing-Shanghai Railroad, and several main river channels. By contrast, high-tech-based industrial companies are located closely to residential neighborhoods because they have a lower noise impact than heavy industrial factories. Moreover, the detailed land use plan designates riverside areas and land along the main roads for high-tech industrial enterprises, especially international companies. High-rise buildings facing main roads and international company brands have formed a city image to serve as market tool to attract more investments.

Distinct from the Shanghai Zhangjiang High-Tech Park, where clusters of science parks dominate the whole district, only a few of the industrial areas in SIP are concentrated as science parks. In Suzhou Industrial Park, individual international companies play a much more important role in economic growth than those industrial clusters. Notably, “blank land” is constructed as standard factories in industrial areas. The factories, which have different levels of construction standards, can meet demands of various industries. Over time, the proportion of industrial land use changes in response to the need to adapt and to upgrade the facilities or in an effort to shift suburban areas for urban space. Because blank land is so flexible, some areas may be maintained and upgraded while others are demolished and replaced as hotels, restaurants, sports and recreation facilities, or dormitories for employees.

Although Suzhou Industrial Park has achieved its remarkable development under Singapore’s guidance and promotion investment, most of the industries in SIP are still

focused on manufacturing rather than incorporating true high-technology companies. One of the most important reasons is that, unlike Beijing and Shanghai, Suzhou lacks a research and education institute. Without sufficient research institutes and highly educated people, sole dependence on large international companies makes it hard to form sustainable domestic industrial clusters. Consequently, SIP developed Dushu Lake Education Innovation Park on the south side, establishing campus branches with the aim to provide more talent to SIP. The founding of Xi'an Jiaotong-Liverpool University (XJTLU) also opens a new field of cooperation with foreign countries. In addition, the fundamental educational system has become well-balanced with sixty-five community schools scattered in three towns and two neighborhoods.

4.5 Jinji Lakeside Areas

Jinji Lake is a 7 km² lake located in the center of SIP; it features an abundance of natural resources. A main theme of the master plan of SIP is to take advantage of the lake as a resource for public citizens. SIP aims to develop the Jinji lakeside area as a public park for residents and tourism as well as a riverfront recreation place. Privatization of the lake or lakeside is prohibited.

Within a superblock, there are opportunities to reserve areas for open space and recreation and possibilities for forming green liner spines of open spaces. The central area of the Suzhou Industrial Park adopts this strategy with great success, connecting the lakefront with the large new central park. Such greenways are important visual amenities and also provide recreational functions. People use the open space for walking, jogging, working in the community garden, and playing.

Landscape design and programming of the Jinji lakeside area increased land value and brought more people to SIP. EDAW, a well-known landscape design firm, was commissioned by the Plan and Construction Bureau to take charge of the landscape design in 1998. It programmed eight theme parks around the lake with different features and functions. The Jinjihu bridge, Suzhou Technology and Cultural Center, the Suzhou Exhibition Center, and the park with ferris wheel on the north side of Jinji Lake have formed a cultural and recreational attraction for both residents and tourists. On the south side, Ligongdi Causeway has been repurposed as a commercial street, and a green golf course have created a natural commercial and leisure space. Open space has become an important outlet for local interaction.



Figure 5.11: EDAW Design of Jinji Lakeside
 Source: Shi, *Urban Design in the Global Perspective*

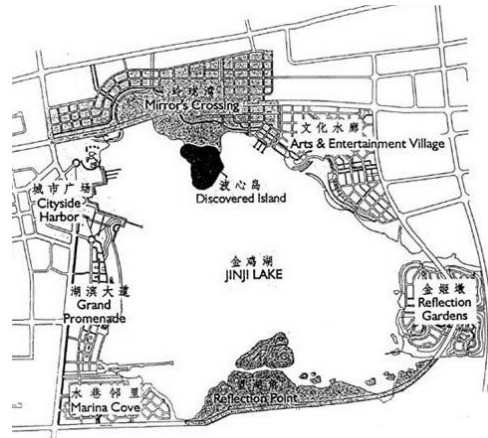


Figure 5.12: Program of Eight Functional Zones
 Source: SIP Website <http://www.sipac.gov.cn>



Figure 5.13: Overview of SIP
 Source: Ibid.



Figure 5.14: Ligongdi around Jinji Lake
 Source: Ibid.



Figure 5.15: Jinji Lakeside
 Source: Ibid.



Figure 5.16: Moon Port
 Source: Jinji Lake Website <http://www.sipjinjilake.com>.



Figure 5.17: Yuanrong Plaza
 Source: Ibid.



Figure 5.18: Lakeside Area
 Source: Taken by Author 2010



Figure 5.19: Jinji Lakeside Landscape
 Source: Ibid.



Figure 5.20: Lakeside
 Source: Ibid

4.6 Programs on Transit and Green Landscape

The entire infrastructure, roads, and buildings of SIP are newly constructed since the project started in 1994. Despite that land use designated for roads is only 15%, lower than the average ratio of Chinese cities, the traffic pressure in SIP is much less than those high-tech parks developed based on existing towns. Transit was developed to help alleviate traffic. The plan separated potential roads to handle the flow of traffic from those more appropriate for working and shopping street; it also established links from the north to the south, with the main axial crossing the CBD from west to east.

Unlike single-use industrial parks, SIP has many more levels in its road hierarchy system to support different traffic demands. The eight streets in the road system plan of the Phase 1 District have widths that range from 18 m to 52 m to serve all types of functions, from branch streets in neighborhoods through expressways crossing different districts. Main avenues link industrial areas and commercial areas through residential districts, providing the most effective transit for commuting. The river system is designed to parallel the street system. The space between the river and the street is a pedestrian landscape with benches, sculptures, and green landscape, resembling the waterside village framework in Suzhou's old downtown. However, the size of blocks and widths of streets are much larger.

One drawback, though, is little accommodation for pedestrians who wish to walk on the streets. Over time, planners generally overemphasized the traffic functions of streets and ignored its promise as a place for social interaction. In the residential area, most of the high-rise housing is separated from the roads and green landscape by walls. Most road planners did not consider pedestrians when the streets were designed.

Consequently, green landscaping along streets have few people despite public facilities for them. Additionally, although design guidelines in the CBD have detailed regulations for the consistency of façades along main streets, the roads are too wide to form a proper path for people shopping on the street. It is necessary to construct more facilities to enhance people's access to the streets.

However, SIP fully used natural lakes and rivers to create a sustainable and livable environment. Those open spaces are dispersed among industrial, commercial, and residential areas and have enhanced surrounding land value. SIP focuses on establishing a smooth transition from the old cultural downtown to a new township through extending the river framework and keeping similar land blocks and cultural elements available to the public. All of these natural and cultural resources form a green landscape network in SIP, providing residents and workers a natural environment to live and to work.

5. Lessons and Experiences Learned from SIP

5.1 Focusing on Specific Context

The impetus that led the Suzhou Municipality to develop SIP as a mixed-use township is threefold. First, there are various purely HIDZs within Yangtze River Delta area. As a late developed district, it is necessary for SIP to find a distinct feature to compete with other high-technology parks.. Second, limitation of land resources and overpopulation caused Suzhou City to develop eastwards. Thus SIP took the responsibility for releasing the pressures of an increasing population and demand for job opportunities.

SIP culled a great deal of knowledge from Singapore's experiences. The deputy party secretary of SIP, Pan Yun Guan, said that from the beginning, China set out to draw upon Singapore's institutional knowledge and expertise in three key areas: "The first was in city planning and construction, the second was financial development, and thirdly, in public administration. We learned from Singapore by sending our officials there for training, as well as inviting Singapore officials here to Suzhou. There were also mutual dialogues and exchanges. We've sent over 1,000 officials to Singapore so far."⁶

SIP fully utilized Singaporean institutional knowledge for city planning, construction, and management, including strategies for planning and management, public utility construction, public undertakings, land development and management, real estate development and management, environmental protection, and construction of small townships. Singaporean professionals also helped SIP officials establish a series of development and construction plans as well as a public management system. The Economic Development Bureau in Singapore and departments in the Management Bureau in Jurong Town lent accredited representatives for guidance on long-term development.

SIP allowed more experimentation for its financial development. It used the economic development strategies of Singapore involving investment promotion, industrial and commercial administration, tourism development, finance and taxation, state-owned fixed assets management, market agencies, modern logistics, and science park management. The joint development body, CSSD, serves as a creative adjustment to implement those strategies.

Since both countries utilize different political systems, SIP selectively borrowed public service constructs including security enforcement, public health, education, and labor management from Singaporean experience. With regard to law enforcement and uncorrupted government, SIP Administrative Committee established its own competition mechanism instead of government intervention for project applications. The Plan and Construction Bureau carried out planning regulations and statutory documents to enforce consistency of planning during the implementation process.

5.2 Forming a Complete Planning System

What SIP has learned from Singapore is not management experience of individual companies or single departments, but integrating a series of experiences for building a new township. A well-developed planning system has served as a significant foundation to the development of SIP, which others can adopt.

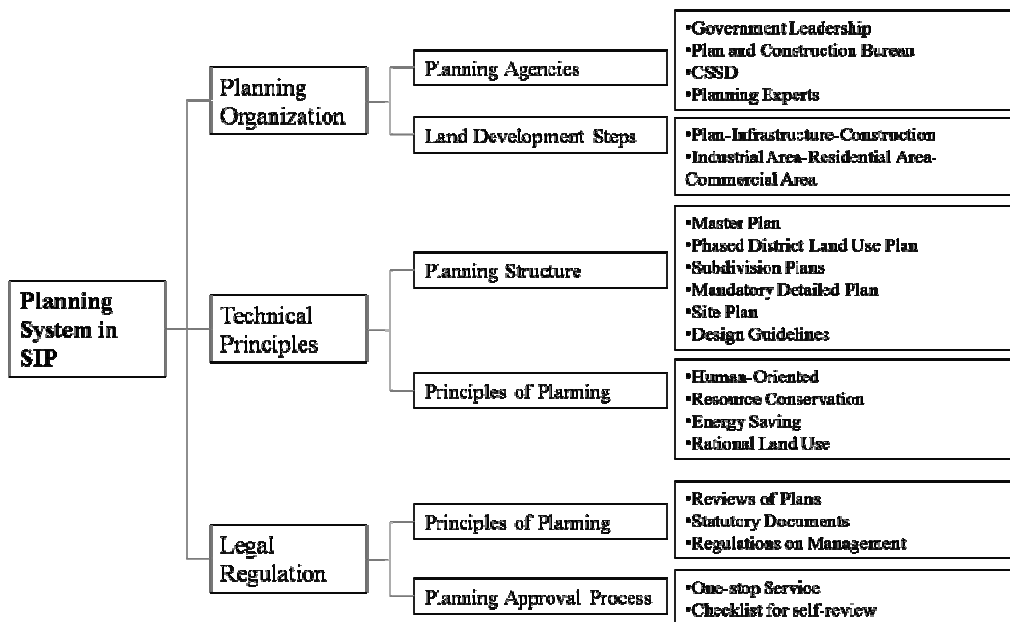


Figure 5.21: Planning System in SIP

This planning system consists of planning organization, technical principles, and legal regulations. The separation of land development right (as invested in the CSSD) from administrative affairs (that is controlled by the Plan and Construction Bureau) effectively stimulates the CSSD to pursue economic profit but also leaves the Administrative Committee rights to review and to adjust plans according to market demand. The complete planning structures and sustainable principles of physical plans are achieved through careful consideration of planning agencies and experts. Those plans and their subsequent construction are authorized through legal regulations. However, in most Chinese cities, legal aspects are still ignored because of the people-based political system and overly rapid construction pace.

Ideal land development steps focus on infrastructure and road construction first before considering investment promotions and project construction. In reality, due to budget limitations, municipal governments tend to sell or to rent land for short-term profit without making a complete master plan, much less a well-developed infrastructure. However, the shortage of infrastructure and public service plans slow down the pace of attracting investment, causing delay or even stoppage of further project development, leaving the entire district with scattered projects and many vacancies.

SIP attacked this problem through phased development. The small size of a phased area in SIP ensured that the infrastructure would be finished on time and with high quality. A well-developed environment and complete public services within a small phased area successfully attracted high-tech companies. The investment of international companies and their subsequent construction in turn enhanced the land value and spurred

further phasing development. SIP and its surrounding five towns all used this strategy and have made great profits.

Another recommended strategy to ensure sustainable development is to compile a series of plans focused not only on land use but also on urban forms, especially for those isolated areas in newly-constructed districts. Some new developments in China invested enough capital in infrastructure at first and constructed a number of buildings but still did not get the image of a high-tech industrial district that they desired. This result stemmed from use of a rough land use plan. SIP Committee made many detailed subdivision plans under the guidance of a master plan and a land use plan. Those subdivision plans carefully considered urban forms and open spaces together with surrounding functions and implemented the requirements through planning regulations and design guidelines. In addition, whether a site plan is consistent with zoning code and has mandatory detailed plans is an important factor that the Land and Real Estate Bureau uses to approve land construction applications. Moreover, the plans should be dynamic and reviewed and adjusted over time to accommodate market changes. The “land bank” strategy in SIP can be used in many districts that aim to develop mixed-use communities yet did not propose enough functions for the area during initial planning.

5.3 Several Recommend Planning Principles

- **Human-Oriented Design**

People’s interactions with the environment and public facilities are a key issue in making “live” open space. All the green landscapes in SIP are open to the public, offering sculptures, benches, sports facilities, and playgrounds. Jinji Lake’s accessible lakeside

region anticipates a number of visitors with its 22 km space. The programs of the lakeside region include various recreational and cultural facilities to attract people and to answer their demands. The facilities also enhance the land value surrounding the Jinji lakeside area and bring more commercial activities. Furthermore, another way to improve interaction is through construction of restaurants and housing in commercial and business areas. Consequently, SIP began to place mixed-use areas in CBD, such as adding commercial-residential apartments to enhance the people activities.

Offering multiple housing choices is another human-oriented principle. Plans on residential land use considered different demands and paying abilities of potential residents. The result is housing categorized into five types: low-rise attached housing; medium-rise apartments; high-rise apartments; high-rise public housing; and dormitories for construction labor workers. Despite different living densities and building quality, all have open parks and convenient public services in a local neighborhood center within walking distance. The closer property is to Jinji Lake, the higher land value is, so lower density populations and lower-rise housing is planned in these locales. This approach allows Jinji Lake to be shared by most of the residents and also balances economic demands and social equity.

- **Energy Saving**

SIP has placed great emphasis on environmental protection through policy guidance, regulation of standards, and advocacy projects. Statutory documents explicitly regulate relevant standards in terms of sewage disposal, water facilities, pollution, construction materials, and air emission. Through regulation, SIP strictly implements design review, energy saving construction quality control inspection, and other means to

save energy and to ensure that buildings meet conservation requirements. Over time practices have shown the effectiveness of environmental conservation strategies. SIP's environment has been approved by ISO14000 and is recognized as one of the first groups of national ecological demonstration parks. The greenery coverage rate of SIP exceeds 45%. The standard coal consumption is 0.34 tons per 10,000 RMB, which is 1/4 of the national average level. The emission of CO₂ and SO₂ in SIP is 1/18 and 1/40, respectively, of the national average.⁷ At the November 20, 2010 meeting to promote building energy efficiency in the Jiangsu Province, the Planning and Construction Bureau of Suzhou Industrial Park was awarded “, an advanced building energy conservation group” by Jiangsu Province.

The improvement of environmental quality through a high green space ratio, well-designed public space, and high ecological standards has attracted several companies such as Lilly Pharmaceutical, GSK, and AMD Semiconductor. These companies have high requirements on the quality of environment and thus are convinced by SIP's transparent environmental conservation strategies and regulations. In April 1998, the National Association of Countries Delegation to China highly appraised the work of ecological strategies used in SIP after visiting Suzhou and expressed the willingness to introduce American enterprises available opportunities to invest in Suzhou Industrial Park as priority in China.

5.4 Summary

“Suzhou Industrial Park, a pioneer in experimenting new policies and measures, is becoming an important window for China to understand the outside world and playing a more obvious demonstration role. Its success urges more and more Chinese to learn and adapt the useful experience of other countries with more open concept and more positive attitude.”

China News Service, August 29, 2009

Suzhou Industrial Park combines various elements of city, garden, industry, business, and life by centering on people, stressing harmonious development, and managing to achieve balance between growth and public benefits, prosperity, and the personal happiness. Both Singapore’s leading investment in SIP’s early days and SIP’s successful planning system, approaches, and techniques learned from the Singaporeans have played major roles in its success. Those strategies are also suitable for those high-tech parks that show rapid development on vacant land. In addition, the pressures and problems SIP faced can be lessons for other development districts. These problems include segregated land use, green space along roads devoid of interpersonal interaction, and deficiency in educational resources. SIP used a series of planning strategies to supplement its weaknesses and serves as a model for others’ practices.

Its regional focus has presented SIP with both opportunities and challenges. At present, from a new starting point, SIP began the Ecological Optimization Campaign and is striving to build up renewed superiority by making new breakthroughs in technological innovations, information projects, modern service industries, and talent pooling, all for the goal of building up a modernized, information-based, environmentally-friendly, and innovative-oriented industrial park. SIP has stepped onto an ecological way towards a new “eco township.” This approach has brought higher requirements for forming an

effective land development system and planning structure. In this new township where people work and live, human interaction with open space is much more important than just laying green landscape on the blueprint. Rather, planning reveals the importance of selecting proper principles and methods for physical planning and design.

¹ “Approval on Issues Concerning the Development and Construction of Suzhou Industrial Park”, National Document by State Council [1994] No. 9

² *Suzhou Statistics Yearbook*, 1996

³ National Document by State Council [1994] No.9; [2006] No. 128; [2002] No. 37; [2003] No. 11; [2004] No. 71; [2006] No. 70; [2007] No. 62; and [2008] No. 23.

⁴ Suzhou Municipality, ed. *Recoding Suzhou: Stories of Suzhou Industrial Park* (Suzhou: Guwuxuan Press. 2009).

⁵ "9 Utilities and Leveled Land" refers to: Roads, Power Supply, Water Supply, Gas Supply, Steam Supply, Sewage System, Storm Water Drainage, Telecommunication, Cable Television, and Leveled Land.

⁶ Suzhou Municipality, ed. *Recoding Suzhou*.

⁷ *Suzhou Statistics Yearbook*, 2008

CHAPTER 6: SHENZHEN HIGH-TECHNOLOGY INDUSTRIAL PARK

1. Brief Introduction

Shenzhen High-Tech Industrial Park (SHIP) is an example of the Type 4 of national HIDZs, which is isolated R&D oriented high-technology zones. Located in the Nanshan District, one of the four districts within the boundary of the Special Economic Zone of Shenzhen City, SHIP was developed as a single R&D-oriented industrial park with its main industries as (Integrated Circuit) IC industry, consumer electronics, and telecommunications. It was established in September 1996 and covers an area of 11.5 km². After 15 years of development, this zone has benefitted businesses and become a home for success. In 2003, the total industrial output value of SHIP was ¥227.2 billion, which is 22 times its 1996 output. Occupying only 0.6% of the Shenzhen land, SHIP has produced 30% of the city's industrial output, and its export value was 10.7 billion USD.

Specific features in Shenzhen have contributed to development of SHIP as an industry dominated park. Shenzhen is a city of sub-provincial administrative status in southern China's Guangdong province, which is situated immediately north of Hong Kong. Owing to China's economic liberalization under the policies of reformist leader Deng Xiaoping, the area became China's first—and arguably one of the most successful—Special Economic Zones. With 12,000,000 people, Shenzhen City has the largest migrant population and is five times that of the registered residents (2,460,000 people).

The interaction between Shenzhen and Hong Kong is another driving force behind SHIP's development. Shenzhen is the only mainland city in China that is connected to Hong Kong by both water and land. It was also the only opening city with an airport and a seaport in the 1990s. This geographic advantage makes it possible for Shenzhen to make full use of each other's resources. Hong Kong needs to resort to mainland technical power to develop high technology, and utilize the mainland manufacturing industry to develop the service industry. Meanwhile, Shenzhen takes full advantage of capital and information resources provided by high technology products from Hong Kong. Numerous high technology enterprises made use of Hong Kong's capital market, and raised funding supports for development.

In the past fifteen years, SHIP has undergone an evolution. Before SHIP's establishment in 1996, there were several scattered industrial bases in this area. These industrial bases were comprised of individual institutes or companies. Historically, industry in SHIP was based on intensive labor work and processing factories. Shenzhen, which is the same as other cities in China, has no restriction in regards to population mobility, but is comparatively more open to the market. Thus, a large number of surrounding farmers moved to Shenzhen. With a low level of education, most of these farmers did manual labor. Abundant migrants provided a solid industrial employee base for SHIP. In the beginning stage, when labor-intensive work was the major contributing factor to the economic development of Shenzhen, migrants created a significant amount of processing work.

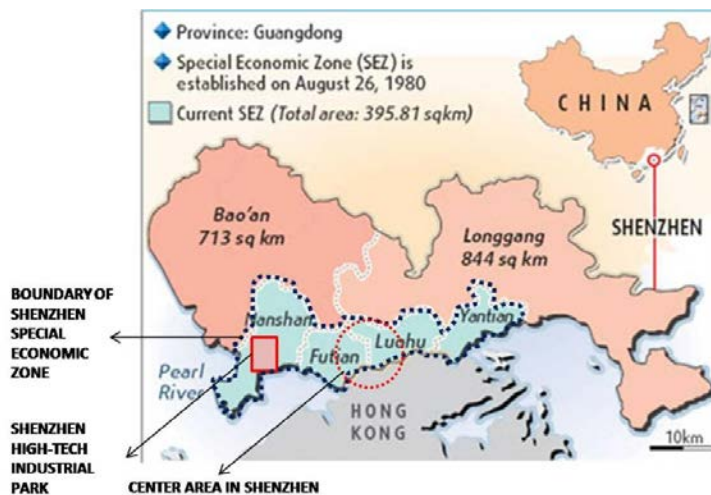
After the readjustment of the industry by the Shenzhen Municipal Government in 2000, more and more R&D centers, together with other commercial, residential, and

public service functions, moved into SHIP. The development of SHIP's trade and production activities led to the growth of higher qualified labors and advanced technologies. Thus, Shenzhen Municipality moved processing factories to nearby villages and towns surrounding SHIP, and established research centers in the park. Besides, the distance from Shenzhen to Hong Kong shortens the transporting time from production to trade market. When talking about why someone should invest in Shenzhen, one director of a foreign enterprise said, "Products were assembled in the morning in Shenzhen, and arrived in the afternoon at Hong Kong airport".¹

SHIP is located in the Shenzhen Nanshan District, which is inside the boundary of a special zone and benefits from the advantageous policy of an economic special Zone. But there is a quite distance from SHIP to the center of Shenzhen; it is located on the line from the city's center to the airport, and connects to the front of the south sea. Since the 1990s, small sized processing industry parks with nearby Shenzhen University provided fundamental resources for SHIP's construction. Moreover, because SHIP is dominated by single industry development, it depends more on the airport and seaport supply chain, as well as a mobile suburban labor force, than the connection with the city's center.

Several distinct characteristics of SHIP has led to its specific development in terms of land use and planning mode. First of all, due to the limited land area in Shenzhen Special Economic Zone, SHIP is one of the smallest national High-Technology Industrial Development Zones. This results in more demand for intensive development in this area. Secondly, most of the companies in SHIP are domestic-developed private civic enterprises, instead of state-owned institutes or large international companies. They

emerged after the Reform and Opening-up strategy of the late 1980s and have achieved rapid growth in SHIP. Different from international companies, these private domestic companies have closer relationships with local labor resources and have developed domestic independent intellectual property. Thirdly, since Shenzhen lacked universities and research institutes, SHIP brought universities and research intellectuals into the park. Currently, there are various types of Research and Development (R&D) centers that provide many intellectual resources for the development of high technology industries.



Map 6.1: Shenzhen SHIP Location
Source: Made by Author from Shenzhen Map



Figure 6.1: Illustration of SHIP's Location
Source: Made by Author from Google earth

The case of Shenzhen High-Tech Industrial Park has provoked several following considerations. How should plans be made according to the transformation of industrial focuses? In what context is SHIP's management mode appropriate? What is the benefit of developing SHIP as an open "space" rather than just a production-trading place? Why should SHIP gain sufficient intellectual resources, despite the serious lack of research institutes during the initial periods?

SHIP uses a lot of planning strategies to address these questions. The industrial development in SHIP caused the transformation of planning strategies in terms of land use, planning system, management agency, and planning content. The planning activities, in turn, have impacted the environmental layout, land framework, and human activities in SHIP. Moreover, with limited land resources in SHIP, the Shenzhen Municipal Government began to establish the High-Technology Industrial Belt, a group consisting of 11 districts and driven by SHIP, to displace processing labor factories outside and increase R&D powder within SHIP.

2. Historical Evolution

2.1 Why develop high-tech industry in Shenzhen?

Shenzhen City's industry started from almost zero and has experienced three steps during its several decades of development. The first stage was before 1985, when the Shenzhen Economic Zone was approved and started to attract investments. During this period, it established an industrial foundation. The second stage was from the late 1980's to the early 1990's. During this time, Shenzhen's industries developed at a high rate.

Shenzhen established a variety of export-oriented enterprises. The third stage started in 1996 when SHIP was established. Since then, high technology industries developed rapidly, with an annual growth rate of 40%.

With increasing nationwide competition in the 1990s, Shenzhen began to consider changing industrial types from processing to high technology. Due to its lack of natural resources, Shenzhen needed technological progress and high technology industry to enhance its economic development and area competition. Moreover, as the reform and opening situation became apparent in many other regions, foreign trade channels had been increased. Shenzhen's specific advantage as a Special Economic Zone has become weakened, and the impact of advanced preferential policies became much less than before. At the same time, the cost of key production in Shenzhen, for example, land and labor resources, increased constantly. This constrained the development of labor intense processing industries. In early 1990's, when some foreign factories began to move north of Shenzhen, the previous trade development format became weakened.

In the late 1980s and the beginning of the 1990s, the Shenzhen municipal government completed a comprehensive survey and research initiative. They realized the importance of high-technology development for future industry. Thus, many industries, like computer, telecommunication, and bioengineering, were regarded as strategic industries to aid in the economic development that was designed to positively affect Shenzhen's future. However, due to its lack of technical expertise, Shenzhen did not have any chance to directly develop large information technology bases. Thus, Shenzhen adopted a way of introducing advanced technology, technical facilities, and high technology enterprises from outside regions. Under the leadership of the government, in

the early of 1990s, Shenzhen developed many small independent high technology areas, such as the technology industry area jointly run by Shenzhen and Chinese Academy of Sciences. This is the earliest established high technology area with total area of 1.02 km²; this was followed by the establishments of Shenzhen technology industry area, the Chinese Technology Development Institution, the Shenzhen High Technology Industry Village, the National Electronic Technology Application Laboratory Center, and Shenzhen University. These industrial bases and small enterprises helped establish an economic foundation for the development of a high technology industry.

With the rapid development of the high technology industry in the late 1990s, government and other enterprises established a common view on the positive effect of the high technology industry. Thus, Shenzhen High-Technology Industrial Park was constructed, and formed its own features during its process of industrial development. Nowadays, the high technology industry has become the main economic power contributing to the improvement of Shenzhen's industrial development.

2.2 Development of Shenzhen High-Technology Park

With booming development of the high technology industry in Shenzhen from 1991 to 1996, the Shenzhen municipal government set up an agenda to improve the quality of the high-tech industry. In 1996, the government created the International Development Strategy of the High Technology Industry, whose aim was to use international investment to promote the development of domestic companies. In May of 1996, the government created SHIP, located on the site of several small industry areas. An Administrative Group was established to lead SHIP; this group was directed by

Shenzhen City's Mayor Zibin Li. The group consisted of officials from nineteen municipal bureaus, such as the Technology Bureau, the Land Resource Bureau, and the City Planning Bureau. The Administrative Office was set up under the lead of the Administrative Group, and worked as the municipal government's agency whose task was to manage all the high technology affairs in SHIP.

Covering small individual industrial bases, SHIP has an area of 11.5 km². It is divided into the North, the Middle, and the South areas. Most of the previous small industrial bases were located in the Middle area. Shenzhen University was located in the South area. Both the North and Middle areas were planned as a unified managed place, while the South area extended the area by reclaiming land from the sea, and started the construction of an infrastructure.

When the Shenzhen government developed the idea of the High-Tech Industrial Belt in 2002, SHIP had already established many functions like IC production, software, telecommunication, biology, new material, higher education, and research in its fully developed 11.52 km² piece of land. Over 200 high technology industries gathered together in this area. Besides the private domestic enterprises, such as Great Wall, Huawei, ZTE, Lenovo, APTECH, TCL, Founder, and Tongfang, Many multi-national enterprises, such as IBM, Philips, Compaq, Olympus, Epson, Lucent, Harris, and Thompson. Lenovo, who initially planned to enter Shenzhen in 1993 but gave up due to the high cost of land resources, came back to Shenzhen and also removed its research center into SHIP. A Lenovo official is quoted as saying "they came back because of the increasingly intense atmosphere in this high technology district."²

3. Planning and Management Strategies

The development of high technology in Shenzhen started in 1990s at a slow pace but rapidly developed. It profits largely from successfully merging technology and economic development. A well-managed and well-planned urban environment contributed to this partnership. Here, the environment refers to the infrastructure, as well as the physical environments and facilities for all city activities. Planning and construction of the environment has promoted the agglomeration of enterprises in SHIP. In turn, the development of high technology brings more demands to planning and management. Based on local characteristics, SHIP has adopted several planning strategies involving management agency, statutory plans, incremental land use, planning of environment, and further high-tech industrial belt to address the problems in development, as discussed below.

3.1 Management Agency

The Shenzhen Municipal Government is responsible for the leadership, decision-making, planning and macro-management of SHIP. It adopts an open-oriented three-level management pattern that is in line with Chinese laws and regulations. The decision-making body is the Administrative Group of SHIP with the mayor of Shenzhen as the head. This body supervises the implementation of the relevant policies regarding the development of SHIP. The management body is the Administrative Office of SHIP and is responsible for the routine daily high technology activities in SHIP. The service body, which includes the Service Center of SHIP, the Service Center of Shenzhen Virtual

University Park, and the Service Center of Shenzhen Software Park, provides complete services to the enterprises and scientific research institutes in SHIP.

The three-level management pattern coordinated with all relevant government bureaus on issues ranging from planning to infrastructure, construction, and service facilities, neither breaking the original approval chain and process of those bureaus, nor rearranging their administrative functions in the high-tech park. The director of Administrative Office of SHIP, who is also vice secretary of Shenzhen Municipal Government, can hold municipal meetings on behalf of the mayor of Shenzhen. Once documents that are formed in the meeting get approval from the mayor, they become a statutory political regulation. Thus, to some extent, the power of Administrative Office of SHIP is even larger than the Development and Reform Commission of Shenzhen.

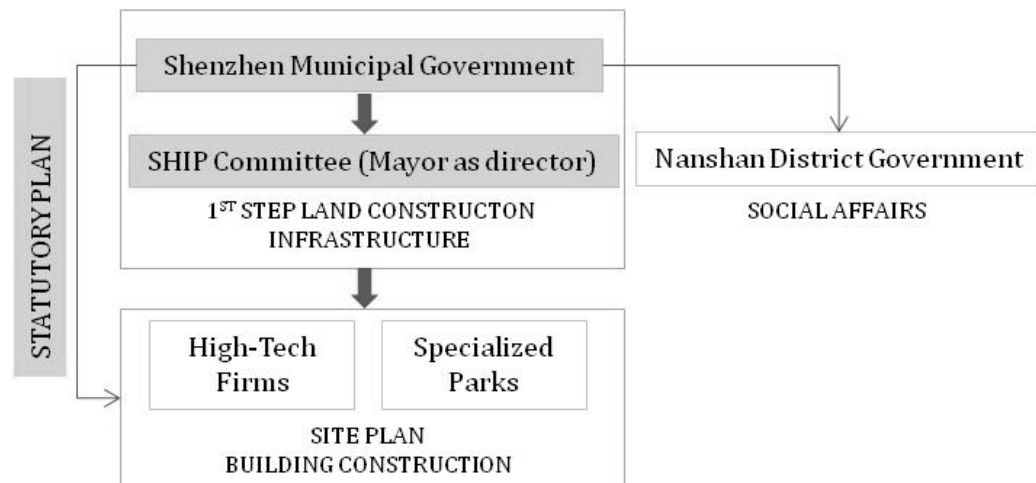


Figure 6.2: Land Development Organization of SHIP

The municipal and district governments distinguish their responsibilities explicitly and effectively. As an agency of the municipality, the Administrative Office of SHIP does not have independent taxation capacity. The tax-distribution system is divided

between the municipality and the local government. Neither the Administrative Group nor the Administrative Office of SHIP is responsible for the social activities in SHIP. Rather, the local district government of the Nanshan District where SHIP is located provides services that include schools, hospitals, and retail and public facilities in neighborhoods. As early as the 1990s, the office intended to establish a joint development company to oversee land development. However, in Shenzhen's free market economy, the company over-emphasized profit and revenue but overlooked high-tech industries. Thus, Shenzhen Municipality repurchased the stock of the company, and changed the land development to in-budget development.

3.2 Incremental Development vs. Statutory Plan

SHIP does not have its separated subdivision plan. Instead, SHIP has a planned industrial area integrated in the Nanshan District Plan under the guidance of the comprehensive plan of Shenzhen Special Zone. Nanshan District Plan established SHIP as a base combining several existing industrial parks on site. For instance, the transit plan and the green space plan of Nanshan District have explicitly defined and regulated planning in SHIP.

Nevertheless, in 1996, the Municipal Party Committee and the Municipal Government established a planning group consisting of 44 experts from 25 relevant department and bureaus, whose aim was to develop a series of plans for SHIP. The planning group includes a main section, an industry section, a land and construction section, and a regulatory section. They have finished the development plan, the land use plan, and the industrial plan of SHIP in one to two years and got those plans approved.

The basic framework of the plans was well carried out and is still guiding SHIP's developments today.

Despite constant land use structure, SHIP underwent regeneration over time. At the initial step of Chinese Reform and Opening up in the 1980s, Shenzhen, as the first Special Economic Zone, engaged its industrial development in the global division of world economy. Due to outmoded economic thinking, what Shenzhen got at that time was only the production role rather than developing manufacturing industries with independent intellectual property. Consequently, in the 1990s, the planning of SHIP focused on providing basic physical environment and infrastructure for production. It developed the road structure among existing small industrial parks, and used the roads and infrastructure to link them together to form a basic framework of a high-technology industrial park. The completion of the basic infrastructure and production environment led to rapid industrial development in SHIP. Correspondingly, the planning of SHIP began to infill a series of functions involving commercial, business, cultural, research, and educational uses into the site. For instance, Shenzhen Software Park was established to aggregate software enterprises together under well-planned standard office buildings. The adjusted development plan displaced some outside processing factories and brought housing and commercial areas into the site in order to meet the demands of high-tech industry development.

The control of construction is under the statutory plan of SHIP. Shenzhen is the first Chinese city to formulate statutory land-use plans as legal documents. Until 2005, the Shenzhen Urban Planning Board had approved the five statutory plans in SHIP. Following the Hong Kong model, the statutory plan is similar to zoning regulation and

has a set of criteria to regulate development. It consists of a map and text explanations, with the map showing how the sub-districts are divided into small zones, and text describing the rules that apply to each zone. All parcels are indexed by number, and acceptable land activities (first category) for each indexed parcel are also listed on the map. In addition, the statutory plan provides a land-use control table to offer further criteria that includes lot area ,floor area ratio, green space ratio, a second category of allowable land-use types(second category requiring city government approval), as well as a third category (requiring approval from the Urban Planning Board).

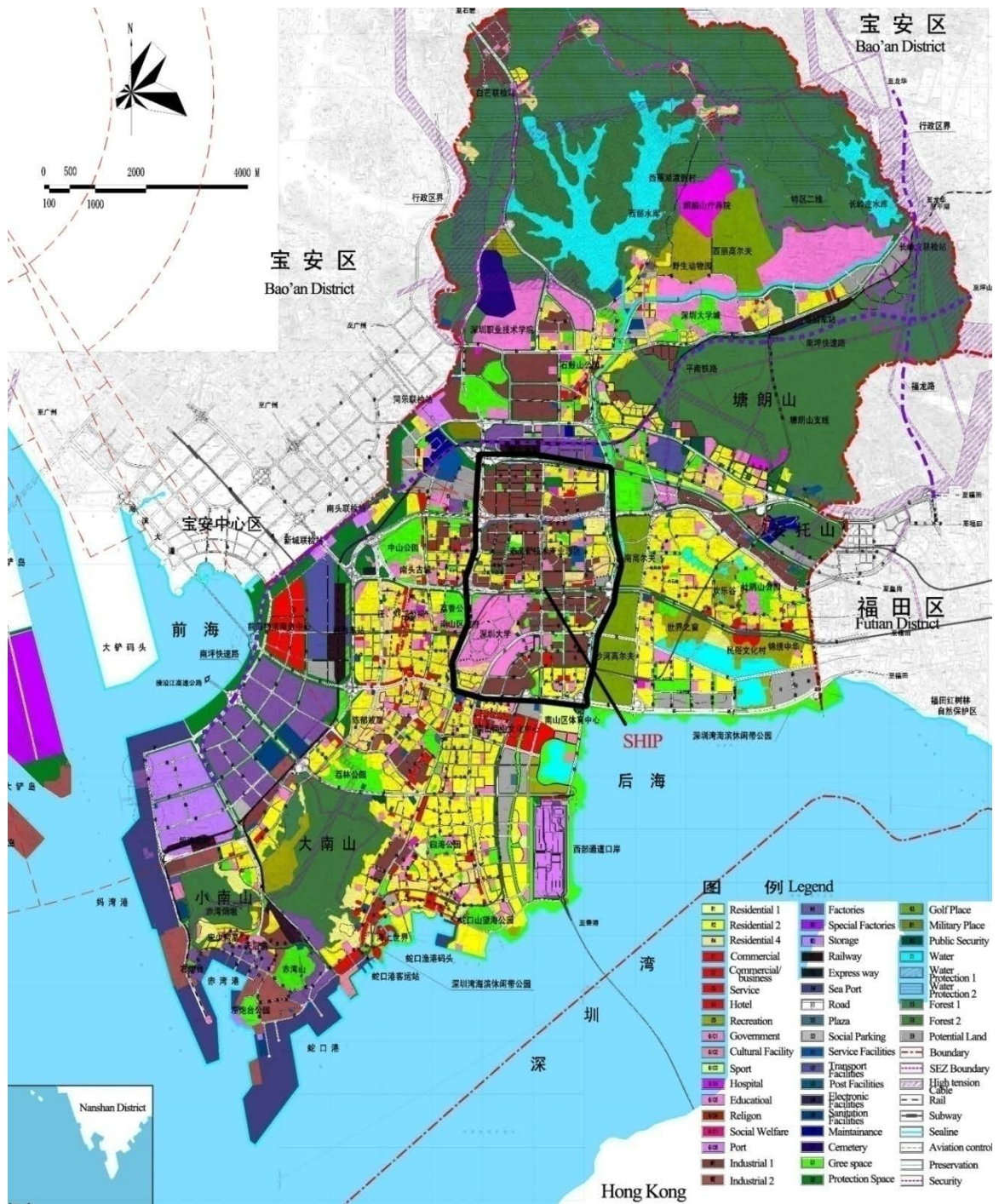
The statutory plans in SHIP have left flexible space for incremental change in this district. For instance, when the statutory plan of the North-West area in SHIP was approved in 2002, half of the land parcels in this area were awaiting investment. Thus, in the plan, the first category stipulates those lands as “high-tech park industrial use” but leaves the second and third category blank for further development guidelines. Contrarily, in 2002, the statutory plan of the South Area in SHIP explicitly specifies land use types and volumes as most of the land parcels in the South Area have been leased to developers and subsequently constructed.

SHIP is undergoing much faster development than the approval of the plans. It takes a long time to prepare and approve a statutory plan as a legal document. Shenzhen Municipal Government established a three-level system, including the planning technology committee, the statutory plan committee, and the urban planning committee, to approve the plan. There are over 40 meetings on statutory plans each year. In addition, due to several controversial arguments on whether the statutory plans are suitable to become legal control documents, the development rate was reduced, as well as any

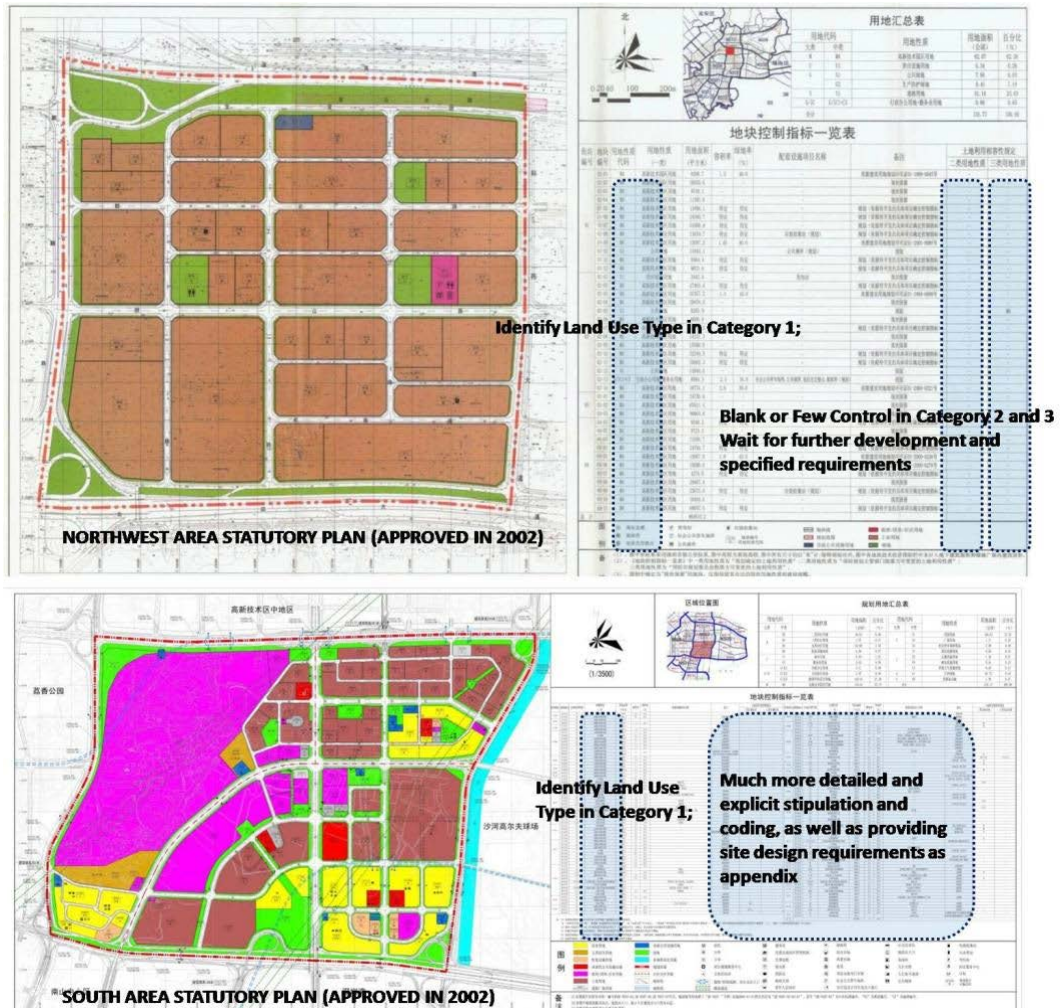
amendment to these plans. Thus, the depth of control illustrated in the statutory plan is still too loose to regulate the local activities at each site.³

Table 6.1: Planning System in Shenzhen

	Master Plan	District Plan	Statutory Plan
Focus	<ol style="list-style-type: none"> 1. Function of the city 2. Scale of the city (population size and urbanized area) 3. Future development goals 4. Overall arrangement of different district of the city 	<ol style="list-style-type: none"> 1. Land-use arrangement 2. Transportation network 3. Open space 4. Preservation 5. Utility network 	<ol style="list-style-type: none"> 1. Land-use type 2. Development intensity 3. Facility layout 4. Transportation
Geographical Coverage	The whole city	73-180 km ²	Varying between 0.65 and 74.61 km ²
Time Span	Until 2020	Until 2020	Not applicable



Map 6.2 Land Use Plan of Nanshan District
 Source: Land Use Plan of Nanshan District 2006-2010



Map 6.3-6.4: Detail of Statutory Plan of SHIP

Source: *Statutory Plan of Shenzhen High-Tech Industrial Park, West Part in North District, 2002*; *Statutory Plan of Shenzhen High-Tech Industrial Park, South District, 2002*.

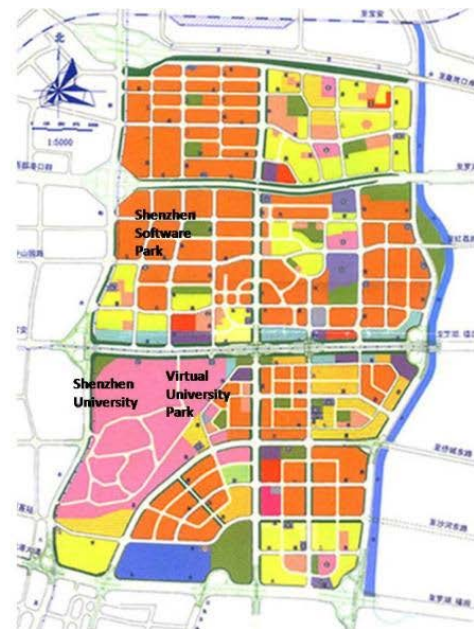
3.3 Land Use in SHIP

SHIP’s newly adjusted development plan identified SHIP as “an efficient high-tech industrial district; a scientific research based zone; a cooperation zone of international institutes; and a cultivated zone for high education-level talents”. This statement has proposed several main functions in SHIP involving industry production, education, and research and development. Thus, in terms of land use, SHIP is divided

into three areas. They are: the North Area, which is dominated by the production factories of the photoelectric industry; the Middle Area with industries such as software, biological engineering, and computer science; and the South Area, with an industrial base of electronic information, as well as a main center for management, education, R&D, exhibition, commercial and business activities. Currently, there are four major types of buildings in SHIP: office tower buildings, large modern factory buildings, workers' dorms, and an informal retail and restaurant spaces. These commercial activities are mainly located along Keyuan Road, which is the main axis of the region. Most of the office buildings are located along Shenzhen Road, which is crossed by Keyuan Road and separates the South and Middle Areas.



Map 6.5: Districts in SHIP
 Source: Made by Author on Shenzhen Map



Map 6.6: Land Use in SHIP
 Source: *Land Use Plan of SHIP, 1998.*

This pattern of land use evolved from the initial scattered industrial parks. Most of the previous land parcels were less than 0.01 km² and had low efficiency. Thus, based on the demands of newly emerged high-technology companies, the land use plan regulated each industrial land parcels into areas larger than 0.02km², and provided standard factories to agglomerate those small-sized factories and companies.

In 2000, the adjustment of the land code led to the transformation of SHIP companies from production to research and development based. In the 1990s, most of the newly boomed domestic private companies in SHIP were small in scale and needed the financial support of the Administrative Office in SHIP to survive. After their successful development towards larger companies, the Office changed the relationships with those companies from funding support to normal land leasing and construction approval. In 2000, one of the biggest domestic private companies, Zhongxing Co. Ltd, applied for higher FAR in its site due to the limited land resources in SHIP. While SHIP's Administrative Office tended to agree with this application, the planning department of Shenzhen Municipal Government rejected this request. The reason is that higher FAR in this site would cause discordant urban form in the surrounding area; more importantly, it is possible for Zhongxing Company to use the additional area for commercial real estate rather than industrial production. The Shenzhen Municipal Government finally made the following decision. First, the government clarified the characteristic of Zhongxing Company, which is an IT industry that is research and development based and distinct from normal manufactory companies. Thus, it is reasonable to increase the ratio of R&D, trade, and service areas. Secondly, based on a wide and deep investigation, the government suggested that SHIP's development plan should emphasize R&D companies

rather than production factories. Thus, the FAR can be slightly enhanced. Also, Zhongxing Company was required to properly adjust its architectural design to avoid conflicts with surrounding areas. This argument has motivated the rethinking of high-tech industries in SHIP. Furthermore, the investigation finally caused the R&D orientation of today's SHIP.

Realizing the important effect of R&D functions, the Shenzhen Municipal Government provided strong supports to establish several research bases. Under the on-site supervision of municipal officials, it took less than one month to finish the flat land for construction of Peking University Biological Valley, which consisted of an 87,000 km² area and took only one day to finish the application process. Moreover, the Shenzhen Municipal Government invested ¥250 million into the planning and construction of Shenzhen Software Park.⁴ So far, the Shenzhen Software Park consists of over 80% R&D centers of multinational companies who were attracted to SHIP because of its green space, complete service, high quality of infrastructure, and unified management.

Rather than R&D centers of companies, SHIP also established large buildings for important research bases. One of the examples is the site design of Shenzhen-Hong Kong Research Institution. With a gross area of 36,000 m², this site was finished construction in less than one year. The site has three parts, including a teaching building, a high-technology research area, and a public training area. The teaching building has facilities that can accommodate remote education, public classrooms, and MBA and MPA training. The High-technology research has an area of over 20,000 m², which has gradually brought in many key state laboratories and high-tech enterprises that were incubated at Peking University or University of Hong Kong. The public areas include an exhibition

center, a conference room, a multifunction room, and an intermediary agent service space. Those comprehensively developed functions have intertwined together to form a mature research base, providing strong R&D support to high-tech industries.

3.4 Planning of Assorted Environment

For a single R&D research based industrial park, the physical planning in SHIP mainly focuses on supporting four kinds of assorted environments: (1) environments for human activities, such as cultural, recreation and sports areas; (2) industrial environments, such as well-planned land use pattern and functions; (3) information environments with unified information networking; and (4) community environments affording daily services for employees and residents. Currently, the North Area has hotels and civic parks for employees and business visitors; the Middle Area has established a large supermarket and bookstores, together with leisure plazas for residents in neighborhoods and employees in the Software Park. Based on Shenzhen University and Virtual University Park, the South Area has many clubs of company presidents, commercial retail spaces, restaurants, and student apartments. Due to its high environmental standards, SHIP has been issued the ISO9001 Quality Management System Certificate, ISO14000 Environmental Management System Certificate, and the SA8000 Social Accountability Management System Certificate.

Moreover, according to *Development Plan of SHIP in 2008*, the capacity of SHIP's employees is about 137,000 persons. SHIP's land use can only accommodate less than 90,000 residents on site, which means that about 50,000 employees need to commute work. This has motivated construction of many residential projects in the areas

surrounding SHIP, such as Taoyuan Village to the east of SHIP, or reclamation areas to the southwest part. A developed subway system has largely promoted the real estate in those areas.

As an R&D based park, SHIP's land use pattern of is different from those mixed-use new town type science parks, where residential and commercial lands dominated center areas, with industrial lands at the marginal edge of parks. The residential lands inside SHIP are formed into groups of neighborhood apartments, located separately in each industrial district. Those employees working in nearby industrial areas have priority and preferential support for those housings. This plan effectively minimizes the distance between work and home, and reduces the work flow.

In terms of the road system, most of the land use are for industrial functions and, consequently, the road structure in SHIP is designed in a grid and block horizontally and vertically. Single industrial land use and a few other services have led to four levels of street hierarchy. The first type, freeway or express way, is for long-distance routes connecting metro areas. The second type is public transit routes connecting regional functional groups within Shenzhen City. The third type is frequently used main streets connecting different functions inside SHIP, while the fourth type is streets between neighborhoods and working places within each area. Compared with mixed use district, the road system in SHIP is much simpler because the industrial use has much less demands for diverse road styles. Nevertheless, there is a lack of pedestrian streets in SHIP's residential areas, causing inconvenience for people's daily activities.

3.5 Urban Village in SHIP as a Challenge

A challenge faced by SHIP is the evolution of urban village. Dachong Village, a 68.4 hectare area located within SHIP, is the largest urban village in Shenzhen. Although the village and SHIP are connected to each other geographically, Dachong village is completely isolated by its surroundings. The population of Dachong village is 29,007, among which only 1,007 of them are original villagers and owned the village houses. Over 96% of the populace are immigrated settlers coming from another place to work in Shenzhen. With an obvious advantage of location and increasing land value, it is much more difficult to renovate this area than before.

Dachong Village was a common rural village south of Guangdong province. Most residents were engaged with agriculture works. In 1980, the government requisitioned the land for economic development. Meanwhile, the government returned a small part of the land to villagers for their housing, which become today's Dachong Village. The requisitioned land, which surrounds Dachong village, was developed as today's Shenzhen SHIP.

In the late 1980s, a large number of immigrants rushed into Shenzhen for better job opportunities. The housing market could not meet such large demands at that time. Therefore, the urban village suddenly became the housing rental market for a large number of settlers. In terms of long development, Dachong Village developed without synthetic planning and effective managing by the Shenzhen government. As a result, it forms a very different urban fabric and weak network system than the surrounding area, and hence has caused low environmental quality.

The scheme of Dachong Village's reformation was first brought forward by the Shenzhen Planning department in 2002. In 2004, the urban planning regulation on urban village reformation was approved by the Shenzhen government. In 2005, the Dachong village reformation commenced. The new reformation scheme will demolish the old Dachong Village and build a high-class modern residential area combined with office, entertainment, and retailing facilities. However, after the scheme was approved, the villagers found that the new property value and benefit of the development are much higher than the compensation they received. Therefore, they did not agree with the compensation program and refused to remove. As a result, the whole project had to be shut down at the end of 2005.

Renovation of an urban village is a difficult systematic project involving planning techniques, land, compensation for displacement, and problems with land property ownership. It is related to many social and economic issues and is more complex than simply demolishing buildings and removing residents. According to report, the renovation project in Dachong, Nanshan District, started on Saturday, 25th January 2010, with 168 families in the neighborhood having signed an agreement with the project developer the same day. However, how to negotiate with settlers, how to relocate the immigrants, and how to infill this land as an integrated park of SHIP, is still a challenge to the government and city planners.

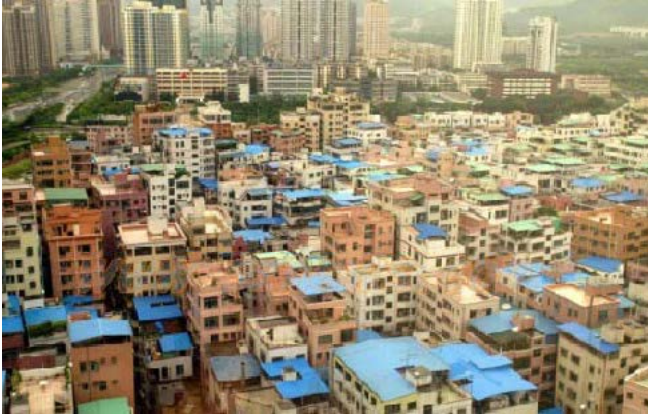


Figure 6.3: Dachong Village
 Source: Shenzhen View <http://city.sz.net.cn>



Figure 6.4: Footprint View of Dachong Village
 Source: Google earth



Figure 6.5: Current Construction of SHIP
 Source: Photos taken by Author in 2010

3.6 High-Technology Industrial Belt: Further Development

Among the national High-Technology Industrial Development Zones, Shenzhen High-Technology Industrial Park is one of the smallest. Despite this, there has been intensive land utilization; however, further development was halted by lack of potential space. Early in 2000, SHIP's Administrative Office had to deny an application of high-tech industrial base from an American IC company, as it required a site with over 1km², which SHIP cannot afford. In recent years, SHIP has cleared up and adjusted over 1.12 km² of usable land; the shortage of land supply is still not resolved.

Consequently, Shenzhen Municipal Party Committee propounded a scheme of developing High-Technology Industrial Belt across regional areas both in and out of Specific Economic Zone in Shenzhen. This scheme is based on several existing industrial areas in Shenzhen's metro region, led by SHIP as the main anchor. There are 11 proposed districts in this belt with different main functions. The planned High-Tech Industrial Belt is 100 km long, covering 152.62 km² of land, which equals 12 times the original SHIP.

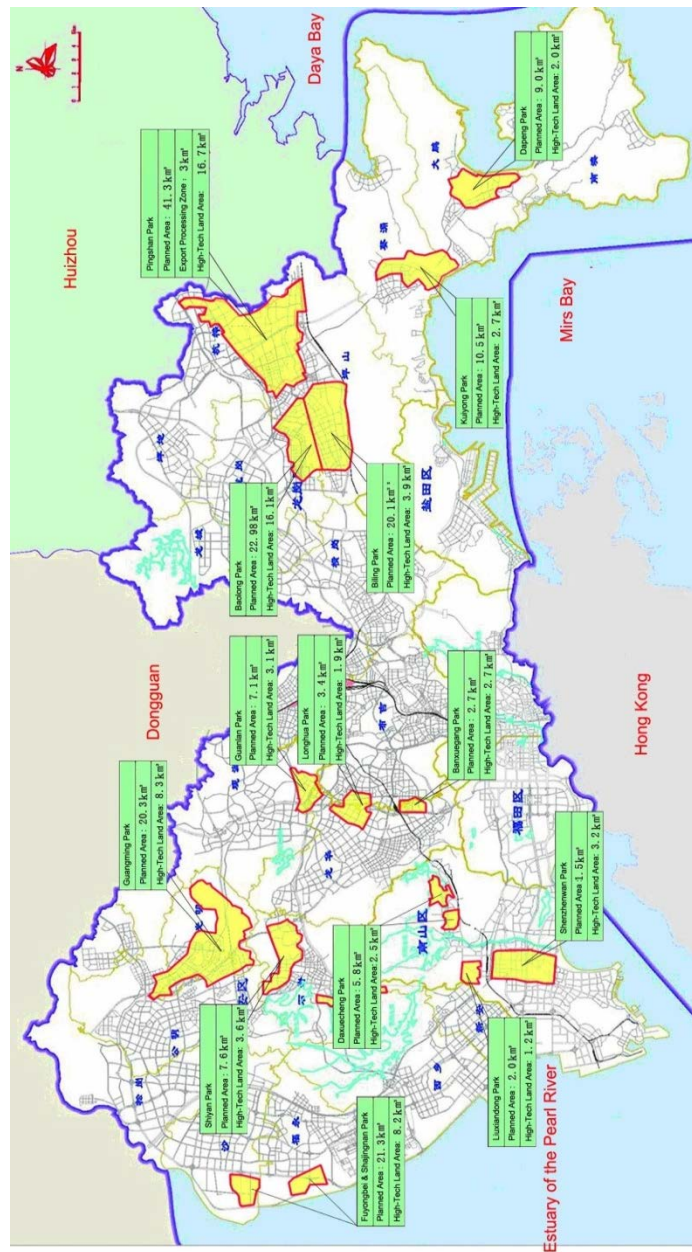
In terms of industrial development, High-Tech Industrial Belt emphasized the R&D function of SHIP, and planned to gradually displace the manufacturing companies and processing industry with more high-tech industries and their R&D functions. This program, if implemented, will significantly increase the capacity of research and development function in SHIP, as well as keep assorted industries in surrounding areas. However, the implementation of developing the industrial belt faces challenges resulting from different strategies inside and outside the Special Economic Zone. Also, the lack of rapid transit network restricts the development. Consequently, in July, 2010, the

Shenzhen Municipal Government announced the extension of the Special Economic Zone's boundaries from its original four districts to its current area covering the entire Shenzhen City, which is five times as large as before. This strategy strongly reduced the imbalance between the special zone and the non-special zone, providing an equal political environment for further development.

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The construction of the High-Tech Industrial Belt also brought an opportunity to develop an ecological metro-region. The planned Belt covered several water source protection areas and ecologically sensitive areas. As a result, it required a much higher quality of environment conservation. The plan of the High-Tech Industrial Belt has implemented several strategies to ecologically protect the environment. They include: in

main high-tech industrial districts, high-tech projects related to water-saving, energy-saving, and pollution reduction are given priority to develop; in ecological farm districts, pollution by chemical fertilizers and pesticides are controlled; several key sewage treatment plants and waste treatment plants are under construction; high density industrial areas and housing are encouraged to use solar energy and meet green building requirements.



Map 6.7: High-Technology Industrial Belt in Shenzhen
 Source: *Development Plan of High-Technology Industrial Belt in Shenzhen, 2010.*

4. Development of SHIP

4.1 Companies in SHIP

Historically, Shenzhen has tried to develop high-tech parks depending on state-owned industries, which are supported by state government capital. The traditional connection between government and state-owned institutes has had a positive effect on speeding up the development of large-scale industries; however, it is proved to be ineffective in promoting high-tech industries, such as the IT industry. Contrarily, some enterprises that develop without state-owned institutes' control had more rights to handle their own affairs, and developed very fast. Thus, the Shenzhen Government gave up dependence on state-owned institutes and governmental direct investment. The Shenzhen Municipal Government explicitly clarified the government's responsibility: it could plan, direct, support and create a nice environment, but not invest directly as a state-owned company to monopolize the entire area.

Thus, small and medium sized enterprises, especially those domestic private ones developing on their own, have become a basic characteristic of SHIP. Beginning in 1995, the Shenzhen Municipal Party Committee and Municipal Government began to establish a high technology industry village as a way to gather twenty-four newly established high technology industries. Despite the small scale of the industry, the technological level was high. Many of them have become major domestic private companies after establishment of SHIP in 1996

Most of the domestic private enterprises are established by technicians. They collected capital, got together to form the team, handled the business, and took the

responsibility for profit and loss by themselves. Most of them concentrated on the activities of development, transfer, counseling and serving. Private is not a signal for economic category, but is a special product in China, differing from those state-owned industries and companies with the Chinese government's support and investment.

However, private enterprises have some disadvantages. For example, they are in small scale and are in lack of human resources. Those features of private enterprise have brought a special characteristic to SHIP. Shenzhen had made a great effort to solve the lack of human resource in the private industry. The municipal government provided funds to cooperate with national technology committee, prestigious universities, and famous universities to establish research centers in order to strengthen the technology research power. Moreover, the Administrative Group in SHIP was inclined to small and medium sized enterprises in policies; they supported and encouraged private industry to establish their own research bases. At the same time, SHIP made full use of its leading role in the planning on resource allotment to establish public facilities, such as libraries, public laboratories, and a large scale public data base.

4.2 R&D Centers in SHIP

The main part of innovation entities in Shenzhen is high-technology enterprise. In Shenzhen, there is a statement referred to as the "four 90%." They are: 90% of research development institutes belong to the enterprise; 90% of research personnel are working in the enterprise; 90% of research funds are from the enterprise; and 90% of the invention patents are created by the enterprise. One of the main characteristics of Shenzhen's high technology area is that it has a variety of research centers. In the high technology area,

there are a lot of autonomous intellectual property programs, such as telecommunication power supply from Huawei and CDMA from Zhongxing.

There are three types of research and development centers in SHIP. The first one is that several companies, such as Lenovo, TCL, and Skyworth, place their production basements in peripheral towns and villages, such as Dongguan and Huizhou, while locating the research centers in SHIP so as to provide technical support for those processing factories. The second type is distributive research and development center, which means that private industries not only develop R&D centers in SHIP, but also establish centers outside, such as in Silicon Valley in the United States or centers in Beijing, Shanghai, and Nanjing. This is exemplified in such companies as Zhongxing and Kexing. A third type is multinational companies establishing R&D centers in SHIP, such as Lucent, Sunplus, and V-tech, in order to focus on research into advance technologies and industries.

International technological research organizations came to SHIP not only because of the potential of Shenzhen, but also because of the existing cooperation strength. Lucent Co. Ltd has stated that the good development atmosphere, unlimited potential market, and excellent human resources in SHIP are an advanced strategic base for them. The participation of multi-national companies, in turn, largely enhances the research development power, making SHIP play an increasingly important role in the international technology research field.

4.3 Virtual University Park

In the process of encouraging the establishment of research centers, the main jobs that SHIP did was attracting colleges, universities and technology organizations to establish in the park. As a newly developing modern city, compared with many other cities in China, Shenzhen does not have many colleges, universities and technology research institutes. The only one comprehensive university, Shenzhen University, is not yet a famous university in China. In order to develop higher education, SHIP was the first to establish a unique university, Virtual University Park, as the foundation of cooperation between enterprises, schools, and research institutions.

Established in 1999, Virtual University Park was located in the South Area of SHIP with the purpose of effectively using the resources of technology institutions and educational atmosphere in Shenzhen to form a base for human resources recruiting and technological innovation. Generally, virtual university exists on the internet; however, Virtual University Park in Shenzhen's high technology area is different. On one hand, it is a virtual logical concept because it shares its information resources with other universities via the internet. On the other hand, it is an essential geographic concept with its own building with an area over 10,000 m². Every university has its representative to handle daily issue, hold lectures, and engage in research activities. More importantly, it transfers intelligent achievement to production directly through intelligence communication.

With the opening of Virtual University Park, many famous universities, such as Beijing University, Tsinghua University, and Hong Kong University, joined. In addition, about 20 famous universities from the United States, Russia, Britain, and Australia

received internet membership. Virtual University Park was built on a 3,000 m² area as initiation area. The Shenzhen Government established the Virtual University Management Center to take charge of the processing and management of the center on behalf of the Administrative Group and Office of SHIP. Also, Shenzhen's government annually allots ¥10 million as university area processing special fund, paying the rent and real estate management fee for each university, as well as providing free facilities and long-term pass to Hong Kong for each university.

Virtual University Park has become an important part in planning of SHIP, directly affecting the planning and industry strategy by transferring the industry from a labor-oriented one to a R&D based industry. Currently, many colleges and universities registered for high technology companies at virtual university; therefore, many new enterprises that have autonomous intellectual property are created. In turn, the cooperation between enterprises and colleges has increased. Many enterprises came to virtual university area, talked with a representative, and tried to look for human resource, achievement and opportunity. Virtual University Park has provided a chance for cooperation between research and the market.

5. Discussion and Recommendation

5.1 Making Plans Based on Transformation of Industry

In 1980s, the Shenzhen Municipal Government correctly estimated the economic trend and made the decision of changing its original emphasis from labor-intensive processing industries towards a focus on high-tech industries represented by electronic

information, new energy, and new material research. This change of emphasis has transformed city planning strategies as well.

First of all, the framework of infrastructure has transformed from transit-oriented to a “transit and information network-oriented” structure. In the beginning stages, SHIP concentrated on constructing the infrastructure of the land and physical environment so as to form a base for industrial development. The infrastructure includes heating, water, sewage, transit system, logistic ways, electricity network, and standard factories. Currently, high-technology has placed more demands on independent information supply and networking. Thus, SHIP transformed the planning focuses to provide more intangible resources for companies, such as establishing the “three networks in one” broadband in SHIP, providing one-stop online approval platform, and publicly publishing statutory plans.

In reality, the transformation of the industry from labor-intensive to high-technology has also led to new content in physical planning. With replacing processing industry with R&D functions, SHIP has promoted more and more business, educational, and commercial projects to enhance local activities. Those commercial areas are placed along the sides of the main avenues, while R&D centers are located either in key research bases, or nearby universities. Moreover, housing and recreation facilities are gradually developed to meet the increasing demands of employees, changing SHIP from original isolated industrial park towards a modern high-technology R&D district.

5.2 Specific Planning and Management Mode

Fifteen years of development has proved the effectiveness of SHIP's open planning and management mode. The Administrative Office, consisting of officials from each bureau and department of the Shenzhen Municipal Government, used the constant working method and approaches in Shenzhen Special Economic Zone. Using officials from municipal departments fully mobilized various resources to support the development of SHIP. Moreover, the Administrative Office of SHIP took charge of the land development process alone, because currently the primary objective of land development in SHIP is not market competence and activity, but to achieve intensive development of limited land through tendentious giving of priority to key private companies, software parks, and university parks.

However, this management process might not be suitable for larger scale development. Several shortcomings of this mode include: long periods of time to coordinate among multiple departments, low efficiency, and large amount of negotiation work. When facing a larger scale, especially mixed-use development site, it is required to develop more independent planning and management agency, which has a greater ability to make financial decision and plans on time.

5.3 Planning an Open Space

Despite that SHIP is named as one of the six pilot zones of the national High-Technology Industrial Development Zones by China State Council, it has encountered many problems during its initial steps. There was a lack of universities, research institutes, and intellectuals in Shenzhen. Shenzhen did not have international investment either.

However, SHIP experienced rapid development in high-technology industry by fully using advantages and creating the place as an open “space”.

Many high-tech industrial parks in China are places where companies come to sell and buy tangible products or to establish processing manufactory. These high-tech parks may be clusters of high-tech companies, but are not real clusters of high technologies and industries. Contrarily, SHIP focused significantly on establishing cross-region coordination in technology, financing support, and research. Despite having only 11.52 km² of land, enterprises within SHIP have a completely open atmosphere in terms of R&D, producing, and research. SHIP’s plan did not identify a clear boundary of the place; rather, it proposed SHIP as an open space that was integrated with the surrounding district to form an entire information network. For instance, the Virtual University Park in SHIP accommodates remote trade and communication on education and research with top ranked universities around the world. Processing factories in Dongwan and Huizhou counties in nearby Shenzhen City can effectively provide intensive labor work with low cost. Shenzhen- Hong Kong Research Base has brought high-end international trade market in Hong Kong to SHIP. These strategies have extended limited place toward unlimited space, bringing multiple functions into the site and accelerating development of SHIP. This concept of “open” can be applied to many other kinds of high-technology zones. For the single-used zones, they can coordinate with surrounding areas to get associated functions. For the mixed-use zones, they can get benefits through enhancing accessibility of the transit system.

5.4 Fully Use of the Intellectual Resources at Right Time

Agglomeration of intellectual resources is a key factor that impacts site selection of high-tech parks. While universities and research institutes can provide stable intellectual and research projects, technical education can also provide the district with well-trained laborers that are needed in high-tech parks. This has been proved by many science parks around the world.

However, in the early 1990s, China's scientific research system was still under a planned economy. Most of the research institutes were separated from enterprises and the market. Until 1997, there were over 6,700 state-owned or province-owned institutes with 600,000 research staffs, occupying over 70% of research staffs in China. Few of their research projects or topics originated from the demands of companies or markets, causing extremely low transformation capacity of technology and research.

Realizing this situation, SHIP did not simply bring all kinds of institutes to establish a Virtual University Park. It created strict criteria during the selection of research institutes. One of the standards is "the research proposal and projects must fit current or long-term demands of developing high-technology industry, and have the potential to transform into production". The purpose of university parks and cooperation research bases are not only to introduce advance research projects, but also to attract more high-tech companies that are looking for intellectuals. Less than one year after construction, the Shenzhen Tsinghua Research Institute introduced over 15 companies and raised over ¥350 million.

Timing is another key issue for the successful development of research bases. In the early 1980s, there were many universities and research institutes coming to Shenzhen

attempting to start businesses and investment companies. Most of them failed and those intellectuals did not stay in Shenzhen. This is because, at that time, Shenzhen was still in the initial accumulation stage, when the most profitable companies in the market and the main anchor of the economy were not high technology, but real estate and labor-intensive processing companies. As for today, when rapid development of industry has formed a stable base for the economy, high technology has become increasingly important in leading the economy towards a more advanced stage. Consequently, the various types of R&D cooperation can achieve successes.

However, when facing new industrial updates, the planning system and management did not fulfill its role of providing guidance. Due to its limited area, continuous consumption of land and energy resources is still a serious problem in SHIP. How to deal with the relationship between incremental development and statutory planning system and to guide further development is still a significant challenge.

Just how the city government will eventually respond to the limitation of land use in SHIP, soon to unfold in other locations and other cities, is not known. But a number of parallel efforts provide some hints of what is possible. The High-Technology Industrial Belt discussed above remains a distinct possibility. Displacing processing factories outside and replacing them with high-technology industries have led to new development space for SHIP. The city will implement comprehensive statutory plans in a couple of years that, at least in theory, will increase the intensity of development. A third possibility is that the large number of virtual universities and R&D centers in the area

will lead to an incremental change towards a research and development oriented base within the existing framework.

¹ Jinkui Li and Zhanjun Liu, *Economic Motivation to Shenzhen High-Technology Industrial Park* (Shenzhen: Haitian Press, 2000).

² Dazhi Wei, *What We Learn from High-Technology Industrial Development from Shenzhen* (Shenzhen: Haitian Press, 2000).

³ Shenzhen Bureau of Planning and Management Website, <http://www.szpl.gov.cn>

⁴ *Shenzhen Statistics Yearbook 1990-2009*. The investment was ¥265 million in total, with 250 million coming from Shenzhen Municipal Government, and 15 million from China State Development and Reform Commission.

CHAPTER 7: FROM THE PLANNING PERSPECTIVE: COMPARATIVE STUDY, EXPERIENCE, AND CONCLUSION

The development of Chinese high-technology parks is not simply an imitation or application of existing science parks in developed countries. On the contrary, they are based on both the knowledge acquired from the international paradigm and, more importantly, the local context and socioeconomic demands. Rapid development and Chinese cities' distinct characteristics have created diverse opportunities as well as challenges in high technology parks, which also provide various growth environments for high technology industries and enterprises.

To represent this development, the following four critical case studies were conducted: Beijing Zhongguancun Haidian Park, Shanghai Zhangjiang High-Technology Park, Suzhou Industrial Park, and Shenzhen High-Tech Industrial Park. Their distinct experiences have shown the diversity and versatility of China's HIDZs. Admittedly, these four examples cannot reflect every problem that has emerged from HIDZ's experiences. All of these parks have greater funding and higher priorities in development than others with the benefits from the local cities' economic strength and state political emphases. Yet they constitute four different exemplars tailoring a series of planning strategies to address distinct developmental pressure and practical problems in implementation, which afford rich information and resources for analyses, show differences in styles, and provide lessons for further development.

ISSUE 1: Nature of the Development Plan

1.1 Segregation, Mixed Use, and Single Land Use

The land use plan in high-tech parks generally anticipates and organizes the use of space, programming activities related to existing and potential land, and resources. The types of functions, their ratios, and the spatial arrangement vary significantly according to different missions. Unlike the parks in Shanghai and Shenzhen in which industrial land dominates the land functions, Suzhou Industrial Park proposed multiple functions in its land use plan, creating a self-sufficient new town style. Beijing Haidian Park, based in the original Haidian District, with a variety of universities, research institutes, and sufficient public services, has also developed the land in a highly mixed-used format.

Despite the differentiations in land use contents and proportions, land use is segregated, regardless of how many functions the land serves. Most of the functional arrangements in Chinese high-tech parks imitate international paradigms such as new township planning in Singapore and zoning in the United States, and these arrangements are explicitly segregated according to the different uses of the land. Suzhou Industrial Park, for instance, sets CBD at the center, surrounded by residential communities, and the industrial areas are located near express ways. Shenzhen High-Tech Industrial Park, which is essentially a single use park, is divided by Shennan Avenue, separating educational use to the south and industrial and manufacturing use to the north.

This layout separates functional areas from each other and reduces people's interactions. Beijing ZGC and Shanghai ZJ Park have formed a variety of isolated islands. The housing in Shenzhen High-Technology Park is placed along the main avenue without

consideration for neighborhood activities. However, Suzhou Industrial Park has made some improvements to address this issue. It plans to place more commercial and residential apartments into CBD area instead of organizing individual neighborhood clusters. This will greatly enhance the human exchange in CBD, and also bring more functions to the residential areas.

In HIDZs, it is critical that the housing supply is treated like a real estate control activity rather than a result of estimating the population and corresponding demands of public service based on employment opportunities. In the late 1990s, when national HIDZs experienced their initial economic growth, many real estate developers invested in this area, causing rapid increases in land prices, which, in turn, largely enhanced the entry threshold for high-technology enterprises. In order to avoid the negative impact to high-tech parks caused by this over-booming real estate market, since 2000, Beijing Zhongguancun Science Park has stopped approving new housing projects within its boundaries and strictly controlled the approvals in surrounding areas. Currently, the housing in Beijing Haidian Park includes university faculty apartments, research institutes' employee apartments, student dormitories, and a few houses. According to the district plan, the housing supply in the next decade will concentrate on faculty and student apartments in research institutes and universities. Most of the land in the high-tech parks is used for research and production development, and the land of other residential areas will not expand. Meanwhile, the rapid growth of high-technology companies has raised housing issues for the increasing number of employees. Since the housing preferential policy by state government and local municipality only provide a

limited amount of housing and allowances to the top talent, most of the employees have to live in other districts and commute to work.

Single land use in Shenzhen SHIP and Shanghai ZJ Park has caused distant commuting, thereby resulting in traffic congestion. Thus, increasingly, associated elements such as housing, social services, and public facilities are being added to high-technology parks. Shanghai ZJ Park places most of the housing in Pudong New Area. However, with its development toward becoming an essential economic center, the demands on real estate are increasing as well and cannot be solved simply through long-distance commuting. Shenzhen SHIP has the same problem with its location, that is, away from center city. Consequently, ZJ Parks constructed a variety of talent apartments for employees despite the tight land space. These apartments are managed by ZJ Development Company and rented by the high-technology companies, who then sublease them to their employees at a low price. Since most of the employees are unmarried, each unit is shared by two or three young people. Many employees move out of the apartments after getting married and leave the apartments to other employees. The agency in SHIP has also proposed employee apartments in the newly developed South Area.

In mixed-use parks, the segregation of functions into different phases has also caused problems. In Suzhou Industrial Park, the original purpose of CBD district was pure business and commercial use. However, since this district belongs to the first phase that focuses on high-technology industrial land development, there is a lack of demand for housing, commercial, and business functions. Moreover, the restaurant plaza and playground at the east of Jinji Lake that were developed in the second phase have attracted much more human activity than the CBD area. When many plots in CBD are

still vacant, it is hard to sustain development with a pure business function. Thus, the updated program of CBD district transfers part of the land functions to condominiums, hotels, and apartments. This approach aims to use housing to attract more users, which brings more commercial opportunities to this site. Comparably, while Shenzhen High-Technology Industrial Park has had intensive land development with relatively single and segregated uses, the management agency proposed a series of residential neighborhoods and hotel apartments along the main avenue and nearby Shenzhen University. This land, while minimal, provides business venues for companies and living spaces for their employees.

- **Urban Village**

The problems of the traditional villages demolished by development are inevitable in Chinese urbanization and the construction process of development zones. Many of the HIDZs in China are selected for development on agricultural land and in villages. Meanwhile, other HIDZs located in urban areas seek to expand, thereby occupying the land of surrounding villages and towns. Therefore, the rapid development rate of high-technology parks and the bad quality of the surrounding villages have caused resident to move to elsewhere. Furthermore, the development and extension of high-technology parks has caused land price increases, leading to higher rates than the original compensation, and hence, complicated the negotiation of displacement.

HIDZ development committees take a long time to address the issue of village displacement, as there are a variety of factors involved, including land ownership, human rights, land prices, the responsibility of governmental agencies, and policies. So far, the Dachong Village in Shenzhen High-Technology Industrial Park is the largest urban

village in the Shenzhen Special Economic Zone. In Shanghai, while the Zhangjiang old town is not a real urban village, the quality of its construction and environment far exceed that of Zhangjiang High-Technology Park and the surrounding Pudong New Area.

The issue of the urban village is not only about housing displacement and land construction. Many villages are filled with migrants and employees working in surrounding areas, especially in science parks, as exemplified by “Ant Tribe.” Their issues cannot be addressed by demolishing the urban village. Since employees must seek residences farther away, with the extension of high-technology parks and urban sprawl, a new “Ant Tribe” in the new urban village will emerge again.

The planning of Suzhou Industrial Park provides a possible solution: the urban-rural integration plan. This approach was followed from the beginning of construction, and it aimed to achieve a mutually beneficial pattern with integrated development and common prosperity. The plan considered the China-Singapore cooperation district and its surrounding towns as an entire area. It set up zoning codes to control the volume of construction in village areas, especially on the land to the southeast of the China-Singapore cooperation district. This spatial control altered the village residents’ displacement and land function, facilitated the negotiation process, and avoided the disorganized expansion and occupation of agricultural land. Moreover, the integration plan proposed an infrastructure and facilities network shared and co-constructed by the cooperation of both the district and villages, which largely enhanced the urbanization of the surrounding towns. In terms of environmental preservation, all projects in the surrounding four towns must obtain the approval of the planning bureau and environmental preservation bureau of SIP before beginning construction. Important

projects must submit an evaluation of their environmental impact as well. The production and live sewage of the entire area are collected in to water treatment factories in SIP. In addition to the facilities, since 1994, the approaches to the farmers' housing construction in SIP are no longer based on parcel-by-parcel displacement. Rather, the SIP committee proposed "new village construction" involving communities with medium-rise apartments, public services, and urban-level facilities. This plan has saved around 70,000 km² of village residential land, and has largely improved the living standards and quality of life of the farmers.

1.2 Nature of Human Exchange: Does Location Matter?

- **Trading Place for Real Estate, or High-Tech Space?**

In the development statements of national HIDZs, there are several common missions that aim to build HIDZ "as incubators of high-technology enterprises, as places to transform scientific and research outcomes, as educational bases for high-level talent, and places for business activities." In actual practice, however, many high-technology parks regard "high-technology" as a title or a physical cluster of normal industries. The park neither reflects the development of high-technology industries nor provides high-technology enterprises an ideal living environment involving R&D spaces to give life to research outcomes.

There are several primary factors that have caused this development status. First, when construction begins on a high-technology park in China, its original intention is to establish industrial bases to attract as many companies as possible so as to form an agglomeration of industries. Thus, the threshold of the criteria for approving companies is

low, allowing almost all companies to enter the park and enjoy preferential policies as long as their titles relate to technology. Second, many international high-technology companies emphasize not only economic benefits but also educational resources, infrastructure, industrial chain support, incubator construction, and the information platform. However, Chinese HIDZs largely ignore the associated services and facilities, making it hard to attract many real high-technology enterprises. A third important reason is that the developers prefer this trade market to incubators and specific parks with regard to the fast return and easy management. There is more money to be gained by renting to the producers of electronic products than leasing the buildings to small companies. Consequently, many high-technology companies have become involved in the real estate market and have gradually overlooked the major high-technology R&D industry. In turn, the higher land and rental costs for office buildings have deterred many small and medium companies and many overseas talents who returned from Silicon Valley and intended to start businesses in Beijing.

Admittedly, real estate construction is necessary to motivate the development of high-technology parks. Suzhou Industrial Park has used the construction of CBD and housing around the landscape of Jinji Lakeside to attract more investment and activities. Shanghai Zhangjiang High-Technology Park, however, did not improve until the construction of real estate improved the environment and attracted more international companies after the policy of “focus on Zhangjiang” was enacted in 1999. However, the over-emphasis on the real estate market has caused a series of phenomena such as the mixed businesses in high-tech parks, the repeated construction of electronic product trade markets, and the exceedingly high proportion of commercial use office buildings. This

has concealed the specific features of high-technology industries, changing the development path from its original mission.

The practices of HIDZs prove that it is useful to address these problems through strengthening the criteria in the approving enterprises, enhancing the intensity of the land use, and adjusting land functions. The “Regulations of ZGC” have regulated specific criteria for high-technology companies in terms of industrial features, scale, and major services. The establishment of the Coordination Committee of Zhongguancun West Zone in March 2010 aims to return the commercial services of electronic product trade market to high-technology industrial businesses, leaving more space for supportive funding to small innovation high-technology companies. The “Regulations on the Promotion of Shanghai ZJ Park” concentrates on bringing important research institutes and international high-technology companies as growth anchors. Through the implementation of the Statutory Plan, Shenzhen SHIP strictly controls the land for R&D use.

- **Space for Human Exchange**

Both the large-scale mixed-use oriented high-technology community and relatively single-use oriented high-technology parks use various planning strategies to create space for human exchange. For instance, Suzhou Industrial Park, performing as a new town style that incorporates living, business, and industrial production, has created multiple types of public spaces. The Jinji Lakeside spaces consist of eight public plazas, each with a distinct function and characteristics. These functions include a pedestrian road, restaurant plaza, shopping mall, sports playground, golf course, and civic green landscape. Beijing Zhongguancun West Zone has an active public plaza in a crowded

urban area, surrounded by multiple 5-A level office building, hotels, shopping malls, and supermarkets. Now, the public plaza has become the most active place in Haidian Park.

In well-planned active areas, the site selection of important projects prioritizes transportation and the transit system. The TOD strategy that combines parks, plazas, and transit stations successfully links people's commuting with leisure activities. The design of each transit station and its large plaza, in turn, helps evacuate crowds in commercial areas. The locations around Haidian Huanghuang Subway Station, Shanghai Zhangjiang Station, and Shenzhen University Station are all primary commercial, educational, and business areas that are concentrated with the most people flow in their HIDZs. Currently, the subway line connecting Suzhou city center and the central park in Suzhou Industrial Park is under construction.

Moreover, large-scale development has provided greater opportunities to reserve areas for open space and recreation and made it possible to connect these spaces across different parcels to form green linear spines. The central spine of Suzhou Industrial Park exemplifies the successful adoption of this strategy, connecting the lake with the major central park at the entrance of SIP. The green spine and its radiations that link the river system are important visual amenities that provide a green network in SIP.

- **City Image**

City image enhancement and location marketing provide mutual benefits. In practice, urban design initiatives appear to be important means of enhancing the quality of a city's image so as to attract economic investment. The concept of city image is broad, as it involves the natural landscape, social traditions, cultural facilities, heritage, and the context of the original residential activities. The four case studies have provided useful

strategies for enhancing city image in terms of the expression of the city image. They include the preservation of natural resources, adoption of cultural elements, and human-based design principles.

Many of the urban locations of the national HIDZs have abundant historic and cultural resources. In the layout of Beijing Haidian Park, the specific parks, university parks, R&D centers, and incubators are developed around the universities and places of interest, with close linkages and without changing the original density and landscape. Moreover, the land regulation in Haidian Park limits a building's height in areas near places of interest in order to protect the historic character. Suzhou is famous for its historical gardens in the old city as well.

While Suzhou SIP is separated from the old city by highways, the urban design guidelines fully consider the linkage between old city and new district along the main avenue that intersects the two districts. In the areas closer to the old city, many public facilities such as transit stations, sculptures, footbridges, and benches for pedestrians use small scale and traditional Chinese elements. When walking towards Jinji Lake, where high-rise office buildings and large-scale civic parks are located, the style of the public facilities becomes much more modern. This transformation is also represented in the skyline design of the CBD buildings, exemplified by the gateway building, displaying the symbols of SIP.

While the four cases demonstrate the best practices in Chinese national HIDZs, there are several shortages in the practices. The large extension of Haidian Park toward the suburbs consumed much of the original farmland, rivers, water system, and many other natural landscapes. Despite the preservation approaches on Summer Palace, other

dispersed historical heritage sites are not well preserved. The courtyard house in Zhongguancun West Zone has retained its format, with no reaction with the surrounding business and commercial districts. Besides, the landscape and building types in many national high-technology industrial parks look similar; they lack specific characteristics in space creation. These high-technology parks, located in vacant large-scale districts on the edges of suburban or urban areas, follow unified building codes and regulations in terms of land density and building format. Their appearance, with the same low-rise manufactory, block-by-block residential neighborhoods, overly wide express roads, and modern high-rise office buildings in the center, lack their own city identification, and thus, have difficulty attracting more investment interest.

2.3 Strategies Accommodating Changes

The human exchange activities are not static. Rather, the development process of high-technology parks is full of uncertainty. Thus, a key characteristic of a well-developed plan in a high-technology industrial zone is that there are various strategies accommodating both expected and unexpected changes, exemplified by Suzhou SIP and Shenzhen SHIP.

Suzhou SIP uses the “land bank” to store plenty of land resources for further development, deliberately holding land in the center for uses not yet known. In terms of the selection of land, the mixed-use areas are more tolerant to further conversion of use. Moreover, since most land in “land bank” is not programmed to be a certain type in the first phase of development, it is identified as green space. Thus, the selected land is located near mixed-use areas such as transit stations or green spaces, such as the riverside,

instead of intense industrial districts or residential neighborhoods. This arrangement retains the consistency of land function in developed areas, and it reduces the reconstruction costs for further development. With limited land resources, Shenzhen SHIP does not adopt the strategy of “land bank.” Instead, the use of a statutory plan—a land control regulation—establishes a series of codes on development parcels. According to the development status, the statutory plan has different levels of control depth ranging from detailed control requiring various reference documents, to loosely defined land use and building types. While the guidelines on blank lands are loose, which leave flexibility to develop, there are strict control regulations on the lands that are already distributed and start construction, so as to guarantee the construction quality.

Keeping land flexible does not mean leaving all the development powers to private sectors or developers. Neither over-regulatory land use control nor an over-discretionary system is suitable for the current urgent development needs. Beijing Haidian Park in ZGC commissioned multiple development companies and institutes to operate infrastructure and land construction, respectively, causing many separate islands for specific parks and a waste of the resources among those islands. For instance, many specific parks and roads are separated by walls instead of open spaces that can be utilized for human exchange. The discretionary system also lacks control approaches to deal with the disordered expansion of each land, which, thus, facilitates the urban sprawl. While Shanghai ZJ Park followed a governmental plan, it did not consider flexible space for the future other than simply continually extending southward. This caused heavy traffic and low intensity of land development.

ISSUE 2: Role of Development Plan in HIDZ

2.1 Composition of Plans

Guided by different missions, the policies of the high-technology parks' plans differ; thus, they have different agendas, designs, and strategies. In these plans, each of which has the mission to become a “new urban district, comprehensive business center, and livable environment,” there are explicit phased agendas, such as 2–3-year short-term plans, 5-year plans, and 10-year plans. These agendas are linked closely with phasing design and operation strategies. Comparatively, another type of HIDZ developed as a simple R&D industrial anchor that concentrated solely on the development of high-technology companies. Hence, the strategies emphasize technology innovation and the protection of intellectual property. The design focuses on the creation of soft environments such as incubators, platform of enterprises, and approval processes. The policies in these types of high-technology parks pay more attention to the predictability of economic growth than social fairness. Thus, the subsequently constructed physical environment aims to provide associated services and facilities rather than leading the development.

Despite their different visions, one of the common objectives of high-tech parks is to achieve economic growth through the development of high-technology industries. The design of the physical environment and place-making strategies also serve this purpose through multiple aspects. The construction of infrastructure and road systems is aimed to enhance the accessibility to the site and provide convenience to commuters. The management of land use functions and density is the result of negotiations among various

interests. It balances various needs and maximizes the profits for high-technology park development. Moreover, in terms of urban space, place-making is used as a marketing tool to persuade investors with the quality of the environment being sought through the image of the park.

2.2 Infrastructure Investment and Construction

Development committees in Chinese high-technology parks have played an important role as the provider of public goods and manager of road construction. In general, governments are responsible for the implementation of infrastructure and road systems, and then it leases the cultivated developed land to private developers. Some other governments directly lease the undeveloped land to private developers and leave the right of infrastructure construction to the developers as well. Under this circumstance, since it costs a lot for development to invest in infrastructure, and it takes a long time to receive the return, the rental price is lower and the term is much longer than the previous condition. Even in cases where private developers own the land, the land development companies are, in fact, state-owned institutions rather than private companies. These semi-public institutions are integrated into governmental organizations of the municipality, taking the responsibility of operation with debt. Moreover, the development committee pays them with the long-term tax income as their supplement in the operation process.

This specific phenomenon in China is due to several factors. First, the Chinese government holds the land ownership rights, hold rights, and utilization rights, which make government involvement necessary. Second, in most government planned high-

technology parks, the construction capital comes from the governmental budget and income through the transfer of land utilization rights to private companies. The major tasks of the development committee as a public good provider include (1) proposing a scientific plan based on the functional requirements of high-technology parks; (2) providing a basic environment with established road, sewage, water, electricity, phone, telecommunication, broadband, and land leveling systems; (3) offering social services including health care, education, cultural services, public transit, and other public facilities; (4) managing and maintaining public facilities; and (5) supplying industrial service for high-technology enterprises.

Suzhou SIP used different approaches to land development by appointing CSSD to take charge of all the work. At the beginning of construction, CSSD was an independent entity isolated from SIP's Committee. However, this approach can only be adopted with abundant initial capital investment. CSSD also changed its identity to a government-owned company in 2001, when the stock structure ratio between China and Singapore was adjusted and the Secretary of Suzhou Municipal Committee served as the president.

While the construction of infrastructure is primarily managed by a development committee, the implementation process is largely impacted by many other sectors. The first limitation comes from state monopolies. For instance, in Beijing ZGC, the universities and major research institutes developed their own districts regardless of the coordination. Second, the development committee works as the agency under the direct guide of the municipal government. While the state policy brought state-owned institutions into the park, the over-intervention of upper-level government extended the

approval period. Thus, many HIDZs began to streamline their organizations, readjust staff, tighten internal control, and strengthen the independence of committees. Lastly, in the administrative organization, planning management, land-use management, and planning enforcement are under the jurisdiction of different agencies. When land-leasing needs to calculate land premiums based on the permitted land use and development intensity stipulated in the conditions of the lease, the intention of urban planning must be translated into lease conditions for its implementation; however, there is a general lack of coordination between them. Land leasing is administered by the Ministry of Land and Resources and its subordinate agencies, whereas planning is administered by the Ministry of Construction and its related planning bureau.

2.3 Regulating Land Use According to the Demands of HIDZs

Development regulation is one of the powerful forces that shape the constructed environment. Regulations have a structure similar to investments with two kinds of decisions: decisions to regulate and decisions to act given the regulations. The former refers to the land use zoning code and regulations and the latter refers to building architecture or spaces in these regulated zones. In the practices of HIDZs, the decision to regulate is collective and the decision to act is individual.

According to the different administrative systems in each city, the decision-makers who determine the regulation in HIDZs vary considerably. In Beijing and Shanghai, where the high-technology parks are integrated in the current urban area, the regulations are prepared by the regional planning bureau. The land use guidelines in Haidian District are set by the planning department in the Haidian District government

under the guidance of the Beijing Municipality; furthermore, the Pudong New Area Management Committee takes charge of the regulatory detailed plan of ZJ Park. While Shenzhen SHIP is separated from the original center, its land regulation belongs to the unified Statutory Plans in the Shenzhen Special Economic Zone. This management approach regards the high-technology park as one part of a larger area; thus, the land use regulation can effectively reduce the negative effects of the adjacency of different administrative zones. However, the approaches lack a detailed plan concerning the local features. Comparably, Suzhou SIP is a relatively independent area; thus, the management committee of SIP devises the land use plan and regulation of its site.

Regardless of the level of mixed use, development plans in high-technology parks use mandatory standards, especially space and dimensional standards, as a supplement of policies to regulate land development and construction activities. Primarily, the planning of national HIDZs use two levels of land regulation: regulatory detailed planning and site planning.

However, the process of making regulations has several weaknesses. Firstly, the rapid development rate places a higher requirement on the decision making process, such as finishing all the land regulation, or developing a statutory plan that covers the entire city administrative boundary in a few months when the planners have yet to understand the current development situation and land ownership layout. The hasty process forces planners to overlook many uncertainties of development, making a regulatory detailed plan a mere formality. Secondly, many political leaders are eager to see the construction of buildings rather than consider what planners have suggested for phasing. Thirdly, HIDZs are not very concerned with urban design, and the physical environmental

landscape and building design as a supplement of site planning. Lastly, HIDZs still have to live with the national code, such as road systems, building programs, public facilities, land density, and parking. They do not have adjustments based on local conditions. For instance, the traditional “thousand people index” refers to a regulated area of kindergarten, educational institutions, health care, and other public services per one thousand residents. In the early years of Shanghai ZJ Park, which had many employees and few residents, the proposed commercial and social services could not satisfy the real demands of employment.

ISSUE 3: Recognizing Educational Resources as Essential

3.1 Local Advantages and Weakness

Research on science parks has pointed out that university-industry alliances became increasingly important to the cities of knowledge as federal support was reduced.¹ Successful cities of knowledge have had universities at their center with (1) the resources and willingness to embrace corporate partnerships and (2) the political clout and institutional ability to play a leading role in local economic development. Both Stanford and Penn in the US have close relationships with the local power structure, and these universities act both as intellectual anchors and as sources of commercial profit. The embrace of corporate partnership was what gave certain universities an early advantage in the competition for scientific industry, and the engagement of the powerful university in economic development continues to be essential for the high-tech parks to flourish.

Nevertheless, case studies of Chinese national HIDZs indicate that integrating university resources into the economic development of high-tech parks is a more complicated and specific proposition in China than it may be elsewhere. The four cities represented by the case studies—Beijing, Shanghai, Shenzhen, and Suzhou—cover the range in size of major Chinese cities from medium to super-extra large. Their educational resources and other facilities vary considerably as well (table), creating different contexts for the development. While Beijing Haidian Park is surrounded by the top universities with rich talent resources, Shanghai ZJ Park is far away from Shanghai's top universities. Suzhou SIP has a lack of research resources in its city as well. However, both Shanghai and Suzhou are located within the Yangtze River Delta area, which has a complete industrial chain and system of research and development that to some extent supplements the deficiency of educational resources. Shenzhen SHIP benefits from its advanced location near Hong Kong, the capital of trade, and the surrounding towns with rich labor resources. The advanced preferential policy in the Shenzhen Special Economic Zone leads the development of high-technology industries. However, Shenzhen University, as the only research institute, lacks strong educational and intellectual resources. In addition, the development of Shenzhen SHIP is constrained by limited land resources.

Table 7.1: Strategies to Address Local Advantages and Weaknesses

	Beijing ZGC	Shanghai ZJ	Suzhou SIP	Shenzhen SHIP
Advantages	Abundant educational resources Universities and State-owned research institutes	Special strategy under Pudong New Area State “Focus on Zhangjiang” Strategy	China-Singapore international collaboration Yangtze River Delta industrial chain	Special Economic Zone Connection with Hong Kong Abundant labor resources
Deficiencies	Over-population Over-power of state-owned institutes and companies	No educational institute Long distance from center city and key universities	No educational institute Compete with existing Suzhou High-tech Park	No strong educational institute Limited land area
Strategies	Catalyze self-investment and development Establish university parks and incubators	Increase link with educational resources via transit Bring state-owned companies and research bases	Catalyze investment Introduce training and educational institutes Bring international research institute	Virtual University Park Shenzhen-Hongkong Research Base Displace labor-based industry, replace with R&D high tech

3.2 Strategies Used

The various advantages and deficiencies in national HIDZs have played an important and decisive role in the uses of different planning and management strategies. For the HIDZs located in Beijing, Xi’an, and other cities with rich educational resources, the management committees encourage the universities and research institutes to establish their own university science parks and incubators so as to promote self-employed businesses. The abundant talent resources also attract rich investment from international corporations. Shanghai ZJ illustrates the important role of governmental support and the introduction of a variety of state-owned institutes given the condition when the HIDZ lacks various resources. The construction of infrastructure and the transit system managed by the Pudong New Area government linked the site with several key institutes in Shanghai, promoting its accessibility to those educational resources. The establishment of Chinese Medicine University and many other medical research bases

facilitated the development of the biomedical medicine industry in ZJ. However, these institute-owned science parks are constructed separately; thus, the association among these isolated parks is overlooked.

Despite the deficiency in various resources, Suzhou SIP—the first China-Singapore joint project—fully utilized the advantage of international cooperation. In addition to the international investments brought by the governments of Singapore and China, SIP has emphasized the creation of talent and educational resources. It established a training system that provides abundant well-trained labor resources for companies and solved employment pressure by increasing the population. In order to offset the educational defect, the SIP development committee cooperated with Liverpool to form the Xi'an Jiaotong-Liverpool University, moved Suzhou University into SIP, and created Dushu Lake Educational Zone. With these multiple approaches, SIP has achieved its successful new township development.

While Shenzhen lacks the counterbalancing educational resources that Beijing and Shanghai have, Shenzhen SHIP developed a new style of its own: the Virtual University Park. With the preferential policies and advanced location, the committee encouraged the top universities and research institutes to set up branches in SHIP with periodic lectures, conferences, and remote education. The registrations of many companies by research institutes in SHIP have motivated a lot of innovative enterprises with self-owned intellectual property rights. The establishment of the Shenzhen-Hong Kong R&D base has largely facilitated the construction of R&D bases by private domestic companies, which further promotes the interaction between enterprises and research institutes. The growth of the power of high-technology R&D is gradually

replacing traditional manufactory, thus improving the quality of high-technology industries in SHIP.

The case studies illustrate multiple ways of using resources. Chinese cities cover a wide geographic range and various contexts; thus, depending on rich educational resources is not the only method to achieve the successful development of high-technology parks. While some of the national HIDZs began their development from the districts with rich educational institutions, more high-technology parks did not follow the same path of international science parks. Rather, they created distinct roads of development through establishing, utilizing, adjusting, or incorporating research institutes and other talent resources, which provided abundant experiences for further practices.

ISSUE 4: Implementation and Organization

4.1 Governmental Leadership and Other Sectors

Many parties with complicated formal and informal interrelationships are engaged in the planning of high-technology parks in China. Similar to the United States, this planning culture is complicated and often messy, characterized by dispersed power derived from three sources: permission or mandate to administer rules (state), ability to control money (state, market, and, to a lesser extent, civil society), and the capacity to rally votes (states, market, civil society).² Thus, in high-tech park planning, the network consists of four groups of actors, each with power at a different level: (1) public group including the state, local municipality, planning departments, and management committee; (2) semi-public group including municipality-owned development company; (3) private

group including business clubs, individual science park, research/educational association, enterprises, and incubators; and (4) civic group including the public, residents, clients, and professional groups. Through the evolution of high-tech parks in China, some cases have all of these sectors, and others have only some of them. These actors, interrelating with one another and positioning themselves, influence, if not determine, the development ideology, the mode of governance, the development agenda, and the effectiveness of the planning mechanisms.

This dynamic network in HIDZs changes over time and has different purposes. In the initial stage, the government leads the development process. During the first seven years of the development of Shanghai ZJ Park, there was no improvement until the state policy of “Focus on Zhangjiang” brought strong funding, and the ZJ Development Company was commissioned to take charge of land construction with debt. The governmental funding support reduced after Zhangjiang stepped on the right path of economic growth. ZJ Park has also gradually transferred its planned development toward market-oriented development. Even in SIP, which is a joint project between two entities, the Singapore sector expected the Chinese government to be more concerned with SIP’s development. The later adjustment of the stock ratio of both sides in CSSD represented a rearrangement of interests and achieved a new balance.

Contrarily, in some districts, where the economic system was transferred in advance, the development has a relatively free market atmosphere. The level of involvement of multiple sectors in the planning network in Beijing ZGC and Shenzhen SHIP is more active as well. The preferential policy in special economic zones has led to earlier development in the Shenzhen market economy than those of other Chinese cities.

Thus, the private domestic enterprises and trade activities are much more vigorous. In order to increase their involvement in the decision-making and planning of Shenzhen SHIP, the companies formed a variety of organizations such as associations of entrepreneurs, platform of incubators, and clubs for innovation enterprises. Since private domestic enterprises contribute a large proportion of the economic growth of SHIP, they are included in the discussion of district development and plan adjustment together with the development committee and department bureaus. For instance, the increase of FAR along Shennan Avenue in SHIP is a result of the gaming among those multiple interests. Beijing ZGC also has multiple interests in sector networks. The international companies and specific science parks aim to pursue economic benefits, and the various universities need to consider where staff and students will live as well as to obtaining profits by extending land and real estate activities. Moreover, the state-owned institutions have a strong relationship with administrative staff, while the university science parks are private companies. Thus, the key development issue in Haidian Park is achieving balance within the complex.

4.2 Processes and Phasing

It is difficult but important to maintain the consistency of the plans in different phases and of different managers through the timeline. The process of planning in large-scale high-technology parks is typically a hierarchical system consisting of various plans. These multiple plans vary in content, land use boundaries, and according to the depths of policies. Moreover, the operation sectors range from municipality level to private real estate developers.

The development in Chinese HIDZs can be divided into two phases in terms of the level of self-innovation capacity: the normal industrial development phase, and the high-technology innovation phase. In the first normal phase, the government funding and external investment were the primary motivations of development. The major activities in the HIDZ were the construction of infrastructure, attracting investment, and marketing to attract international companies. Since the companies in developed countries keep their core technology secret, most domestic companies were still operating normal industrial businesses and learning from advanced technology. The networking and increasing communication with international businesses helped domestic companies accumulate innovative techniques, marking the high-technology park's progression into the second phase. In the phase of high-technology innovation, the main characteristic of the park is the increasing of new domestic companies as well as the growth of networking among high-technology enterprises. HIDZs in this phase are comprehensively impacted by economic, social, and cultural effects.

The differences between the two types of land development are caused by initial funding support and the size of the high-technology parks. A lack of funding at the beginning of development causes a type of "rolling development" in which the committee uses a limited amount of funding to start a small scale high-technology park. The income earned in the completed first phase is used to plan and develop the second phase. In this type, most committees work essentially like land development companies. However, rolling development has many uncertainties during its phasing steps, and the land use plan is easily changed due to unexpected funding issues. The opposite type of development, such as that in the cases of Suzhou and Shenzhen, has a relatively closer

linkage among several phased constructions. The abundant funding and investment in Suzhou SIP ensures the proper implementation of SIP's land use plan and phased development. Shenzhen SHIP benefits not only from the unified management of the Shenzhen Special Economic Zone but also from its relatively small scale, which largely reduced the cost of initial construction.

Land development comes after phased development and a land use plan. It has two steps: (1) the construction of roads and infrastructure, aiming to create cultivated land and (2) leasing or selling the land use rights to developers. As previously discussed, the first step in most HIDZs is essentially managed by the government or its agency. However, the four cases vary substantially in the second step. Suzhou SIP's land assignment is completely managed by CSSD. Some small HIDZs can use SHIP's approach of using the municipal planning department to control land trade activities.

Table 7.2: Steps of Plans in Each Case

	Beijing ZGC	Shanghai ZJ	Suzhou SIP	Shenzhen SHIP
Comprehensive Plan	City level	City level	City level	City level
District Plan (Land Use Plan)	By Authority	By Authority	By Authority	By Authority
Phasing Steps	piece-by-piece development	piece-by-piece development	keep consistency	Based on existing small research bases
Land Development	By multiple land development companies	By Authority-owned company	By CSSD (private company, but China and Singapore owned)	By Authority
Statutory Plan/Detailed Control	Regulation changed by developer	n/a	keep consistency	after statutory plan finished in 2002
Site Plan and Construction	By individual developer	By individual developer	Under guideline, by individual developer	By individual developer

In the step of site planning, the HIDZs gradually step into the second high-technology innovation phase. The consistency of the plan depends more on development

control than the initial master plan. Effective development control depends not only on well-made plans but also on well-defined legislation and an administrative framework. However, the master plan—the only statutory plan in most Chinese cities—is too sketchy to provide concrete guidance in processing development applications. Development control is, thus, open to interpretation and the administrative discretion of planning officials, and it becomes very difficult if not totally impossible.

4.3 Improve a Plan's Capacity

- **Professional Skills**

There is a gap between the knowledge of high-technology industrial development and physical planning strategies for land use, the transit system, and the environment. In major Chinese cities, physical planning is institutionally separated from economic planning, and both are separated from environmental management and transportation, with little communication among them. HIDZs focus on the industrial location for project-specific development rather than simply the creation of urban space. Therefore, the physical planning strategies in high-technology parks are rarely discussed.

The current plans of large-scale high-technology industrial parks are undertaken by municipal governments through the appointment of either a planning bureau or planning institutes to propose the initial plan and then obtain the approval of the city council. The district plan of Shanghai ZJ Park was proposed by the Shanghai Planning Institute, and the detailed plans were implemented by the Pudong New Area Planning Bureau. The Suzhou SIP Committee appointed groups of planning staff to receive training of management and planning in Singapore, and these groups undertook the

development through international bidding. The planning and management of Shenzhen SHIP was proposed by an expert group invited by the Shenzhen Municipality.

However, the planning review process has several deficiencies. First of all, the proportion of professional staff and relative experts is less than one third of the total number of people involved. Most of the decision makers are administrators and political staff; thus, the planners have no formal power over land-use policies and planning strategies. Secondly, the content of planning review focuses on the appearances of plans and ignores the underlying correlation with economic, transportation, and ecological development issues. Also, almost nobody knows the knowledge about commercial and development. In other review meetings such as the road system program held by the Transportation Bureau, or the environmental impact discussion led by the Environmental Preservation Bureau, planners are not involved. The segregation among different disciplines may bring many unexpected problems during the implementation process, resulting in a waste of resources and difficulties in construction.

A possible solution is to involve multidisciplinary experts to propose planning strategies. A comprehensive city plan involves various fields including the economy, anthropology, transportation, the environment, and sociology. However, when applied to district plans or land use plans in high-technology parks, the research on these subjects is lacking in practical application. Thus, when proposing a plan, the managers of HIDZs can invite or commission experts from multidisciplinary fields to provide opinions from different perspectives. Moreover, it is necessary to strengthen the coordination among planning-related departments to avoid the dysfunctions of planning control. Since there are profit competitions among the departments and bureaus at the same administrative

level, the Municipal Government must take the responsibility to organize and supervise the co-working process. The Suzhou SIP Committee reduced its tens of management departments to several comprehensive departments. Since combining these originally related departments into one section increases communication, this approach largely improves the efficiency of management.

- **Statutory System**

The statutory planning systems of HIDZs focus on the development right of the land and the control and approval of land construction, among which detailed planning regulation is the most important legislation. Theoretically, once approval is obtained, the detailed planning regulation has legal power and cannot be amended without undergoing a certain review process. However, the high uncertainty caused by the rapid development of high-technology parks in many Chinese cities has largely weakened the control power of detailed planning.

There are controversial arguments about whether it is suitable to legislate detailed planning and regulation. The advocates insist that detailed planning aims to protect the land development rights and public benefits through regulating the land use, building height, associated facilities, and other spatial controls of land development. These indexes are highly related to the users' benefits and should be legally protected. On the other hand, the opponents argue that current detailed planning is made based on the technicalism of physical planning rather than by considering economic and social issues. Given the current rapid development with a constantly changing market, even the most excellent planners cannot predict the future developers and their requirements for land use, especially in the high-technology parks located in new, vacant areas. There is no

definitive answer, as it largely depends on the practical conditions. In the initial stage of the construction of high-technology parks, when the investors and clients are unclear, detailed planning regulations are more like a programming document. Unlike the previous large amount of content in detailed planning regulations, the programming includes market surveys and analysis, focusing on the types of potential industries, companies, and residents. It intends to provide potential investors with a loose identification of land use and intense land development. After the investors are explicitly identified, the regulation sets deeper and more complete details on land construction. By dividing the proposal and implementation of regulations into several phases of procedural planning, the detailed statutory planning fully gives play to its power of legal control on land development.

4.4 Responsibilities for Public Facilities

Theoretically, the development zones are isolated districts that focus on economic development. A development zone is a “geographic island, economic island, functional island, and political island.”³ These special zones have independent rights on project approval, engineering construction, import and export trade, and scientific technique management. However, many HIDZs are located in urban areas; some others include towns in their extended boundaries, causing issues of dividing responsibilities between the local government and the committee.

The four case studies have shown different approaches to balancing the responsibilities of economic management and social affairs. Suzhou Industrial Park was developed under a new township mode; hence, it has the highest independence in

management rights, which covers both economic development and social affairs. Nevertheless, the management committee of Suzhou SIP reduced its scale and commissioned most economic affairs, especially profit-oriented tasks such as land construction and attracting investment, to CSSD. The major concentrations of SIP are social affairs, planning approval, and the provision of facilities for commercial and public activities. Moreover, the SIP management committee comprehensively considered coordinating with the surrounding rural areas. The construction of new villages for the displacement of farmers, and the construction of Dushu Educational District to the south of SIP are successful examples.

Table 7.3: Division of Responsibilities

Role of Management Authority	Beijing ZGC	Shanghai ZJ	Suzhou SIP	Shenzhen SHIP
Special District Agency	Appointed by Municipal Government	Appointed by Municipal Government	Director Appointed by Municipal Government; Officials through exam	Appointed by Municipal Government
Tax	By both Haidian District Government and Beijing Municipal Government	By Pudong New Area Development Agency	Suzhou Municipal Government	By both Nanshan District Government and Shenzhen Municipal Government
Land Development	Leave to multiple land development companies	Zhangjiang High-Technology Park Development Committee	Leave to CSSD	Shenzhen Municipal Government
Service and commercial activities	Leave to Haidian District Government	Guided by Pudong New Area Development Agency; leave partial service to original town government	Independent organization. Also consider social affairs of surrounding areas.	Leave to Nanshan District Government

In contrast, since Shenzhen SHIP is a small R&D zone, all of its development affairs are under the unified guidance of the Nanshan District government and the

Shenzhen Municipality. The development committee of SHIP is an appointed agency, with the mayor serves as the president of committee. The Special Economic Zone's advanced policies provide SHIP with a concentration of investment and funding.

In Shanghai ZJ Park, the affairs are explicitly divided into two parts. While the local Zhangjiang town government takes charge of community development and health care facilities, all the other high-technology companies and commercial facilities are under the management of the ZJ Committee. The relatively single land use in ZJ avoids the potential conflicts between the two teams. However, due to the separation of management, Zhangjiang town's low level of social and commercial development was not enhanced by the surrounding development of specific science parks and industrial bases.

In the case of Beijing, the complicated political context has led to the role of ZGC Management Committee as an industrial policy-maker and intermediary among various sectors. Furthermore, the Haidian District government undertakes most of the commercial activities, social affairs, and public services. Meanwhile, the infrastructure improvement and land construction practices are under separate land development companies. Nevertheless, ZGC Management Committee experienced several administrative adjustments during the decades of development, aiming to provide more effective services for coordination and policy-making.

ISSUE 5: Environmental Sustainability

5.1 Maintenance: Use of Natural Elements and Industrial Resources

Through the utilization of natural resources, high-technology parks have created different types of outdoor spaces for both nature and social uses. Given the excellent natural resources and climate advantages, SIP has embraced the green and sustainability concepts in its master plan design. Since its inception in 1994, it has proposed a large-scale, ecological, green landscape along original river systems and lakes, aiming to create a green landscape network within the industrial park. Currently, there are various leisure parks around Jinji Lake that integrate human activities with green spaces and create livable environments and great open spaces. Furthermore, Shenzhen High-Technology Industrial Park serves as a model for the utilization of natural resources. Its infrastructure construction fully considers the local topographic situation. Usually, the construction involves trimming the ground and then disposing the pipeline. However, since SHIP's original terrain was uneven with an elevation difference of over ten meters, the infrastructure pipelines were laid according to the elevations and depressions of the natural landscape, which not only preserved the advantages of the original terrain but also largely saved construction costs.

5.2 Land Use and Transportation

Sustainable approaches can also be adopted in land use and transportation aspects. SIP, for example, employs sustainable land use strategies in terms of two parts. With regard to infrastructure, Singaporean experts insist on more investment in initial

construction in order to gain more revenue from the high quality of infrastructure. The advanced equipment and higher quality of plants and green landscapes has guaranteed the efficient operation of facilities and avoided the waste of frequent checks and fills of gaps in further maintenance. The use of land banks has also left a lot of space for further development.

In terms of land functional arrangement, regardless of scale, most HIDZs adopt the TOD mode. Mixed-use facilities and buildings are proposed for construction around important transit stations. In some HIDZs, where the subway and trolley systems are constructed after the development has matured, the site selection for transit stations focuses on covering key districts as well as further expansion directions. For instance, the trolley line in Shanghai Zhangjiang High-Technology Park starts from Zhangjiang Station of No. 2 Subway line, and covers all important industrial bases in Zhangjiang Park. Nevertheless, it is notable that most transit systems in HIDZs concern vehicles, buses, or subways; pedestrian programming is ignored by many managers. Although, the industrial districts do not need as many pedestrians as communities do, the lack of pedestrian considerations has diminished the quality of commercial environment in CBD district and public plazas.

The HIDZs face challenges with regard to sustainable development during their expansion and sprawls toward suburban areas. While the spatial extensions have brought development opportunities to surrounding towns and villages, the lack of coordination among the districts has caused disorder in the land arrangement. The extended areas are dispersed separately around every town or village with weak development intensity and low density. The growth of manufactories continues to swallow an increasing amount of

farmland without systematical control and assignment. Thus, the low density of land development results in a waste of land resources and a break in the natural environment. The future of HIDZs may be out of control without balancing the demands of industries and original suburban villages.

5.3 Energy Consumption

Opportunities to reduce energy usage and carbon emissions, especially through improvements in technology and behavioral changes, and to promote alternative energies can be accelerated as people gain awareness of their ecological footprint. In terms of energy savings, within the expanding urbanization period, HIDZs set up strict criteria on the selection of sustainable companies who may enter the park. Most industries in high-technology companies are devoted to scientific research and product service. Low-technical manufacturing industries were rejected by the HIDZs. Environmental conservation regulation is the main approach to energy saving in the high-technology parks. Drawing on the experiences of Singapore's environmental control, Suzhou Industrial Park planned a rigorous management system for planning and construction that covered a series of aspects including sewage, water, pollution, construction materials, and gas emission standards. SIP also proposed energy-efficient buildings and factories in important districts that can save a large amount of energy resources in the entire life cycle of a building. Shenzhen High-Technology Industrial Park adopted a similar management system to successfully create an excellent working environment. Currently, the South Area of SHIP holds a series of environmental preservation certificates.

Nevertheless, most of the HIDZs' environmental developments are at a far lower level than the average level of environmental preservation among worldwide science parks. The low efficiency of energy utilization is closely related to the types of industries in HIDZs. Transferring manufacturing industries toward sustainable high-technology industries is not only beneficial for the development of high-tech companies but also to energy saving and environmental preservation.

Summary

The HIDZ is a significant example of science park development for international practices with specific features. They are closely linked with rapid urbanization, which bring particular social commissions to high-technology park developments, as well as economic growth. Chinese HIDZs show how extremely large-scale sites were developed under specific governmental top-down planning and management. The urbanization, industrialization, socioeconomic, and environmental issues intertwined to force Chinese HIDZ development toward new high-technology-based townships or technopoles.

The Beijing Zhongguancun Haidian Park, Shanghai Zhangjiang High-Technology Park, Suzhou Industrial Park, and Shenzhen High-Technology Industrial Park illustrate how Chinese HIDZs use planning strategies to benefit their development. These examples vary across resource levels, and represent different HIDZ development types. They work across diverse contexts, demonstrating the versatility of planning by blending a variety of key planning and public goals to guide environmental place-making, regulate the land development process, and attract economic investment.

In addressing the first research question (What planning strategies did management entities of HIDZs determine and implement, and in what circumstance and for what purpose?), this research found that, in order to accommodate both anticipated and unexpected changes, HIDZs shaped their planning strategies around local conditions. A couple key factors determine the choice of strategies for planning and development. For instance, the source of capital is essential in determining the approach for land development, as well as the relationship between the land development company and the administrative committee. If lacking in initial funding, most of the HIDZs use the power of government to motivate the construction of the parks. Another influential factor is the composition of enterprises and institutes, which hold large amounts of power in the decision-making process and the adjustment of plans. Moreover, the characteristics of the physical environment, and the surrounding area, also impact the choice of planning strategies and the corresponding design programs. For example, the large scale of projects has led them to adopt phasing steps, and existing land use directly impacts both the programmed layout and the transit program.

Much has also been learned from investigating how physical strategies impact the outcomes of HIDZs. For example, a flexible plan is necessary in the development process. This flexibility can be achieved multiple ways, such as land banks, statutory plan systems, and phasing steps. A second discovery is that while many HIDZs lack essential educational resources in their cities, these resources can be created through a series of approaches, which involve international cooperation, the creation of a Virtual University Park, and enacting remote education programs. Moreover, transport issues could be attacked at the outset by improving public transit systems and providing supportive

facilities, as with those for housing, service, and commercial use, along with high-technology institutes and manufactory.

In developing a sustainable high-technology park, the approaches to environmental control include the establishment of environmental standards, the reduced use of resources, and the saving of energy for further development. The approaches also include an increase in the intensity of land development, the development of new recycling resources, and energy conservation in buildings. In terms of operation, the sustainable practices can refer to regional policies, local regulations and codes for land development, building guidelines, and the criteria of the planning review.

Chinese HIDZ development also reveals a variety of common problems. For instance, most of the HIDZs overlook the importance of human exchanges in high-technology parks. They propose segregation in land use, layout, and phasing steps, and ignore interactions between people and the environment. While many HIDZs have currently adopted mixed-use in areas that were originally single-use, in order to enhance human activities, human-oriented design principles have yet to be acknowledged in most of the economic-oriented science parks. Moreover, in terms of planning management, current splits in responsibility, between local governments and HIDZ committees, are counterproductive. An alternative is to establish better co-directional mechanisms among different administrative organizations, and to put major responsibilities in one strong hand.

The culture of planning in HIDZs has evolved from a state-planned process to a process driven by experts and local government. Early in development, the preferential policies of local governments provide funding, residential allowance, taxation,

infrastructure, and land benefits to attract companies and create employment opportunities. The government can also borrow from governmental partnership experiences with advanced science parks in developed districts in order to mobilize greater resources. As exemplified by Japan, Korea, Singapore, and Taiwan, state and municipal governments promote the funding of high-technology in order to protect their domestic industries, supporting development and stimulating the growth of market-oriented systems and the maturation of domestic high-technology companies.

When the output value of high-technology industry has become an important part of urban industry, the high-technology parks will mature and the role of government will change, moving away from intervention in the market and toward a role as a service provider for the market. In the innovative market, the government's capacity and efficiency at responding to fast change is lower than market-oriented enterprises. Government-controlled development does not promote a capacity for personal innovation, hampering rapid growth in high-technology enterprises. Thus, a series of one-piece service platforms and public service centers are established. High-technology companies form associations to participate in the decision-making process, and the land development companies gradually transfer from governmental agency to real estate developers to serving companies and R&D centers. However, the importance of networking has yet to be appreciated in current HIDZ practices. Moreover, practical processes lack the corresponding legal and public participation needed to support the multi-sector planning network. There are many practices in the HIDZs that still need improvement.

The Big Picture: Development toward Innovation

Despite the over two decades of development, the current national HIDZs are not at the same development stage. Behind the versatility of the planning and management of China's HIDZs, there are three different urban development purposes. A limited number of national HIDZs, as exemplified by Beijing ZGC and Shanghai Zhangjiang Park, are developed toward the establishment of a national innovation center with strong high-technology research and development capacity. More cities, however, take the approval of national HIDZs as favorable occasions to develop industries and achieve economic growth rather than certainly improving the self-innovation ability of high-technology development. There is a third group of national HIDZs, such as Suzhou Industrial Park, that use preferential policies of high-technology zones to attract international investment and firms to their cities and stimulate the urban development.

Their differentiations of developments illustrate a series of sequences driven by China's economic reform since the 1980s. The reforms in the 1980s and early 1990s were characterized by various schemes of devolving power from higher to lower levels of government and allowing more of any surplus and autonomy to accrue to local units, without fundamental change in the encompassing structure of macroeconomic administration. Thus, many domestic private firms automatically emerged in some large cities during this period, such as Electronic Street in Beijing and small companies in Shenzhen, as an alternative to state-owned large manufactories and institutes. The boom of these firms represented their early innovation incentives of developing high-tech industries. The second phase of economic reform since the mid-1990s shifted the focus from the modification of the pre-reform economic system to the construction of a "new

market system with socialist characteristics,” which is generally interpreted as incorporating market forces within an essentially socialist system. Many cities, especially those in coastal areas, intended to cultivate high-technology industries for economic growth. Driven by global specialization, many international companies also began to step into China’s market in search of processing and labor factories.

As a result of the piecemeal transformation of the economic structure, the original purpose of State Council’s establishment of national HIDZs in the 1990s was to facilitate the development of high-technology industries through the enlargement of high-technology companies and international investments, and achieve successful industrialization. The state policies with regard to urbanization and guiding high-technology industrial development during the transitional period remain significant in funding, taxation, and bringing investment for cities. However, the policies, especially the preferential strategies for high-technology industrial development zones, overlook the completion of a management system in supporting the local innovation capacity of high-technology companies.

Consequently, when applying the policies in local contexts, the variation in social resources, differentiations of economic structures, and imbalances among different districts have led to different development purposes of local governments, and hence, resulted in a variety of patterns of national HIDZs. As an “experimental zone,” Beijing ZGC implemented the strategy of “boosting the country through scientific and educational advances” through the full use of educational resources by encouraging the establishment of university parks and incubators. Despite the heating of business and commercial activities in the central area, self-developed, high-technology companies

such as Lenovo and Founder Tech, as well as international high-technology companies' research bases in this area, such as Google and Microsoft Research Institutes, evince the well-developed innovation capacity of ZGC. Some national HIDZs located in areas with rich educational resources such as Xi'an and Wuhan also applied ZGC's approaches to retain the research scholars and graduates and to transform research outcomes into high-technology productions.

Some other national HIDZs also use the strong power of state government to remove or establish university branches, research institutes, and incubators in their areas, as exemplified by Shanghai Zhangjiang High-Technology Park. While Lujiazui Financial Trade Zone has attracted a lot of international businesses and become the top business center in China and Jinqiao Export Processing Zone has well-developed manufacturers, Zhangjiang Park did not have its own high-technology incentives in either domestic firms or universities. A state policy of "Focus on Zhangjiang" helped ZJ Park gain successful economic growth through the construction of Pudong Software Park, IC Industrial Zone, and many institutional research bases. The state government aims to build ZJ Park as a competitive high-tech zone in South China as a counterpart of Beijing ZGC.

Different from previous development patterns that have increased the competitiveness of research, some other cities have focused on the production end and intended to use the national HIDZs' construction to improve labor's professional capacity and R&D ability of high-technology companies. Shenzhen Special Economic Zone used to concentrate on traditional manufacturing and processing industries. In order to twist its role as the end of the industrial chain, Shenzhen Municipality used a series of approaches

to cultivate the research ability of high-technology firms, involving headquarter research bases, R&D platform, Virtual University Park, and innovation incubators.

The path of development toward innovation in Chinese cities is intertwined with the context of urbanization and industrialization. Thus, some cities are constructing high-technology industrial zones with the primary goal of creating a new urban center and to attract people with employment opportunities. For instance, Suzhou Industrial Park, despite being under the label of a “high-technology industrial zone,” aims to develop a mixed-use industrial town driven by industrial growth and economic accomplishments instead of a pure R&D base. Thus, it attracts international companies through highly-trained, skilled professionals and high-level labor pool sources rather than focusing on the construction self-innovation research bases or incubators. Some other cities such as Chengdu and Tianjin also gradually transferred their suburban industrial districts into a mixed-use urban sub-center. The meaning of HIDZs to these cities is more like industrial incentives stepping toward urbanization than developing innovative industry.

Consequently, the development and construction of China’s national HIDZs are not conventional international science parks that simply refer to the agglomeration of high-technology industries. In China’s specific context, instead, the national HIDZ is a distinct label and approach for developing a new urbanized district. The incompleteness of economic and management systems has led most of the national HIDZs to firstly create high-level labor professionals so as to attract outside companies and investment. To date, the management of HIDZs still focuses on environmental construction and preferential policies rather than on providing supportive functions for the research and redevelopment of innovative industries.

With 27 newly approved national HIDZs in December 2010, the current 84 national HIDZs have become an important part of China's economic development, allowing it to increase its competitiveness in international development. In the mid-2000s, China's state government announced a "second technological innovation" strategy for national HIDZs, aiming to increase its self-innovation capacity rather than its skilled labor manufacturers at the bottom of the international industrial chain. However, from original, traditional, cheap labor to high-skilled labor for development industries, and to the self-innovation development of China's high-technology industries, there is still a long way to go in their planning and management practices.

¹ O'Mara, *Cities of Knowledge*, 227.

² Eugenie L. Birch, "U.S. Planning Culture under Pressure, Major Element Endure and Flourish in the Face of Crisis." In *Comparative Planning Cultures*, ed. Bishwapriya Sanyal, (New York: Routledge, 2005).

³ Pi, *Introduction of Chinese Economic Development Zones*.

APPENDICES

Appendix 1: List of 84 National HIDZs, Cities, Provinces, and Approval Years

	NAME OF HIDZS	CITY	PROVINCE	APPROVAL YEAR
1	Changchun High-Technology Industrial Development Zone	Changchun	Jilin	1991
2	Changsha High-Technology Industrial Development Zone	Changsha	Hunan	1991
3	Chengdu High-Technology Industrial Development Zone	Chengdu	Sichuan	1991
4	Chongqing High-Technology Industrial Development Zone	Chongqing	Chongqing	1991
5	Dalian High-Technology Industrial Park	Dalian	Liaoning	1991
6	Fuzhou Science Park	Fuzhou	Fujian	1991
7	Guangzhou High-Technology Industrial Development Zone	Guangzhou	Guangdong	1991
8	Guilin High-Technology Industrial Development Zone	Guilin	Guangxi	1991
9	Hainan International Science Park	Haikou	Hainan	1991
10	Hangzhou High-Technology Industrial Development Zone	Hangzhou	Zhejiang	1991
11	Harbin High-Technology Industrial Development Zone	Harbin	Heilongjiang	1991
12	Hefei High-Technology Industrial Development Zone	Hefei	Anhui	1991
13	Jinan High-Technology Industrial Development Zone	Jinan	Shandong	1991
14	Lanzhou High-Technology Industrial Development Zone	Lanzhou	Gansu	1991
15	Nanjing High-Technology Industrial Development Zone	Nanjing	Jiangsu	1991
16	Shanghai Zhangjiang High-Technology Industrial Development Zone	Shanghai	Shanghai	1991
17	Shenyang High-Technology Industrial Development Zone	Shenyang	Liaoning	1991
18	Shenzhen High-Technology Industrial Park	Shenzhen	Guangdong	1991
19	Shijiazhuang High-Technology Industrial Development Zone	Shijiazhuang	Hebei	1991
20	Tianjin New Technology Industrial Park	Tianjin	Tianjin	1991
21	Weihai Torch High-Technology Industrial Development Zone	Weihai	Shandong	1991

22	Wuhan East Lake New Technology Industrial Park	Wuhan	Hubei	1991
23	Xiamen Torch High-Technology Industrial Development Zone	Xiamen	Fujian	1991
24	Xi'an High-Technology Industrial Development Zone	Xi'an	Shaanxi	1991
25	Zhengzhou High-Technology Industrial Development Zone	Zhenzhou	Henan	1991
26	Zhongshan Torch High-Technology Industrial Development Zone	Zhongshan	Guangdong	1991
27	Anshan High-Technology Industrial Development Zone	Anshan	Liaoning	1992
28	Baoding High-Technology Industrial Development Zone	Baoding	Hebei	1992
29	Baoji High-Technology Industrial Development Zone	Baoji	Shaanxi	1992
30	Baotou Xitu High-Technology Industrial Development Zone	Baotou	Inner Mongolia	1992
31	Changzhou High-Technology Industrial Development Zone	Changzhou	Jiangsu	1992
32	Daqing High-Technology Industrial Development Zone	Daqing	Heilongjiang	1992
33	Foshan High-Technology Industrial Development Zone	Foshan	Guangdong	1992
34	Guiyang High-Technology Industrial Development Zone	Guiyang	Guizhou	1992
35	Huizhou Zhongkai High-Technology Industrial Development Zone	Huizhou	Guangdong	1992
36	Jilin High-Technology Industrial Development Zone	Jilin	Jilin	1992
37	Kunming High-Technology Industrial Development Zone	Kunming	Yunnan	1992
38	Luoyang High-Technology Industrial Development Zone	Luoyang	Henan	1992
39	Mianyang High-Technology Industrial Development Zone	Mianyang	Sichuan	1992
40	Nanchang High-Technology Industrial Development Zone	Nanchang	Jiangxi	1992
41	Nanning High-Technology Industrial Development Zone	Nanning	Guangxi	1992
42	Qingdao High-Technology Industrial Development Zone	Qingdao	Shandong	1992
43	Suzhou New District	Suzhou	Jiangsu	1992
44	Taiyuan High-Technology Industrial Development Zone	Taiyuan	Shanxi	1992
45	Urumqi High-Technology	Urumqi	Xinjiang	1992

	Industrial Development Zone			
46	Weifang High-Technology Industrial Development Zone	Weifang	Shandong	1992
47	Wuxi High-Technology Industrial Development Zone	Wuxi	Jiangsu	1992
48	Xiangfan High-Technology Industrial Development Zone	Xiangfan	Hubei	1992
49	Zhongguancun Science Prk	Beijing	Beijing	1992
50	Zhuhai High-Technology Industrial Development Zone	Zhuhai	Guangdong	1992
51	Zhuzhou High-Technology Industrial Development Zone	Zhuzhou	Hunan	1992
52	Zibo High-Technology Industrial Development Zone	Zibo	Shandong	1992
53	Suzhou Industrial Park	Suzhou	Jiangsu	1994
54	Yangling Agriculture High-Technology Industrial Zone	Xianyang	Shaanxi	1997
55	Ningbo High-Technology Industrial Development Zone	Ningbo	Zhejiang	2007
56	Taizhou High-Technology Industrial Development Zone	Taizhou	Jiangsu	2009
57	Xiangtan High-Technology Industrial Development Zone	Xiangtan	Hunan	2009
58	Anyang High-Technology Industrial Development Zone	Anyang	Henan	2010
59	Baiyin High-Technology Industrial Development Zone	Baiyin	Gansu	2010
60	Bengbu High-Technology Industrial Development Zone	Bengbu	Anhui	2010
61	Changji High-Technology Industrial Development Zone	Changji	Xinjiang	2010
62	Dongwan High-Technology Industrial Development Zone	Dongwan	Guangdong	2010
63	Jiangmen High-Technology Industrial Development Zone	Jiangmen	Guangdong	2010
64	Jingdezhen High-Technology Industrial Development Zone	Jingdezhen	Jiangxi	2010
65	Jining High-Technology Industrial Development Zone	Jining	Shandong	2010
66	Kunshan High-Technology Industrial Development Zone	Suzhou	Jiangsu	2010
67	Liaoyang High-Technology Industrial Development Zone	Liaoyang	Liaoning	2010
68	Liuzhou High-Technology Industrial Development Zone	Liuzhou	Guangxi	2010
69	Nanyang High-Technology Industrial Development Zone	Nanyang	Henan	2010

70	Qiqihar High-Technology Industrial Development Zone	Qiqihar	Heilongjiang	2010
71	Quanzhou High-Technology Industrial Development Zone	Quanzhou	Fujian	2010
72	Shaoxing High-Technology Industrial Development Zone	Shaoxing	Zhejiang	2010
73	Tangshan High-Technology Industrial Development Zone	Tangshan	Hebei	2010
74	Weinan High-Technology Industrial Development Zone	Weinan	Shaanxi	2010
75	Wuhu High-Technology Industrial Development Zone	Wuhu	Anhui	2010
76	Xining High-Technology Industrial Development Zone	Xining	Qinghai	2010
77	Xinyu High-Technology Industrial Development Zone	Xinyu	Jiangxi	2010
78	Yanji High-Technology Industrial Development Zone	Yanji	Jilin	2010
79	Yanjiao High-Technology Industrial Development Zone	Yanjiao	Hebei	2010
80	Yantai High-Technology Industrial Development Zone	Yantai	Shandong	2010
81	Yichang High-Technology Industrial Development Zone	Yichang	Hubei	2010
82	Yinchuan High-Technology Industrial Development Zone	Yinchuan	Ningxia	2010
83	Yingkou High-Technology Industrial Development Zone	Yingkou	Liaoning	2010
84	Zhaoqing High-Technology Industrial Development Zone	Zhaoqing	Guangdong	2010

Appendix 2: 57 National HIDZs (1991-2009) By Region

NORTHEASTERN	PROVINCE
Anshan High-Technology Industrial Development Zone	Liaoning
Changchun High-Technology Industrial Development Zone	Jilin
Daliang High-Technology Industrial Park	Liaoning
Daqing High-Technology Industrial Development Zone	Heilongjiang
Harbin High-Technology Industrial Development Zone	Heilongjiang
Jilin High-Technology Industrial Development Zone	Jilin
Shenyang High-Technology Industrial Development Zone	Liaoning
NORTHERN	
Baoding High-Technology Industrial Development Zone	Hebei
Baotou Xitu High-Technology Industrial Development Zone	Inner Mongolia
Shijiazhuang High-Technology Industrial Development Zone	Hebei
Taiyuan High-Technology Industrial Development Zone	Shanxi
Tianjin New Technology Industrial Park	Tianjin
Zhongguancun Science Prk	Beijing
EASTERN	
Changzhou High-Technology Industrial Development Zone	Jiangsu
Fuzhou Science Park	Fujian
Hangzhou High-Technology Industrial Development Zone	Zhejiang
Hefei High-Technology Industrial Development Zone	Anhui
Jinan High-Technology Industrial Development Zone	Shandong
Nanchang High-Technology Industrial Development Zone	Jiangxi
Nanjing High-Technology Industrial Development Zone	Jiangsu
Ningbo High-Technology Industrial Development Zone	Zhejiang
Qingdao High-Technology Industrial Development Zone	Shandong
Shanghai Zhangjiang High-Technology Industrial Development Zone	Shanghai
Suzhou Industrial Park	Jiangsu
Suzhou New District	Jiangsu
Taizhou High-Technology Industrial Development Zone	Jiangsu
Weifang High-Technology Industrial Development Zone	Shandong
Weihai Torch High-Technology Industrial Development Zone	Shandong
Wuxi High-Technology Industrial Development Zone	Jiangsu
Xiamen Torch High-Technology Industrial Development Zone	Fujian
Zibo High-Technology Industrial Development Zone	Shandong
SOUTHERN	
Foshan High-Technology Industrial Development Zone	Guangdong
Guangzhou High-Technology Industrial Development Zone	Guangdong
Guilin High-Technology Industrial Development Zone	Guangxi

Hainan International Science Park	Hainan
Huizhou Zhongkai High-Technology Industrial Development Zone	Guangdong
Nanning High-Technology Industrial Development Zone	Guangxi
Shenzhen High-Technology Industrial Park	Guangdong
Zhongshan Torch High-Technology Industrial Development Zone	Guangdong
Zhuhai High-Technology Industrial Development Zone	Guangdong
CENTRAL	
Changsha High-Technology Industrial Development Zone	Hunan
Luoyang High-Technology Industrial Development Zone	Henan
Wuhan East Lake New Technology Industrial Park	Hubei
Xiangfan High-Technology Industrial Development Zone	Hubei
Xiangtan High-Technology Industrial Development Zone	Hunan
Zhengzhou High-Technology Industrial Development Zone	Henan
Zhuzhou High-Technology Industrial Development Zone	Hunan
NORTHWESTERN	
Baoji High-Technology Industrial Development Zone	Shaanxi
Lanzhou High-Technology Industrial Development Zone	Gansu
Urumqi High-Technology Industrial Development Zone	Xinjiang
Xi'an High-Technology Industrial Development Zone	Shaanxi
Yangling Agriculture High-Technology Industrial Zone	Shaanxi
SOUTHWESTERN	
Chengdu High-Technology Industrial Development Zone	Sichuan
Chongqing High-Technology Industrial Development Zone	Chongqing
Guiyang High-Technology Industrial Development Zone	Guizhou
Kunming High-Technology Industrial Development Zone	Yunnan
Mianyang High-Technology Industrial Development Zone	Sichuan

Appendix 3` : Literature Review/Annotated Bibliography

The literature research of physical planning and management strategies in China’s national high-technology industrial development zones covers a wide range of fields, involving urban planning and design, science park development, and China’s specific issue (Figure). This annotated bibliography aims to explore the major themes in each subject, and current gap in the overlay of three fields. The worldwide science park development consists of two parts: (1) overview discussions of international science park development, most of which are books written by Western scholars, published since the 1980s; and (2) subdivided topics of science park practices, most of which are Western journal papers focusing on single or several science parks in certain region, with regard to management and industrial development issues. The second section, urban planning and design, also has two parts: (1) urban planning and design principles, which are books or sections in planning and design fields, aiming to explore theories and taxonomy of physical planning strategies; and (2) the application process of planning and design in practical activities, such as design review, guideline, planning system, and design control. The last field, China’s issues, is composed of three major parts of literature research: (1) a general overview of China’s urbanization and industrialization. Most of the books are written by Chinese Scholars but in English versions; (2) China’s planning and design research, many of which are papers published in key Chinese journals since 2000s, focusing on discussing problems in China’s planning and design practices; and (3) science parks practices in China, which are Chinese books or journals in case practices of science parks or high-technology industrial development zones in China.

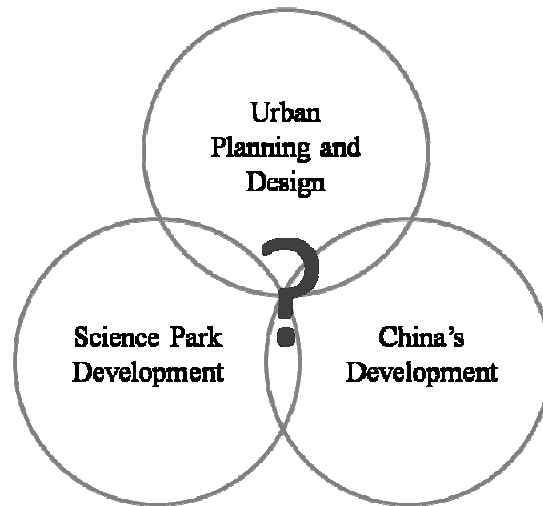


Figure A: Literature Review Fields

1. INTERNATIONAL SCIENCE PARK DEVELOPMENT

1.1 GENERAL DISCUSSION OF INTERNATIONAL SCIENCE PARK

- 1. Anttiroiko, Ari-Veikko. "Global Competition of High-Tech Centers." *International Journal of Transport Management* 28, no. 3/4/5 (2004).**

This article highlights the present state of development of the global competition between high-tech centers. Special attention is paid to science parks as a development policy option and the extent to which this policy has been adapted in the USA and major European and Asian countries. Another important framing theme of the article is to outline the development of science parks and clarify the science park terminology. In addition, the functions, performance, and new directions of science parks are briefly discussed.

- 2. Bugliarello, George. "Knowledge Parks and Incubators." In *The Technology Management Handbook*, edited by R.C. Dorf. Boca Raton, FL: CRC Press, 1999.**

The author defines knowledge parks and incubators as special physical environments for the creation—directly or indirectly—of economic value through the development, application, and transfer of knowledge and the creation of new enterprise. Most parks are planned, but some happen spontaneously. This part of paper discusses the typology, strategies, resources needed for a knowledge park, the originator, and the entrepreneur. It also analyzes the agglomerative effect of spin-offs from a university center on the technology commercialization environment.

- 3. Castells, Manuel, and Peter Hall. *Technopoles of the World: The Making of 21st Century Industrial Complexes*. London: Routledge Press, 1994.**

Technopoles - planned centers for the promotion of high-technology industry - have become a key feature of national economic development worldwide. Created out of a technological revolution, the formation of the global economy and the emergence of a new form of economic production and management, they constitute the mines and foundries of the information age, redefining the conditions and processes of local and regional development. This text is a systematic survey of technopoles in all manifestations: science parks, science cities, national technopoles and techno-belt programs. Detailed case studies, ranging from the Silicon Valley to Siberia and from the M4 Corridor to Taiwan, relate how global technopoles have developed, what each is striving to achieve and how well it is succeeding. This book distills the lessons learned from the successes and failures, embracing a host of disparate concepts and a few myths, and offering guidelines for national, regional and local planners and developers worldwide.

- 4. Frej, Anne, et al. *Business Park and Industrial Development Handbook*. Washington, D.C.: Urban Land Institute, 2001.**

This book is a guidance book of the development of business parks and their individual components. It provides a brief history of the evolution of business parks from the early 1900s to the present, as well as the characteristics of a successful business park and its specialized types. It details the process of analyzing the market and financial feasibility of business parks using case studies and financial pro formas based on actual projects. This book also provides an overview of the capital markets for industrial development. In addition, it addresses the important components of site planning and designing business parks. Besides the marketing, leasing, operations, and management of industrial projects, this book uses many case studies to highlight the experience gained from successful projects around the world.

5. IASP. "Survey of International Science Parks." International Association of Science Parks, 2002.

A general survey of international science parks in 2002, conducted by IASP.

6. ———. "Survey of International Science Parks." International Association of Science Parks, 2006-2007.

A general survey of international science parks in 2002, conducted by IASP.

7. Komninos, Nicos. *Intelligent Cities and Globalisation of Innovation Networks*. New York: Routledge, 2008.

This book is about innovation, cities, and regions. It approaches the subject not through addressing a theory of innovation, but to quest for understanding the environment for generating innovation. It explains why intelligent environments are important today; sets out their role within global innovation networks; and discusses how we can create such environments. The intelligent cities have two dimensions of identification: (1) as territorial systems of innovation within which a continuous mix of skills and learning institutions takes place, driving the development of new products and technologies in the organizations located into a territory (companies, R&D centers, intermediaries, incubators, science parks, etc), and (2) as digital spaces of collaboration. The book combines concepts and theories from three different fields of science and technology: (1) urban development and planning; (2) innovation management; and (3) virtual/intelligent environments. It offers a series of digital platforms and tools for the making of intelligent cities.

The first part of the book looks at the evolution of territorial system of innovation under the pressure of globalization and the rise of intelligent environments (cities, clusters, regions) as a means of dealing with global innovation networks, global new product development, and global knowledge outsourcing. The second part of the book addresses several key functions within intelligent cities such as strategic intelligence, technology acquisition, cooperative product development, global supply chains and digital-city market places. It ends within discussing three levels that make an intelligent city (creative people and organizations,

innovation support institutions, digital innovation spaces) and the four functions that enable people to work cooperatively and master different forms of knowledge and know-how.

8. **Luger, Michael Ian, and Harvey A. Goldstein. *Technology in the Garden: Research Parks and Regional Economic Development*. Chapel Hill, N.C.: University of North Carolina Press, 1991.**

This book assesses the impact of research parks on regional economic development, including job creation, new business formation, and average wage and salary levels. It also aims to explore how the benefits of such parks are distributed among population groups, particularity among minorities and women. It provides an overview of the population of research parks in the U.S., discusses the expected economic development outcomes of research parks, introduces a model of the stages of development of research parks and discuss the concepts of success and failure in terms of these stages., and presents the results of a cross-sectional analysis of a large sample of research parks. Using case studies of three of the most successful research parks in the U.S.: Research Triangle Park, University of Utah Research Park, and Stanford Research Park, the book identifies the contextual and situation-specific factors of success. It explores the two-way relationship between research parks and their associated universities, and discusses the implications of findings for the design of regional economic development and technology policies.

9. **Massey, Doreen, and Richard Meegan. *The Anatomy of Job Loss: The How, Why and Where of Employment Decline*. London: Methuen, 1982.**

This book looks at the geographic impact of different forms of production change within industry in the context of recession. This book focuses on the different processes of employment decline, and aims to explore an approach to the analysis of its geography. It examines a number of sectors of British economy that were losing employment over the years 1968 to 1973. Then it explores how, why, and where these jobs were lost, and in turn their implications for the geography of employment decline. It argues that the fact of continuing employment decline has had a number of wider effects, both social and political. It had become an important weapon in the battle between labor and capital.

10. **Massey, Doreen, Paul Quintas, and David Wield. *High-Tech Fantasies: Science Parks in Society, Science and Space*. London: Routledge, 1992.**

This book explores the relation between the scientific and technological content of science parks, their social structure and meaning, and their spatial distribution and form. It analyzes the places of scientists, technologists, and engineers in the class structure of capitalist societies, and how that place s changing. The book also examines the social and scientific bases of the hype around high tech, takes up arguments about the nature of scientific research and industrial innovation. The impact on, and of, geography in the new era of high tech, and the social significance of spatial symbolism are studied. This book criticizes the divisive hype of science parks arguing that both the theory and practice are unproductive for the economy

and for any socially progressive science and technology. Questioning responsibility, innovation and symbolism, the authors explore the mutual determination of society, science and space.

11. Markusen, Ann. "Sticky Places in Slippery Space: A Typology of Industrial Districts." *Economic Geography* (1997): 293-310.

This paper identifies three additional types of industrial districts, with quite disparate firm configurations, internal versus external orientations, and governance structures: a hub-and-spoke industrial district, revolving around one or more dominant, externally oriented firms; a satellite platform, an assemblage of unconnected branch plants embedded in external organization links; and the state-anchored district, focused on one or more public-sector institutions. It also reviews the strengths and weaknesses of each.

12. O'Mara, Margaret Pugh. *Cities of Knowledge: Cold War Science and the Search for the Next Silicon Valley*. Princeton: Princeton University Press, 2005.

This book focuses on historically and spatially understanding why high technology thrived in certain places, and why these regions have proved so hard to replicate. It calls these places as cities of knowledge: consciously planned communities that were physical manifestations of a particular political and cultural moment in history, and shaped by the relationship between the state and civil society in late 20th century America. This study traces the intersections of policy and place, and the role of universities within this process from inception to implementation, beginning with the Cold War politics of the late 1940s, moving through the local economic development efforts of the 1960s, and taking an intense look at the experience of three very different metropolitan areas and their leading research institutes. It finds that cities of knowledge are products of Cold War spending patterns, products of university-centered economic development, and products of local action. The cases illustrate the unevenness of the high-technology playing field, and the way in which Cold War politics spurred tremendous opportunities for some places and closed off economic possibilities for others.

13. Porter, Michael E. "Location, Competition, and Economic Development: Local Clusters in a Global Economy." *Economic Development Quarterly* 14 (2000): 15-34.

It is widely recognized that changes in technology and competition have diminished many of the traditional roles of location. Yet clusters, or geographic concentrations of interconnected companies, are a striking feature of virtually every national, regional, state, and even metropolitan economy, especially in more advanced nations. The prevalence of clusters reveals important insights about the microeconomics of competition and the role of location in competitive advantage. Even as old reasons for clustering have diminished in importance with globalization, new influences of clusters on competition have taken on growing importance in an increasingly complex, knowledge-based, and dynamic economy. Clusters represent a new way of thinking about national, state, and local economies, and they

necessitate new roles for companies, government, and other institutions in enhancing competitiveness.

1.2 SCIENCE PARK PRACTICES

1. **Bakouros, Yiannis L., Dimitri C. Mardas, and Nikos C. Varsakelis. "Science Park, a High Tech Fantasy?: An Analysis of the Science Parks of Greece." *Technovation* 22 (2002): 123-28.**

There is a lack of evidence about the role of science parks in the less developed countries. This paper examines the science parks in a peripheral European country, Greece. The findings indicate that the picture of the three science parks of Greece is not the same in terms of the links between university and industry. Informal links have been developed between the firms and the local university, however, only the firms located at one science park have developed formal links, while the formal links of the companies of the other two parks are at the infant level at this time.

2. **Bigliardi, Barbara, et al. "Assessing Science Parks' Performances: Directions from Selected Italian Case Studies." *Technovation* 26, no. 4 (2006).**

This paper aims at providing a sound and theory-grounded methodological framework to science parks performance measurement and some practical suggestions useful for the design and the implementation of a Science Park's performance evaluation. Based on the analysis of four Italian case studies, the empirical findings partly lend support to previous research output and partly add new elements of discussion to the debate. More specifically, major results are that the evaluation criteria should be aligned with science park (a) actual mission, (b) major stakeholders commitment, (c) economic regional conditions, (d) legal forms, (e) nature of the scientific competence base available within research centers and (f) SP's life-cycle stages.

3. **BMI, (Battelle Memorial Institute). "Characteristics and Trends in North American Research Parks: 21st Century Directions." AURP (Association of University Research Parks), 2007.10.**

This is a general report on the development of American Research Parks in 2007, conducted by Association of University Research Parks (AURP).

4. **Braun, Bradley M., and W. Warren McHone. "Science Parks as Economic Development Policy: A Case Study Approach." *Economic Development Quarterly* 6 (1992): 135.**

This article uses the results of a recent survey of high-technology firms in Orlando, Florida to compare and contrast the characteristics of firms that have located in a university-related

research park with high-tech firms that operate in other parts of the metropolitan area. In general, the survey revealed substantial differences between these two categories of high-tech firms, extending across many dimensions of firm structure and development.

5. **Bugliarello, George. "Urban Knowledge Parks, Knowledge Cities and Urban Sustainability." *International Journal of Transport Management* 28, no. 3/4/5 (2004).**

Urban knowledge parks, a subset of knowledge parks, are a new mechanism for the transformation of cities into knowledge cities. Take Metrotech in NYC as an example, this research outlines the distinguish characteristics of urban knowledge parks and the processes by which they come into being.

6. **Cabral, Regis. "The Cabral-Dahab Science Park Management Paradigm: An Introduction." *International Journal of Transport Management* 16, no. 8 (1998).**

This is a series of researches involving science park cases from a global perspective: Brazil, Sweden, USA, China, and Kuwait. This introduction provides ten points of the Cabral-Dahab Paradigm in terms of guidance for success of science parks. It also provides a new definition of innovation and, as a consequence of science park.

7. **Chou, Tsu-Lung. "The Science Park and the Governance Challenge of the Movement of the High-Tech Urban Region Towards Polycentricity: The Hsinchu Science-Based Industrial Park." *Environment & Planning A* 39 (2007): 1382-402.**

This paper explore the governance challenges of science-park-based urban regions by exploring the case study of the Hsinchu science-based industrial park in Taiwan. In contrast to the economic emphasis of new regionalism on regional learning, It investigates the change and development of the high-tech Hsinchu region as it moves towards polycentricity, by exploring how the political processes of multiple and interconnected forces, from international to national and subnational levels, affect spatial-construction and regional governance issues. The research highlights that international, national, and subnational forces caused the polycentric development, which in turn has led to governance contradictions.

8. **Cooke, Philip. "The Role of Research in Regional Innovation Systems: New Models Meeting Knowledge Economy Demands." *International Journal of Transport Management* 28, no. 3/4/5 (2004).**

This paper discusses the recent thinking and experiences of regional innovation systems. It focuses on the governance, or functional support system of public and private research intermediaries now understood to be of central importance to the health of innovation systems and the clusters that may be embedded within tem. Based on the questions of governance in further depth, new examples of innovative regional governance of innovation systems grappling with the exacting demands of the knowledge economy are presented.

9. **Elstrom, Peter., Paul M. Eng, Paul Judge, and Gary McWilliams. "It Must Be Something in the Water." *Business Week-Silicon Valley Special Report 1997.08.***

This discussions analyzes the role governments play in the development of Silicon Valley.

10. **Ferguson, Richard. "Why Firms on Science Parks Should Not Be Expected to Show Better Performance -- the Story of Twelve Biotechnology Firms." *International Journal of Transport Management 28, no. 3/4/5 (2004).***

This paper investigates growth in employment over a 13-year period in 12 small biotechnology firms, with the purpose of understanding the effects of a science park location on firm development. Findings show that all of the firms experiencing higher-growth moved off of a science park prior to exhibiting high-growth performance. Similarly, all the non-surviving firms with a science park history also relocated off-park prior to their failure. This suggests that we need to look beyond firms' present locations to see the effects of a science park location.

11. **Glasmeyer, A. "The Japanese Technopolis Programme: High-Tech Development Strategy or Industrial Policy in Disguise?" *International Journal of Urban and Regional Research, no. 12 (1988): 268-84.***

This paper reports the strategy of Japanese Technopolis Programme enacted in the 1980s. It analyzes the background, incentives, motivation, and strategies used in this program.

12. **Goldstein, Harvey A. and Michael I. Luger. "University-Based Research Parks as a Rural Development Strategy." *Policy Studies Journal 20, no. 2 (1992).***

This paper describes some conditions that are normally required for research parks in the U.S. to be an effective rural development strategy. It discusses the research park phenomenon, with particular attention to the roles of state and local governments and universities, the rationale for developing research parks in nonmetropolitan areas, the attributes and performance of research parks in nonmetropolitan areas, and lessons that experience to date holds for planners, policy makers, university officials, and others considering the use of research parks as a rural development stimulus.

13. **Henton, D. "Lessons from Silicon Valley: Governance in a Global City-Region." In *Global City-Regions: Trends, Theory, Policy*, edited by Allen J. Scott. New York: Oxford University Press, 2001.**

This paper examines an innovative region, Silicon Valley, to discuss the governance and institutions in global city-region under the period of new economy. It traces back the historical change of governance of Silicon Valley from the 1970s. After addressing the challenges and key principles, this paper concludes that Silicon Valley has evolved from a laissez-faire approach through business-led model to collaboration and networks just as the

economy has evolved toward networking. Joint Venture employs a collaborative model based on networks and voluntary agreements rather than hierarchy or markets.

- 14. Hommen, Leif, David Doloreux, and Emma Larsson. "Emergence and Growth of Mjärdevi Science Park in Linköping, Sweden." *European Planning Studies* 14, no. 10 (2006).**

This article examines the role that science parks play in the promotion of regional development with particular reference to one of Sweden's most successful science parks, the Mjärdevi Science Park. This article traces the historical events related to the creation of Mjärdevi Science Park that have influenced its technological and industrial development. It then outlines the park's path of development and subsequently addresses key factors affecting the growth dynamics of the park.

- 15. Keeble, David. "High-Technology Industry and Local Environments in the United Kingdom." In *High Technology Industry and Innovative Environments: The European Experience*, edited by Philippe Aydalot and David Keeble. London: Routledge, 1988.**

This chapter demonstrates the widespread nature of high-technology industrial growth in spatially in the United Kingdom, in a context of national high-technology job decline focused on major cities and conurbations. It argues a clear association between expanding high-technology activity and less-urbanized smalltown locations, to reflect the key importance to this sector of highly-qualified R&D workers and entrepreneurs, and the marked residential preference.

- 16. Lindelof, Peter, and Hans Löfsten. "Academic Versus Corporate New Technology-Based Firms in Swedish Science Parks: An Analysis of Performance, Business Networks and Financing." *International Journal of Technology Management* 31, no. 3/4 (2005).**

This study is in the field of new technology-based firms and the role of science park. It empirically tested on the basis of 134 new technology-based firms in Swede, which can be divided into two categories: university spin-offs, and corporate spin-offs. The two groups tended to exhibit differences between advices from managers in the parks. The study indicates that there is a direct relationship between science park importance for attracting external capital and financing issues. There are some evidence that professional businesses benefit from a science park location.

- 17. Lindelof, Peter, et al. "Science Park Location and New Technology-Based Firms in Sweden--Implications for Strategy and Performance." *Small Business Economics* 20, no. 3 (2003).**

This research surveys a total of 273 new technology-based firms (NTBFs), of which 134 were on a Science Park and 139 were not on a park. There were significant differences in the means of strategy dimensions between the on-Park and off-Park firms. It can be seen that the

NTBFs who located in Science Parks showed significantly greater emphasis on firm characteristics as innovation ability, competitor- and market-orientation, sales and employment growth, high profits etc. The differences indicate a slight advantage for the Science Park firms. The off-Park sample reported proximity to other firms to be of higher importance than the on-Park sample in their choice of location. However, these differences do not show any clear pattern, making it difficult to understand if NTBFs who locate on Science Parks are systematically looking for something different in their location.

- 18. Link, Albert N., et al. "U.S. Science Parks: The Diffusion of an Innovation and Its Effects on the Academic Missions of Universities." *International Journal of Industrial Organization* 21, no. 9 (2003).**

The paper is an exploratory study of science parks in the United States. It models the history of science parks as the diffusion of an innovation that was adopted at a rapid and increasing rate in the early 1980s, and since then at a decreased rate. It models the growth of a science park once established, showing significant effects on growth for the proximity to universities and other resources. The paper also reports university administrators' perceptions about the impact of their science parks on the academic missions of their universities. Statistical analyses show there is a direct relationship between the proximity of the science park to the university and the probability that the academic curriculum will shift from basic toward applied research.

- 19. Park, S-C. "The Transformation of the South Korean Economy and International Economic Development in East and Southeast Asia." *International Planning Studies* 2, no.2 (1997).**

The Asia-Pacific region has been the most dynamic part of the world economy throughout the postwar period. This paper reviews that rapid economic development in the Asian countries has resulted in a transformation of economic structure as well, however, regional cooperation in Asia is still weak compared with the European Union. Its multilateral economic cooperation is mainly based on the governmental level instead of private sector initiatives. It explains the South Korean economy in three facets of growth, namely diversification, stabilization and growth momentum. In order to reach these goals, the government has played the role of entrepreneur who planned what, when and how much to produce.

- 20. Phillips, Su-Ann Mae, et al. "A Place for R&D? The Singapore Science Park." *Urban Studies* 40, no. 4 (2003).**

This paper argues that it is insufficient for R&D places to provide just physical infrastructure and investment benefits. Understanding actor-specific strategies and their enrolment in innovation networks and enabling institutional pre-conditions are equally important in embedding R&D activities. Based on a study of one such place-the Singapore Science Park-this paper explores the realities of science park formation. It is found that adequate institutional thickness and local embeddedness apply only to a small number of R&D firms in

the Park. The paper also examines the myth that spatial proximity to R&D institutions and organisations automatically results in collaborative R&D efforts. The study shows that there is an urgent need for a fundamental transformation in the prevailing thinking of economic planning, R&D policies and urban development.

- 21. Siegel, Donald S., et al. "Assessing the Impact of University Science Parks on Research Productivity: Exploratory Firm-Level Evidence from the United Kingdom." *International Journal of Industrial Organization* 21, no. 9 (2003).**

University science parks are alleged to stimulate technological spillovers. However, there is virtually no empirical evidence on the impact of these facilities on research productivity. This paper examines whether companies located on university science parks in the United Kingdom have higher research productivity than observationally equivalent firms not located on a university science park. The preliminary results appear to be consistent with this hypothesis and are robust to the use of alternative econometric procedures to assess relative productivity.

- 22. Simmie, James, et al. "Local Innovation System Governance and Performance: A Comparative Analysis of Oxfordshire, Stuttgart and Toulouse." *International Journal of Transport Management* 28, no. 3/4/5 (2004).**

This paper traces the development of three "ideal types" of local innovation system governance since the Second World War in three highly innovative city regions. The types of innovation governance are dirigiste, networked and grass roots. These are analyzed in the case study areas of Oxfordshire, Stuttgart and Toulouse. It is shown that the hegemony of each type of governance changes over time in each area. The analysis of the relative performance of the three changing local innovation systems indicates that widely networked systems grow faster than market oriented grassroots systems.

- 23. Staudt, Erich, and Jurgen Bock. "Technology Centres and Science Parks: Agents or Competence Centres for Small Businesses?" *International Journal of Technology Management* 9, no. 2 (1994).**

This research investigates the role of technology centers and science parks in the transfer process between the research and education sector and small businesses, as well as the importance attached to these institutions by its target population. It explores the conditions in which these institutions operate, the ways in which they perceive themselves, and the extent to which their support policies meet the requirements of a small business. It reveals that at present there are considerable weaknesses to be observed in this area from both technology centers' side and small business's side.

- 24. Sternberg, Rolf. "Technology Centres in Germany: Economic Justifications, Effectiveness and Impact on High-Tech Regions." *International Journal of Transport Management* 28, no. 3/4/5 (2004).**

This paper seeks to analyze the relationship between technology centers and high-tech regions in Germany. This paper demonstrates that the Munich region clearly represents one such high-tech region. Despite the existence of technology centers in this and many other German regions, only in a very few exceptional cases have these institutions generated statistically significant economic effects at the regional level, and never to the emergence of a high-tech region. Realistically, however, this cannot be the goal of German-style technology centers, as they differ considerably from, for example, the British or US style of science or research parks.

25. Storey, D. J., and B. S. Tether. "Public Policy Measures to Support New Technology Based Firms in the European Union." *Research Policy* 26 (1998): 1037-57.

This paper provides a review of public policy measures implemented in EU countries to support New Technology-Based Firms (NTBFs) during the 1980s and early 1990s. It identifies five policy areas and provides a synthesis of the policy developments during this period and an assessment of their effectiveness. The policy areas examined are: Science Parks; the Supply of PhDs in Science and Technology, the relationships between NTBFs and Universities/Research Institutions; Direct Financial Support to NTBFs from National Governments; and the Impact of Technological Advisory Services on NTBFs.

26. Suzuki, Shigeru. "Technopolis: Science Parks in Japan." *International Journal of Transport Management* 28, no. 3/4/5 (2004).

Technopolis, a plan for developing science park in Japan, came into force in the early 1980s. There were 26 regions designated by Technopolis. However, the Technopolis Act was terminated in 1998, and the program discontinued. This paper aims to explain what features and problems Japan parks had and why the Technopolis program failed.

27. Zhang, Yuehua. "Critical Factors for Science Park Development: The Case of the Singapore Science Park." *International Journal of Technology Transfer & Commercialisation* 4, no. 2 (2005).

Through tracing Singapore Science Park's two-decade history, this study identifies factors critical to its development. These include: a national environment encouraging R&D endeavor; strong government support; a committed management team; competitive rentals; and familiarity with the market. They suggest that both governments with the macro-environment it creates and park management with the micro-strategies it formulates are decisive for the Park development.

2. URBAN PLANNING AND DESIGN

2.1 URBAN PLANNING AND DESIGN PRINCIPLES

1. **Alexander, Christopher. *A New Theory of Urban Design*. New York: Oxford University Press, 1987.**

A New Theory of Urban Design is Alexander's evolving design philosophy for creating a growing whole in a city. This book describes a new theoretical framework of how cities can evolve in a coordinated and organic manner. This book is useful for those students and professionals in the architecture, urban design, and planning fields.

Questioning the lack of organic character of modern cities, Alexander presents a set of seven rules to return to a feeling of wholeness in urban designs. In his book, Alexander first, explains his concept of "a growing whole." However, the author acknowledges that "growing whole is "piecemeal" and "unpredictable," yet "coherent." Alexander develops and states his overriding design principle, which essentially suggests that each part of developing a city should "heal the city." Furthermore, he states that every new act of construction must create a continuous structure of "wholes" around it. Alexander tests his seven governing rules of his design process in an area in San Francisco.

2. **Bailly, Antoine S., et al. *Socially Sustainable Cities: Principles and Practices*. London: Economica, 2000.**

This research identified the social sustainability of city and addresses six main themes of local management: urban governance, social and cultural policies, public services; land and housing policies, urban transport, and economic revitalization. These key issues allow us to consider solutions that could promote socially sustainable cities. Each theme is introduced with a discussion of conceptual elements and general urban management issues. Examples drawn from the Network's case studies then illustrate how these issues have been tackled in local and metropolitan policies.

3. **Barnett, Jonathan. *An Introduction to Urban Design*. New York: Harper & Row, 1982.**

In this book, Barnett is targeting urban designers in academia and in professional practice. He highlights that the current pattern of development is not going to change because of private investment in existing buildings and people's attachment to buildings. In his book, he offers a definition of urban design, advocates the modern movement, and describes a new atmosphere for urban design.

Barnett sections his book into three parts. Part I of his book discusses the changing framework for urban design with the emergence of environmental considerations, community participation, and historic preservation. Part II concentrates on development controls rather than specific building designs. Finally, Part III covers the elements of design and development strategy and includes land use planning, open space, street design, transportation, and public investment. Barnett places responsibility on urban designers to "write the rules for the significant choices that shape the city."

4. ———. *Redesigning Cities: Principles, Practice, Implementation*. Chicago: American Planning Association, Planners Press, 2003.

This book provides basic principle, practical applications of these principles, and implementation strategies. The examples of successful projects in this book do not merely showcase demonstration projects on greenfield sites but further include the revitalization and reinvention of more problematic and complex segments of existing cities and their sprawl. It surveys the history of urban design from a lot of literatures, and introduces five basic principles of design: “Community, Livability, Mobility, Equity, and Sustainability”. The second part describes how these principles are applied in creating new neighborhoods; in the rebirth of older, first-ring suburbs and inner-city neighborhoods; in giving new vitality and value to outmoded commercial areas and downtowns that have lost their competitive edge; and in aiding edge cities to become real cities with community and livability and transit-centered mobility that are both sensible and sustainable. Lastly, it provides commonsense implementation guidelines that illustrate that better public and private space can optimally serve society with essential opportunities for interaction, sense of community, and livability.

5. **Beatley, Timothy and Kristy Manning.** *The Ecology of Place: Planning for Environment, Economy, and Community*. Washington D.C.: Island Press, 1997.

This book is about creating and nurturing sustainable towns, cities, and regions—“sustainable places”. Beatley and Manning offer an idealistic and visionary view of a possible future for cities and towns. Their approach to planning simultaneously addresses concerns about the environment, the quality of human life, and the distribution of social and economic opportunities. Beatley and Manning start with the idea of planning for sustainable places. They argue that this is the natural next step in the evolution of the idea of planning. In four substantive chapters, Beatley and Manning provide a very rich discussion of how to move in the direction of creating sustainable places. Successively, they take up urban form, the struggle of cities and regions to live within their ecological landscapes, economic development, and issues of civic involvement and social capital including nurturing cultural and social diversity. The concluding chapter presents the next logical steps in promoting more sustainable places. Beatley identifies elements of a new ethic of environment and community and proposing actions to promote such an ethic. The authors then discuss specific local and regional actions that can be taken to move in the direction of sustainable places. This book proposes a number of concrete federal policy changes that could assist in the creation of sustainable communities. These include such things as changes in the tax code, environmental policy reform, and adjustments to federal subsidies and financial incentives.

6. **Ben-Joseph, Eran.** *The Code of the City: Standards and the Hidden Language of Place Making*. Cambridge, MA: MIT Press, 2005.

This book aims to answer questions about the origins and diffusion of design standards, performance and outcome, and design standards’ implications for transformation and opportunities. Ben-Joseph discusses the American place-making mode and leads us to a

broader understanding of the impacts of standards and codes on urban development. Ben-Joseph's work is insightful to architects, planners, designers, and decision makers interested in the history and future of American planning and design.

The author describes the factors that played a major role in standards development and how professions such as land surveying shaped urban form. To demonstrate how standards have contributed to the shaping of the neighborhoods, cities, and natural landscape, the author uses many examples from different countries to emphasize that we should look at the cultural differences and the circumstances of a plan's norm to determine what is appropriate to be built and designed, instead of adhering to the vision of an ideal average and social homogenization. Ben-Joseph proceeds over several chapters to address the impact of technological choices on planning practice and landscape, and indicates that countless landowners who care more about sale returns than the community's future have planned our cities. Last, the author emphasizes that the failure to think in community terms and to appreciate that the city is a physical thing involves losses that the future cannot repair.

7. Brebbia, C. A. et al, ed. *Sustainable City: Urban Regeneration and Sustainability*. Boston: WIT Press, 2000.

This book consists of different academics, professionals, and practitioners in a wide range of disciplines to exchange ideas and identify best policies and practices for a viable urban environment. These selected papers represent an international view toward a sustainable development. The major themes include: strategy and development in terms of factors, elements, management, and programs; environmental management and pollution which related to drainage, brownfield redevelopment, waste recycling, and performance evaluation; land use and management; transport environment and integration; cultural heritage and architectural issues; planning development and management such as national plan, interactive model, inner-city renewal, and housing policy; restructuring and renewal; community and the city; and finally the public safety and security.

8. Brooks, Michael P. *Planning Theory for Practitioners*. Chicago: American Planning Association, Planners Press, 2002.

This book focuses on the ways in which a number of issues central to the planning theory literature affect the role performance of professional planners. It argues that planning theory is important to the profession's sense of identity and purpose. This book emphasizes the process of planning rather than the substance of specific planning issues. In other words, the chapters discuss the very nature of planning as a distinct form of professional activity. It views planning theory as the process component of planning profession; it guides planners through a continuous self-examination of what it is we are doing, how, why, for whom, and with what results.

Moreover, it points out that it is necessary to identify and employ planning strategies that are integrated with, and make creative use of, the political system. In the relationship between

planning and politics, there are a series of fundamental issues such as one's professional value, and ethics. It is worth mentioning that this book argues that there are no universal value systems to which all planners subscribe, and thus the value-based planning behaviors under ethical dilemmas causes some conflicts in practices. While there is no definitive and universal set of ethics that will cover all situations, self-awareness, introspection, sensitivity to the value nuances of practice are major virtues that every planner should possess.

One of the contributions of this book other than academic discussion on importance of planning theory is that it provides an action strategy of planning—Feedback Strategy—that planners might follow in the pursuit of planned change. This strategy includes six stages from defining problems to make a decision. When applying the strategy in realistic practices, this book also offers several key elements of being a political savvy planner.

9. Brower, Sidney. *Good Neighborhoods: A Study of in-Town & Suburban Residential Environments*. Westport, Conn: Praeger, 1996.

This book is a study of ideal residential neighborhoods in as experienced by residents. Brower's book is useful to academics and professionals in urban studies, urban planning, and urban design. Good Neighborhoods applies to neighborhood development and environmental design. In his book, Brower takes a linear approach to developing a typology of good neighborhoods.

Brower claims that the coexistence of his "good neighborhoods" in a single urban environment is impossible. He highlights the variety of residential areas for the varying needs of city dwellers. Brower's normative approach identifies the characteristics of good neighborhoods in three dimensions: Ambiance, Engagement, and Choicefulness. Brower organized the book into three sections. The first section discusses the basis for his work and definitions of neighborhoods. The second section describes concepts for good neighborhoods established from existing and historical neighborhoods. In the last section of the book, Brower builds a typology of good neighborhoods from the first two sections. Brower also tests his hypotheses for these neighborhoods. Brower's typologies are based on aspects of place, activity, and the personality and culture of residents. Brower uses four prototypical neighborhood types: Center Neighborhoods, Small-Town Neighborhoods, Residential Partnerships, and Retreat Neighborhoods.

10. Dutton, John A. *New American Urbanism: Re-Forming the Suburban Metropolis*. Milan: Skira, 2000.

In this provocative study, John Dutton shows how American urban models, whose influence has been essential in the shaping of cities worldwide since 1945, are currently recovering at home from the crisis of the 1970s and 1980s. He masterfully analyzes the theoretical inputs and the design solutions that have shaped a collection of experimental town landscapes that deserve all our attention today.

The projects in this book demonstrate their attempts to restructure urban growth into cohesive designs that balance buildings, open space, infrastructure, landscape, and transportation. In place of the piecemeal advance of placeless, car-dominated suburban sprawl, they envision dense, mixed-use neighborhoods with walkable streets, and connections to transit. The work ranges from entire new towns to urban infill. Many of the architects practicing these ideas have formed a movement called the Congress for New Urbanism (CNU), which most clearly and effectively has articulated this alternative vision. This book is about particular tendencies, however, and not ownership of ideas. Although the Congress for New Urbanism presents its position in the proprietary form of a charter, its vision is representative of much broader strains of architectural ideology, and continues a twentieth-century search to find ways to address the problems of the modern city.

- 11. Evans, Graeme and Jo Foord. "The Generation of Diversity: Mixed Use and Urban Sustainability." In *Urban Sustainability through Environmental Design: Approaches to Time-People-Place Responsive Urban Spaces*, edited by Kevin Thwaites, et al. New York: Routledge, 2007.**

This paper defines a series of urban environmental elements that combine to determine the quality of life in higher-density, mixed-use locations can be triangulated in terms of the key features involving physical land use, social vitality, and seedbed economy. It presents the development of a GIS-based analysis and planning tool arising from a study of mixed-use inner-city areas.

- 12. Farr, Douglas. *Sustainable Urbanism: Urban Design with Nature*. Hoboken J: John Wiley, 2008.**

This book seeks to create a brand, agenda, and standards for an emerging and growing design reform movement: sustainable urbanism, which is an integration of walkable and transit-served urbanism with high-performance buildings and high performance infrastructure. It provides a historical outline of courses in planning, architecture, engineering, environmental studies, and interdisciplinary sustainable development. Then it discusses an operating system of implementing the theme involving leadership, plan, process, projects, and templates. Nearly thirty emerging thresholds of sustainable urbanism are included in this book, used as benchmarks and performance targets on projects, particularly useful in conjunction with the LEED ND, or even more robust standards. Lastly, multiple case studies, including a diverse and mature worldwide movement of visionary neighborhood-scale projects provide practical experiences in design guidance and goals.

- 13. Francis, Mark, Lisa Cashdan, and Lynn Paxson. *Community Open Spaces: Greeting Neighborhoods through Community Action and Land Conservation*. Washington, D.C.: Island Press, 1984.**

This book is the authoritative research on the phenomenon of community-developed and maintained gardens and parks in urban neighborhoods. It presents a detailed and realistic

picture of community open-space development. In highlighting the process, benefits, and problems of this unique community development activity, the book provides an invaluable tool for the continuation and expansion of urban open-space efforts. Based on an overview of the movement in both the United States and Europe, the authors discuss and evaluate New York City community open-space projects. Then the book discusses some of the characteristics and consequences common to community open-space projects everywhere. The concluding chapter presents a brief vision of the future of the community open-space movement, providing a road map for community residents, designers, and government officials who want to develop open spaces for communities with community participation.

14. Gehl, Jan. *Life between Buildings: Using Public Space*. New York: Van Nostrand Reinhold, 1987.

In *Life between Buildings*, Gehl focuses on the life between buildings and how architecture and planning impact this space and our everyday lives. In this book, the author puts public spaces and daily activities at the center of her work and towards a new approach to architecture, urban design and city planning. This book is helpful to understand the everyday needs of the public for students and professionals in those fields.

Gehl begins by highlighting public spaces such as streets, plazas, and other open spaces. The author draws from example in Copenhagen and other Danish cities to illustrate her point. Gehl describes the prerequisites for planning in terms of process and projects. Gehl identifies three types of activities: necessary, optional, and social activities. The author states that these activities create demands on the physical environment. He proposes spaces that create safe urban areas by attracting people to them. Gehl's observation and conclusions are premised on humanistic needs and interactions.

15. Gehl, Jan and Lars Gemze. *Public Spaces, Public Life Copenhagen: Danish Architectural Press, 1996*.

This book describes the remarkable qualitative improvements which have taken place in central Copenhagen over the past 34 years, and how they have been accomplished, and is a handbook on how to create human qualities in the city. The book is split into 4 different sections. Part 1: Public Spaces- A report on how streets and squares in the city have developed over the period 1962-1996; Part 2: Public Life- This section contains the results of the surveys documenting how the city center was used in 1995/96; Part 3: Interviews- Looks at who uses the city and what people think about it? The results of over 2,000 street interviews and 1, 000 questionnaires are presented, and include user descriptions of activities and viewpoints; and Part 4: Public Spaces? Public Life 1996 is a summary of the studies along with opinions and advice about the future development in the city.

16. Glazer, Nathan. "The Public Image of the Profession." In *The Profession of City Planning: Changes, Images and Challenges, 1950-2000*, edited by Lloyd Rodwin, and

Bishwapriya Sanyal. New Brunswick, NJ: Center for Urban Policy Research at Rutgers, 2000.

Using a metaphor of “public image of planning profession”, this paper discusses the movement of planning principles, practices, and their impact to the public in a sequence following the development of planning theory and activities. A series of movements and figures include Mumford, Jacobs, preservation movement, new urbanism, environmentalism, and community advocacy, etc. With looking back to consider the image of the city planner to the public, the paper argues that there needs to be greater interplay between the exceptional figures that do embody the image of the planner in the public mind, and the professional practice of planning.

17. Golany, Gideon S. *Ethics and Urban Design: Culture, Form, and Environment*. New York: J. Wiley, 1995.

Golany's *Ethics and urban design: culture, form, and environment* features historical examples and contemporary case studies from around the world to illustrate an approach to urban design that balances the requirements of both cultural and natural environments. The book also addresses such issues as housing, transportation, urban ecology, public space and geospace design options. There is a wealth of line drawings and photographs of Golany's design concepts.

What Golany finds in the success stories of the past are cohesive sociocultural values that shaped the design of homes, neighborhoods, and cities. These ethical values helped to maintain equilibrium within the society that permeated its natural, social, and humanmade environments. In the present era, conversely, he finds a major disconnection between human values and the ethics of technology, which has resulted in confusion, imbalance, and dehumanization. To help designers gain a perspective on possible solutions, Golany explains leading comprehensive design strategies, including the valley theory, the urban border zone concept, and the regional concept of Patrick Geddes. "Future Frontiers for Urban Design", the culminating section of this groundbreaking book, opens with Golany's vision of the future city. He examines the issues of thermal performance and climate as they relate to urban design and offers the concept of "geospace" - the earth enveloped habitat. Buttressing his presentation with detailed information on the mechanics of geospace, Golany describes case studies of the successful use of earth enveloped habitats in China and Tunisia. He makes a powerful argument for the geospace city as a renewal of ancient traditions that can restore the vital equilibrium between nature and human settlements that we seem to have lost.

18. Gosling, David, and Barry Maitland. *Concepts of Urban Design*. New York: St. Martin's Press, 1984.

Gosling and Maitland's *Concepts of Urban Design* is intended for urban design students and practitioners. The main objective of the book is to establish a realistic and technical background of the varied and opposing directions found in urban design. The book covers

topics in urban design concentrating at the scale of the quarter. First, Gosling and Maitland discuss the nature of the problem of modern city form. Then, the authors describe the sources and theories of urban design. Using, international case studies, the book delves into case studies of urban design. Finally, the book describes future directions and concludes with two separation conclusions from each of the contributing authors. Overall, the book stresses the urgency to find appropriate techniques and good models of urban design.

19. Greenbie, Barrie B. *Spaces: Dimensions of the Human Landscape*. New Haven, CT: Yale University Press, 1981.

In this book, Greenbie examines townscapes, urban environments, and the countryside. The author examines how manmade environment relates to social interaction in both public and private spaces. This book offers a humanistic view on urban space to planners, architects, urban designers, and landscape architects in academia and in practice. The author investigates civilized life and urban spaces in North America and Europe. His book begins at the home and street scale and transitions toward the neighborhood level. The second half of the book is a review of large cities such as Boston and Rome. The author investigates the social interactions of public square, parks, promenades, and marketplaces. Greenbie also explores the use/misuse of elements of urban form such as roadways, monuments, and natural features. Greenbie's framework proposes a study of space and cross-cultural behavior.

20. Hack, Gary. "Planning Metropolitan Regions." In *Planning for a New Century*, edited by Jonathan Barnett. Washington, D. C.: Island Press, 2001.

In a metropolitan-wide context, this paper describes that urban areas are already evolving into a new kind of regional city, so the setting for these new policies has already changed in ways that some people do not yet recognize. After addressing the changes and diversities of current down-towns, neighborhoods, and regions, Gary provides two regional strategies for the new realities: one is to undertake regional development plan and a permanent mechanism for metropolitan region; and another is to give more decision-making power and responsibility to local governments.

This book, consisting many metropolitan planning-related topics, cover a wide range of issues, such as transportation and land-use planning, zoning and design, housing, public education, welfare reform, public safety, down-town revitalization, pollution control, and protection of open spaces and natural areas.

21. Hall, Peter. *Urban and Regional Planning*. 3rd ed. London: Routledge, 1992.

This book historically traces the evolution of urban and regional problems, and of planning philosophies, techniques and legislation, from the Industrial Revolution to the present day, with special references to the changes brought by these movements. It analyses the post-war history, and attempts to pass judgment on the performance of the planning system, first at broad regional level in respect of economic planning, then at the scale of the town and the

city region in respect of urban planning. It also provides a comparative look at planning experiences in UK, other Western Europe, and the U.S. It discusses an outline of the sequence of urban and regional plan making, with an introduction to some of the more important techniques involved at various stages of this process.

22. Hillier, Bill, and Julienne Hanson. *The Social Logic of Space*. Cambridge: Cambridge University Press, 1984.

The authors develop a new theory and method of analysis that are underscored by the relationship between society and space. Using this new theory and method, the authors attempt to generate knowledge of social process which was once thought to be created in academic studies. This book provides useful theory, methods, and practical knowledge to planners and designers.

Understanding that there is not much effective theory or methodology applicable to social spatial relation, the authors have created a new theory and method. These new theory and method of analysis overcomes two difficulties. The two obstacles are the lack of consistency in descriptive accounts of morphological features of man-made spaces and of societies. Hillier and Hanson build a descriptive theory based on “the social content of spatial patterning and the spatial content of social patterning.” The book also describes their method of analysis of spatial pattern, which account for the relationship between local and global patterns. They further their study by using this descriptive theory and analysis method to generate information about the social-spatial connection.

23. Jacobs, Allan B. *Looking at Cities*. Cambridge, MA: Harvard University Press, 1985.

This book is about how to look at and understand urban environments. In order to plan sensitively, the city and regional planner must walk in, look at, wonder about, and simply enjoy cities. Careful observation is a crucial tool for the kind of analysis and questioning necessary to achieve good planning. Through observation the city planner and urban activist can learn when an area was built, for whom it was built, who lives there now, how it has changed, and how it might be improved for present and future inhabitants. Case studies of American and European cities--San Jose, San Francisco, Cincinnati, Bologna, Rome—and over two hundred striking photographs, drawings, and maps by the author present ways to read the environment that will prove indispensable for urban planners and will delight all city watchers.

24. Jacobs, Allan B. *Great Streets*. Cambridge, MA: MIT Press, 1993.

This book is a survey and analysis of a wide array of street types and urban spaces around the world. Jacobs believes that good cities are made of good streets and designers and planners are rapidly losing our talent for creating them. This book is not only useful to planners and designers, but also appealing to a general audience. The first section of the book highlights fifteen of the finest examples of “great streets.” The author uses 242 line drawings to “great

streets” from around the world. Among those included are Barcelona’s Ramblas, Paris’s Boulevard Saint-Michel, and Venice’s Grand Canal. In his section second Jacobs compares streets by types such as boulevards, main streets, and residential roads. The author devotes a chapter to square-mile maps of street patterns in 50 cities, offers a comparison of urban fabric. The author evaluates the streets and has developed a list of characteristics that make “great streets.” They include buildings of similar height, interesting facades, trees, windows that invite viewing, intersections, beginnings and endings, stopping places and, to be sure, space for leisurely walking, and “the magic of design.”

25. Jacobs, Jane. *The Death and Life of Great American Cities*. New York: Vintage Books, 1961.

This book targets a general audience as well as academics and practitioners in the urban planning and design fields. This book has had a major impact for the planning and designing of cities. *The Death and Life of Great American Cities* has influenced contemporary planning movements to address the problems that prior planning policies have created. The author initially intended to describe her idea of a good street live. The author critiques modern city planning and claims that the planning policies have led to the destruction of inner-cities. For example Jacobs stresses the impacts of urban renewal and conventional zoning for separation of uses. Jacobs consistently refers to Greenwich Village in New York City as a model of an exemplar community. Jacobs suggestions for revitalizing cities is go against what urban planners and designers recommend. These activities include creating dense and mixed-use urban communities, cutting block sizes, and varying size, type and condition of buildings. In *Death and Life*, the author’s resourcefulness is applied to her ideas for revitalizing communities.

26. Jenks, Mike, and Nicola Dempsey, ed. *Future Forms and Design for Sustainable Cities*. Amsterdam: Elsevier, 2005.

This book provides examples in different urban forms and the ways in which planning activities are designed to be more sustainable. A great deal has been written about the influences that affect the urban form, such as the technological, social, economic, institutional, geographical and physical. Three themes are discussed in this book: the first section discusses different spatial urban concepts, with particular reference to the city region. Section two discuss case studies in high density urban areas with sustainable objectives such as the efficient use of land, good accessibility to employment, and key services and facilities through public transport use, walking and cycling. The third section offers some holistic arguments for achieving sustainable development, and illustrates how different urban forms have particular requirements that must be taken into account for sustainability to occur.

27. Kuang, Shi, Gary Hack and Zhongjie Lin. *Urban Design in the Global Perspective*. Beijing: China Architectural and Industrial Press, 2006. (Partially Chinese)

This book reviews a series of worldwide large-scale projects and discusses the urban design strategies and approaches used in these practices. Gary Hack, in the introduction of this book, discusses several principles of large-scale urban design.

28. Lang, Jon. *Urban Design: The American Experience*. New York: Van Nostrand Reinhold, 1994.

Lang reviews the context of places within the social and environmental design arenas. Lang's humanistic focus of urban design emphasizes the needs of society and the individual. The book targets professionals, researchers, and students of the urban design field. The book synthesizes the works of previous practitioners about designing based on the knowledge gained in the field about the environment and people. Furthermore, this knowledge has started to move urban designers towards Empiricism. The first section is an overview of current urban design practices. In this section, Lang proposes a more functionalist, empiricist urban design focus. The second part follows with a redefinition of functionalism and discusses meeting the needs of a Sociogenic and Biogenic environment. The third section synthesizes this new functionalist approach and proposes a procedural model. Finally, the book concludes with a discussion of the future of urban design. This book provides a comprehensive overview of urban design in the United States and the needs for the future.

29. Lozano, E. *Community Design and the Culture of Cities: The Crossroad and the Wall*. Cambridge: Cambridge University Press, 1990.

This book attempts to combine the theory and practice of designing at a community scale. Lozano applies a systems approach to spatial community design. The author makes two claims in his book. First, Lozano argues that interdisciplinary systems approach should be the methodology for spatial planning and design of cities. Second, Lozano identifies universal rules for urban form. The book organized into four major parts. Part I discusses the background of urban form and traditional professional practices. Part II delves into the idea of a systems analysis and it applies to typology, morphology, and urban patterns. Part III addresses land use and density in cities. Part IV describes the roots of design and form of traditional communities. Lozano concludes with "a call to action" for planning and design professionals to incorporate the culture of cities with their designs.

30. Lynch, Kevin. *The Image of the City*. Cambridge, MA: MIT Press, 1960.

In this book, Lynch introduces the concept of imageability. Lynch creates a new language of urban form in legible manner. Lynch's book is a method of evaluation which can be used by students, researchers, and practitioners in urban planning and design. Lynch's study in this work analyzes Los Angeles, Boston, and Jersey City into elements of urban form. The five elements are paths, districts, edge, nodes, and landmarks. Using graphic representation for these elements, Lynch could deduce individual's mental images of cities. Lynch's research and contribution to the field has added an ability to "read" the city and gain an understanding of city dwellers images of the environments.

31. ———. *What Time Is This Place*. Cambridge, MA: MIT Press, 1972.

This book deals with the evidence of time which is embodied in the physical world, how those external signals fit (or fail to fit) our internal experience, and how that inside-to-outside relationship might become a life-enhancing one. The discussion ranges from historical preservations to the forms of transition, futurism, time signals, the esthetics of time, biological rhythm, time perception, disaster, renewal, and revolution. The theme of the book is that the quality of the personal image of time is crucial for individual well-being and also for our success in managing environmental change, and that the external physical environment plays a role in building and supporting that image of time. The relationship is therefore reciprocal.

32. ———. *A Theory of Good City Form*. Cambridge, MA: MIT Press, 1981.

The primary objective of this book is to develop a normative theory of urban form. In this book, Lynch analyzes earlier theories and draws from other artistic arenas such as film, painters, and novelists. This book is not only important in theory, but also the process through which Lynch synthesizes a theory of city form. Students and practitioners who are in the design and planning fields will find this book very useful. Lynch's theory relates to the value of the city and its urban form. In Part 1 of his book, Lynch evaluates existing theories and models of urban form. Part 2 outlines his normative theory of urban form by employing performance dimensions. The five dimensions are: vitality, sense, fit, access, and control of the use of the settlement. Lynch uses two other "meta-criteria", efficiency and equity, as all-encompassing of the five dimensions of good city form. Part 3 of the book discusses applications of his theory to cities, neighborhoods, growth, conservation, urban textures, and communication networks. The last section reviews functional theory, describes city patterns and values.

33. Madanipour, Ali. *Design of Urban Space: An Inquiry into a Socio-Spatial Process*. Chichester, UK: John Wiley & Sons, 1996.

The author discusses space as a combination of people and objects and this space is "understood in the process of its creation." The author approaches the dynamics of design and development as a socio-spatial platform. The authors take from useful concepts introduced by Lynch, CIAM's Athens Charter, Lefebvre, and Giddens to define urban space to encompass all the buildings, objects, and spaces in the urban form. Madanipour describes three interlinked demands. The first is the lack of clarity in the interdisciplinary field of urban design. Second is the recent growth of interest in urban design. The third demand is need for research in urban design. Madanipour takes a normative approach with respect to the physical dimension of the political environment, hence addressing both the physical and social scopes of the built environment.

34. ———. "Roles and Challenges of Urban Design." *Journal of Urban Design*. 11, no. 2 (2008): 173-93.

This paper provides an analysis of the rising significance of urban design and the challenges it is facing. It places urban design in the wider context of the urban development process, and of the growing importance of cities in the global economy. By adopting a dynamic and multi-dimensional perspective, the paper looks at this process from the viewpoints of producers, regulators and users of the built environment. Urban design is found to make major contributions for each of these groups, which explains its rising but contested significance; being integrated into the mainstream of the development process has generated new challenges for urban design.

35. Moore, Gary T., D. Paul Tuttle, and Sandra C. Howell, ed. *Environmental Design Research Directions, Process and Prospects*. New York: Praeger, 1985.

Here is a compendium of the thoughts by most of the major figures in the field of environment and design. They suggest ways to structure education programs and select areas that should be research priorities. This survey of environment studies, behavior and design is based upon a grant from the National Endowment for the Arts to the Environmental Design Research Association. The book is organized in three parts. Part I provides a synthesis of the field. Part II outlines areas, topics, and issues needing immediate and sustained research attention. Part III suggests some of the strategies necessary to see the research directions implemented through legislation, granting agencies and foundations, research institutes, and education.

36. Moudon, Anne Vernez. *Built for Change: Neighborhood Architecture in San Francisco*. Cambridge, MA: MIT Press, 1986.

Here is a compendium of the thoughts by most of the major figures in the field of environment and design. They suggest ways to structure education programs and select areas that should be research priorities. This survey of environment studies, behavior and design is based upon a grant from the National Endowment for the Arts to the Environmental Design Research Association. The book is organized in three parts. Part I provides a synthesis of the field. Part II outlines areas, topics, and issues needing immediate and sustained research attention. Part III suggests some of the strategies necessary to see the research directions implemented through legislation, granting agencies and foundations, research institutes, and education.

37. Shirvani, Hamid. *The Urban Design Process*. New York: Van Nostrand Reinhold, 1985.

This book is Shirvani's compilation of urban design practices in cities in the United States. Shirvani's synthesis of existing approaches, issues, and prospects is useful to practitioners, researchers, and students in the urban design field. Shirvani's objective is to collect the components of urban design into an overall framework, as he views the urban design process as "a microsynthesis of urban design components." The author develops his overall framework through three orientations: development, conservation, and community. He suggests that a realistic approach must incorporate and possibly balance all three orientations.

In the first few chapters, the author gives an overview of these three dimensions and their elements. Shirvani describes design methods and practices used by in the profession. The Internalized method is an intuitive approach, which the Synoptic method is essentially the rational method. The next three chapters cover administrative, legal, and financial implementation. Finally, the author concludes with a discussion on prospects for the future of urban design. The author suggest that the urban design process needs to incorporate criteria and standards which better relate the human dimension and the natural environment.

38. Southworth, Michael. and Eran Ben-Joseph. *Streets and the Shaping of Towns and Cities*. New York: McGraw-Hill, 1981.

This book historically traces ideas for street design from London through to the United States. The authors critique the current situation in the United States and suggest some options that are less rigidly controlled, more flexible, and responsive to local conditions. In terms of structure, the first four chapters review the history of streets through American eyes, with reference to Britain, in terms of evolution in the widths of rights-of-way, usage of street surfaces, codes, bylaws and practices. The discussion is devoted to three-thinking of streets that began in the 1980s. The first is the "rightsizing" of streets for the uses they are supposed to serve. Second is form: straighter versus curvilinear streets, and grids versus discontinuous patterns. Third is displacing the automobile-as-king syndrome by finding palatable tradeoffs between traffic efficiency and improved social and residential environments. The notion of "shared streets" has been at the centre of this school of thought. In the last section, Then the authors show that the shift found generally in planning to establish performance standards is reflected in street planning.

39. Spirn, Anne Whiston. *The Granite Garden: Urban Nature and Human Design*. New York: Basic Books, 1984.

This book introduces nature as an element of urban form. Her book brings useful theoretical considerations into the fields of architecture, urban planning and design, and landscape architecture. The author imparts urban life set in a garden and a natural approach to urban planning. Spirn emphasizes the interdependence between city and nature. The author uses examples throughout history from Boston to Zurich. The book is arranged using various natural systems include air, earth, water, and plants and wildlife. At the end of each section, Spirn describes how these processes can be part of "A Plan for Every City." The author unites these individual systems into one "Urban Ecosystem" and discusses designing the city as a "Granite Garden" and reinforces an ecological approach for the future of urban planning.

40. Steiner, Frederick R., and Kent Butler. *Planning and Urban Design Standards*. Hoboken, N.J.: J. Wiley, 2007.

This is a comprehensive reference book in urban planning and design. The American Planning Association compiled these references from resources throughout the profession.

The book includes tools and techniques for practices in urban planning and design. The APA has focused the book towards practicing professionals.

Planning and Urban Design Standards incorporates theory and analysis methods, in addition to, practical standards for design and planning. Part I of the book is Plans and Plan Making. Part II is Environmental Management, which covers air, water, land, and hazards. Part III, Structures, contains building types, transportation, infrastructure, open space, and working landscapes. Part IV is Place and Place-making and includes theoretical underpinnings and design considerations at a variety of scales. Part V of the book, Analysis Techniques, encompasses projections and impact analyses, as well as, mapping and visualization tools. The book incorporates Implementation Techniques in Part VI. This section includes legal bases, preservation, economic development, and real estate development. Finally, the APA has compiled a bibliography organized by subject matters.

- 41. Trip, Jan Jacob. "The Role of Urban Quality in the Planning of International Business Locations: The Case of Amsterdam Zuidas." *Journal of Urban Design* 12, no. 2 (2007): 275-93.**

Based on an extensive case study of the Zuidas project in Amsterdam, this paper addresses the questions as to how urban quality, and in particular diversity, is taken into account in the planning of large-scale international business locations, which actors are responsible and to what extent they base their actions on a distinct long-term perspective on urban quality. It is concluded that even in such a prestigious, quality-oriented project the role of urban quality is not necessarily guaranteed; the paper therefore advocates a more flexible and open development process.

- 42. Vale, Lawrence J. "Urban Design for Urban Development." In *The Profession of City Planning: Changes, Images and Challenges, 1950-2000*, edited by Lloyd Rodwin, and Bishwapriya Sanyal. New Brunswick, NJ: Center for Urban Policy Research at Rutgers, 2000.**

This paper discusses the resurgence in interest in physical planning involving its phenomena, reasons, and lessons. As urban designers linking the issue of design to a variety of the most pressing issues of development and implementation, more educational sessions devote to urban design than to any other topic. It argues that physical planning has returned not as an alternative to economic planning but as an increasingly integrated component of urban development. Since the actions of both architects and planners remain marginalized by the power of developers, lawyers, and engineers to dictate the framework of most important design decisions, especially in the U.S., urban designers need to combine their visualization skills with a newfound development savvy to gain greater influence in the future, but at the same time do so without losing a commitment to the quality of public spaces.

- 43. Vidler, Anthony. "The Third Typology." *Oppositions* 7 Winter 1976 (1976): 251-55.**

This short reading discusses the rise of urban form typologies and introduces a new typology based on the existential form of the city. Vidler describes two earlier typologies that were architecturally-based and provided legitimization for design practices of the day. A first typology is found in the Enlightenment rationalization of neo-classical architecture through nature. A second typology rationalizes modernist architectural practice through processes of mechanization and mass-production. In describing a new third typology, Vidler eschews external validations of typology, opting instead for one that is internally self-referential—the city itself. This paper can be read as advocacy for empirically-based research in urban form and a contemporary urban design practice associated with the importance of public space and everyday urbanism.

44. WCED, (World Commission on Environment and Development). "Towards Sustainable Development, Our Common Future." New York: Oxford University Press, 1987.

Often referred to as the “Brundtland Report”, this report provides a working definition of "sustainability" that is used today. This report, published later as a book, has been a key document in the international dialogue of sustainability. All academics and practitioners in any field related to sustainability and sustainable development should be familiar with this work. The report begins by explaining the world crisis due to the increase in human population and our impact on the environment. WCED is “a call to action” and urges a break from past patterns of economic development. The Commission suggests a moving from the symptoms and causes and move to find solutions. Sustainable development requires that societies meet human needs both by increasing productive potential and by ensuring equitable opportunities for all. Sustainable development is a process of change in which the exploitation of resources, the direction of investment, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and objectives.

45. Whyte, William H. *The Social Life of Small Urban Spaces*. Washington, D.C.: Conservation Foundation, 1980.

This book is "an outgrowth" and synthesis of Whyte's Street Life Project. The book is essentially about the details that make public spaces in the city thrive. It explains how basic tools of observation and interviews generate empirical data and in turn make cities more livable. Whyte's work changed the planning and creation of public spaces. Each chapter of the book serves as design guidelines for that particular topic. Chapter subjects includes plazas, sitting space, food, the street, effective capacity, the "undesirables," among other public space related elements.

46. Yuen, A.F. Foo, Belinda, ed. *Sustainable Cities in the 21st Century*. Singapore: Faculty of Architecture Building & Real Estate, National University of Singapore, 1999.

This book is about cities: their growth and future development. The essays in this book can be broadly classified into three main groups: (1) sustainable resources including important

aspects of city development: water supply, shelter, transport, solid waste, and possible strategies to address there; (2) principles for the good life which are essentially design-oriented, and (3) enhancing civilization and city growth, which question the very meaning of sustainability and what constitutes sustainable development. This book with its collection of nine essays brings together a variation of views and visions of how we might build sustaining cities into the 21st century.

2.2 PLANNING AND DESIGN PRACTICES

1. **Abu-Lughod, Janet L. *New York, Chicago, Los Angeles: America's Global Cities*. Minneapolis: University of Minnesota Press, 1999.**

This book studies the forces of globalization that have swept three major American cities over the last century. The author singles out New York, Chicago and Los Angeles as America's "global cities" shaped by the increased importance of business services, a dichotomized class structure and the internationalization of commerce. Globalization, she insists, is much older than many scholars understand, with the seeds firmly in place in the mid-19th-century. A central thesis here is that, since 1973, the class and income gap between rich and poor Americans has widened sharply thanks to regressive government policies, cutbacks in entitlements and a tax system that shifts wealth upwards from the poor and the middle classes to corporations and the wealthy.

2. **Birch, Eugenie L. "U.S. Planning Culture under Pressure, Major Element Endure and Flourish in the Face of Crisis." In *Comparative Planning Cultures*, edited by Bishwapriya Sanyal, 2005.**

Within the U.S. complicated planning culture, the promotion and acceptance of plans is an iterative process and reflects the checks and balances inherent in a society with shared power. Taken New York City's World Trade Center in September 2001 as an example, this paper outlines early planning responses from September 2001 to August 2003. It argues that despite the crisis atmosphere and the desire for rapid reconstruction of the site, the dynamics and practice of American planning culture not only endured but also flourished and expanded into new territory.

3. **Brand, Stewart. "Shearing Layers." In *Urban Design Reader*, edited by Matthew Carmona, and Steve Tiesdell. Burlington, MA: Architectural Press, 2007.**

Brand presents an important discussion of how the different parts of a building age/change at different rate. He extends and develops Frank Duffy's series of layers of longevities to create a series of six systems: site, structure, skin, services, space plan, and stuff. The systems are differently paced—site and structure are the slowest, stuff and space plan are the quickest. As Brand suggests, the key to robust buildings—those able to accommodate change—is to allow

the faster paced system to change without the need for change in the slower paced system. Furthermore, a building's—and a place's enduring character may be substantially embedded in its slower moving system.

- 4. Devas, Nick, and Crole Rakodi, ed. *Managing Fast Growing Cities: New Approaches to Urban Planning and Management in the Developing World*. Harlow, Essex, England: Longman Scientific & Technical, 1993.**

Situations faced by rapid urbanizing cities in developing countries become much more critical, involving both population pressure and environmental problems. This book examines the attempts which have been made to plan and manage the cities of the developing world, and draw lessons from that experience as a basis for identifying new approaches to the planning and management of the world's fast growing cities. After addressing current challenges, this research intertwined governance together with planning and management, and then identified four key themes: the role of cities in national development, population growth and manageability, the need for realistic and effective planning and management, and the institutional and political framework for urban governance.

In terms of planning and management, it summarizes a series of activities involved in the planning/policy/management process, such as survey, strategies, policies, implementation, monitoring, and evaluation. This book then discussed how these activities work in a logic cycle to meet the needs of developing cities, especially analyzing the role of planning activities in urban land market, the institutional arrangement by government, political context, and application of law into urban planning and management. However, this book neither specially discusses the application of planning and management in the context of rapid growing cities, nor compares it with developed countries.

- 5. Hall, A. C. *Design Control: Towards a New Approach*. Oxford: Butterworth Heineman, 1996.**

This book addresses the ability of planning agencies to control the design of town and country. It does not seek to define or explore the concept of good design, important as this is. Rather, it examines the means by which these agencies pursue the control of design and, in doing so, focuses upon how policies are generated and how they are put over to others. The first two chapters establish the need for design control as a legitimate planning operation. They identify the lack of policy statements in current practice and the consequent problems experienced by both participants in the development process and the public at large. Chapter 3 develops a new methodology aimed at the production of effective design plans. Chapter 4 provides an illustration of the application of the ideas proposed by means of a case study of the town of Chelmsford. Chapter 5 draws attention to the relationship between the ideas suggested and examples from British practice. Chapter 6 notes the problems of communicating design control policies to the lay public, reviews the media available and advocates the use of computer visualization as the way forward.

6. **Hester, Randolph.** *Neighborhood Space.* Stroudsburg, PA: Dowden, Hutchinson & Ross, 1975.

Hester points out that the scholars usually ignored social sustainability of neighborhood, such as user's concern of safe, friends, and controlling environment, when they undertake the site design of neighborhoods. In this book he defines neighborhoods as public outdoor territory close to home, which, because of the residents' collective responsibility, familiar association, and frequent shared use, is considered to be their own. The book addresses different neighborhood conceptions. Hester discusses neighborhoods from a design aspect and defines their desirable features as: a focal point (elementary school), peripheral access roads, elimination of rectangular residential islands surrounded by roads, safe residential streets, neighborhood facilities, a shopping center. Neighborhoods also have a social aspect where the neighborhood is viewed in terms of its symbolic and cultural aspects, emphasizing shared activities and experiences, social groupings, common values, and others. Hester also describes a socio-spatial conception, which practitioners have attempted to define neighborhood by relating human behavior and geography, land development and social predictions, and city planning and social change. Hester states that neighborhood groups are largely seen to be increasing in influence as citizens see that collective action can indeed preserve and enhance neighborhoods. Hence, designers need to pay attention to intangibles in the design of physical space and should involve the community for which they are planning.

7. **Hoch, Charles J., Linda C. Dalton, Frank S. So, ed.** *The Practice of Local Government Planning.* 3rd ed. Washington, D.C.: International City/County Management Association, 2000.

This book covers a wide range of important principles used to guide and evaluate planning practice as well as descriptions of a generous sampling of planning activities. It describes state-of-the-art planning; relying on the "best practice" examples selected from a variety of routine rather the exotic situation. It is not designed to function as a step-by-step planning guide, rather, it consists of chapters covering five main parts: planning context, planning analysis, functional planning elements, implementing plans, and planning, people, and politics.

8. **Hopkins, Lewis D.** "How Plans Work." In *Urban Development, the Logic of Making Plans*, edited by Lewis D. Hopkins. Washington, D. C: Island Press, 2001.

This research gives all those involved with planning human settlements a more thorough understanding of why and how plans are made, enabling them to make better choices about using and making plans. It is an important contribution that will be essential for students and faculty in planning theory, land use planning, and planning project courses. Developers, politicians, and citizens alike blame "poor planning" for a host of community ills. But what are plans really supposed to do? How do they work? What problems can they successfully address, and what is beyond their scope? In *Urban Development*, leading planning scholar Lewis Hopkins tackles these thorny issues as he explains the logic of plans for urban

development and justifies prescriptions about when and how to make them. He explores the concepts behind plans, some that are widely accepted but seldom examined, and others that modify conventional wisdom about the use and usefulness of plans. The book does the following: places the role of plans and planners within the complex system of urban development; offers examples from the history of plans and planning; discusses when plans should be made/not made; gives a realistic idea of what can be expected from plans; and examines ways of gauging the success or failure of plans.

9. Jones, John Chris. *Design Methods*. New York: John Wiley, 1992.

This book first evaluates traditional methods such as design-by-drawing and shows how they do not adequately address the complexity of demands upon today's designer. It then provides 35 new methods that have been developed to assist designers and planners to become more sensitive to user needs. The new methods are described and classified in a way that makes it easier for designers and planners to find a method that suits a particular design situation. They include logical procedures such as systematic search and systems engineering, data gathering procedures such as literature searching and the writing of questionnaires, innovative procedures such as brainstorming and synectic and system transformation, and evaluative procedures such as specification writing and the selection of criteria. Offering a wider view—accompanied by appropriate skills—than can be obtained from the teaching of any specialized design profession, *Design Methods* is important reading for designers and teachers in numerous fields. It will be welcomed by engineers, architects, planners, and landscape architects, as well as by interior, graphic, product, and industrial designers. This extraordinary book will provide key insights to software designers and numerous others outside traditional design professions who are nevertheless creatively involved in design processes. It is also relevant to the teaching of cultural studies, technology, and any kind of creative project.

10. Krieger, Alex. "The Planner as Urban Designer: Reforming Planning Education in the New Millennium." In *The Profession of City Planning: Changes, Images and Challenges, 1950-2000*, edited by Lloyd Rodwin, and Bishwapriya Sanyal. New Brunswick, NJ: Center for Urban Policy Research at Rutgers, 2000.

In the transition from the "narrower" world of spatial thinking to the broader world of process and policy formulation, the work of planners became more abstract, less approachable, and ironically, more distant from public expectations about what a plan or planners can do. Planning education is in need of reform again, now by reintroducing design thinking into the curricula. Krieger develops nine specifications composing the DNA of his ideal planners at the dawn of the new century.

11. Lang, Jon. *Urban Design: A Typology of Procedures and Products*. New York: Architectural Press, 2005.

This book provides a comprehensive and accessible introduction to urban design, presenting a three dimensional model with which to categorize the processes and products involved. It not only defines the subject, but also considers the future direction of the field and what can be learned from the past. 50 international case studies demonstrate the variety of urban design efforts that have occurred in recent history.

12. Larice, Michael and Elizabeth Macdonald, ed. *The Urban Design Reader*. London: Routledge, 2007.

This book brings together some of the most influential writing on the historical development and contemporary practice of urban design. This anthology includes forty-one selections that illuminate the history, theory and practice of urban design. In addition to classic writings from the field's luminaries, such as Jane Jacobs, William H. Whyte, and Kevin Lynch, *The Urban Design Reader* provides recent material on the urban design aspects of contemporary urbanism, place-making, density, sustainability, neighborhood planning, traffic calming, green infrastructure, and the public realm. The readings are organized into eight topical sections beginning with historical precedents, continuing with a variety of theoretical and pragmatic concerns, and concluding with material on current professional practice. The sections begin with introductory essays that contextualize and situate major themes within the field. In addition, introductions for each selection highlight important lessons emanating from the literature, as well as biographical information on the authors and suggested supplemental reading.

13. Lynch, Kevin, and Gary Hack. *Site Planning*. 3rd ed. Cambridge, MA: MIT Press, 1984.

This is a widely used introductory textbook. An introduction summarizes the site planning process. This is followed by a case study of a typical professional project and ten chapters which provide new materials on user analysis, programming, site planning for built places, housing tenures and their planning implications, cost estimating, mapping, the reading of air photographs, site design for housing in developing countries, design strategies, environmental impact analyses, and many others - all illustrated with in-text photographs and line drawings and with Lynch's characteristic marginal sketches.

14. Marcus, Clare Cooper, and Wendy Sarkissian. *Housing as If People Mattered: Site Design Guidelines for Medium-Density Family Housing*. Berkeley: University of California Press, 1986.

This book gathers some of the information -- how to design housing to fulfill people's needs-- in the form of design guidelines. It has evolved from 15 years of examining housing, conducting post occupancy evaluation research, and analyzing comparable studies done by others. It represents what we know at this time about human needs and desires in the housing environment and how they are affected by design. The guidelines are based on sensitive observation of how people apparently want to behave, to be, to play and work and socialize in and around their homes and how they feel about these activities. This book focuses on the

arrangement of dwellings on the site, the treatment of facades and entries, and the crucial spaces between buildings. It is primarily about housing for families. The guidelines in this book are statements regarding human behavior in or attitudes toward the built environment that might be useful to designers and their clients.

- 15. McGlynn, Sue, and Paul Murrain. "The Politics of Urban Design." In *Urban Design Reader*, edited by Matthew Carmona, and Steve Tie. Burlington, MA: Architectural Press, 2007.**

This paper takes the presentation of the different sectors in the development process further by exploring power relations between them—relations that are summarized in the form of a Powergram. The Powergram draws basic distinctions between actors who can exercise power to initiate or control development, those with a legal or contractual responsibility towards some aspect of development, and those with an interest or influence in the process. It graphically illustrates how power is concentrated on the matrix's left-hand-side among the actors able to initiate and control development in a very direct way. It also shows the wide-ranging interests of designers, and the lack of power wielded by the users of development. Actors on the right-hand-side rely primarily on argumentation, alliances and participation to influence the process. The value of the Powergram lies in encouraging consideration of power relationships, and how different actors can use the powers available to them to advantage.

- 16. Moudon, Anne Vernez. "A Catholic Approach to Organizing What Urban Designers Should Know." *Journal of Planning Literature* 6, no. 4 (1992.05): 332-49.**

This article introduces a framework for the practice of urban design. Her article is directed to researchers and practitioners in the urban design and related fields. Moudon focuses on methods of inquiry, which can inform urban design practice. These nine concentrations of inquiry include: urban history studies; picturesque studies; image studies; environment-behavior studies; place studies; material culture studies; typology morphology studies; space-morphology studies; and nature-ecology studies. Moudon points out that there is no single approach to urban design as a result of the "catholic" nature of the field, which draws from a variety of disciplines.

- 17. Preiser, Wolfgang F. E., ed. *Environmental Design Perspectives: Viewpoints on the Profession, Education, and Research*. Blacksburg: College of Architecture, Virginia Polytechnic Institute and State University, 1972.**

This book establishes a dialogue between environmental research and education on one side and practicing designer on the other. The papers contained in this volume have been grouped into three topical domains dealing with design education, professional practice and research in environmental design. The first section represents descriptions of current educational objectives and approaches. Needed and proposed future changes in the various curricula are discussed and , as an example, the model of an interdisciplinary course sequence in man-

environment relations is present. Rather personal viewpoints are expressed in a group of papers concerned with the changing attitudes and the new social and political context in professional design practice. Research involvement of the graduate interdisciplinary faculty is exemplified in the third section of the book. It contains contributions on topics such as the design application of research findings in user behavior evaluations.

18. Priest, Donald. et al. *Large-Scale Development: Benefits, Constraints, and State and Local Policy Incentives*. Washington: Urban Land Institute, 1977.

The large-scale projects, best exemplified by the so-called new towns, have become an established form of urban development. This book discusses the benefits and costs of large-scale, planned development. It details constraints to such development, and presents various incentives and techniques that encourage scale. This research also compares these different techniques drawn from existing programs and analyzed for effectiveness. This study familiarizes local and state officials with the techniques which they could consider in order to facilitate or encourage large-scale, planned development.

19. Punter, John. *Design Guidelines in American Cities: A Review of Design Policies and Guidance in Five West Coast Cities*. Liverpool: Liverpool University Press, 1999.

This book is a study of design initiatives and policies in five US West Coast cities – Seattle, Portland, San Francisco, Irvine and San Diego – all of which have had particularly interesting experience of relevance to urban design practice in Britain and other countries. Punter summarizes and synthesizes the findings that come from analyzing the urban design public policy of five cities on the west coast of the United States—cities that he posits are generally understood to have put in place best practice urban design guidance. From the analysis, which includes review of legal issues related to planning regulatory controls, the author distills a framework for how design guidance should be structured that he argues is applicable to cities elsewhere, including in different countries.

20. Punter, John and Matthew Carmona. *The Design Dimension of Planning: Theory, Content, and Best Practice for Design Policies*. New York: E & FN Spon, 1997.

This book evolves from two research projects: one is a practice-oriented piece of academic research, the other is a piece of research consultancy for the Department of the Environment. This book explains the various components of the research—content analysis of plans, case studies of best-practice authorities, studies of policy effectiveness and policy sources. It also examines the methodological strengths and weaknesses.

There are several key issues addressed in this book: 1 The scope of design control, its operation at different scales, the issues it embraces and their relationships to urban conservation, to architectural and urban design practice, but also to landscape, ecology, access and security/public safety; 2 the analytical basis of policy, the relationship to design theory and principles, the method of study of locality and context, and the derivation of

principles; 3 the relationship between policy and public preferences, how public views are sought and accommodated, and how professional and public concerns are reconciled both within and without the plan-making process; 4 the context of policy formulation -- in particular, the way in which landscape/townscape qualities, development pressures, political priorities or indeed staff skill and resources determine policy responses; 5 the hierarchy of guidance -- what should be put in the plan, and how this relates to design at different scales, to supplementary design guidance, guides and briefs and other kinds of informal guidance; 6 the implementation of policy, embracing architectural and development industry reaction to policy parameters, the reaction of government inspectors at local plan inquiries, the relationship to central government advice, and the ability of less skilled staff to apply policies; 7 the overall relationship between design principles and policies and the theory of environmental aesthetics.

- 21. Rowley, Alan. "Private-Property Decision Makers and the Quality of Urban Design." In *Urban Design Reader*, edited by Matthew Carmona, and Steve Tie. Burlington, MA: Architectural Press, 2007.**

This book looks in more detail at the motivations of different groups of development actors by examining the involvement of developers, investors, and occupiers in urban design through a set of five case studies, six expert panels, and a literature review. From the perspective of a private-property decision-maker, it examines the role and importance of urban design considerations; the benefits of giving explicit attention to such considerations; factors constraining the promotion of good urban design, and incentives and other measures encouraging increased attention to urban design quality. It concludes that a better understanding of the relationship between urban design, the development process and the property industry is a prerequisite to achieving lasting improvements in the quality of the urban environment.

- 22. Scheer, Brenda Case, and Wolfgang F.E. Preiser. *Design Review: Challenging Urban Aesthetic Control*. New York: Chapman and Hall, 1994.**

Design review is a procedure, like zoning, used by cities and towns to control the aesthetics by design and towns to control the aesthetics and design of development projects. This book is a edited collection of papers on diverse aspects of design review. There are three parts in this book. Part I focused on issues in design review, it reviews the development process and power of design review from a historical perspective; Part II analyzes design review from a practical perspective and uses several case studies to support the analysis. Part III provides several critical perspectives and design review and explains several most important problems in the development and implementations of design review.

- 23. Seamon, David. "Phenomenology and Environment/Behavior Research." In *Advances in Environment, Behavior, and Design*, edited by E.H. Zube and Gary Moore. New York: Plenum Press, 1987.**

This chapter reviews phenomenological research on the person-environment relationship since 1982 and considers contributions from both the design and the environment-behavior literatures. The chapter begins with a general discussion of the phenomenological approach and examines why designers and social scientists have become interested in this perspective. Next, four themes are considered—life world, place, home, and design as place making—which mark substantive phenomenological topics in environment-behavior research. Finally, the chapter examines several criticisms often made against phenomenological work and asks whether it can be fruitfully integrated with mainline positivist research in environment-behavior studies.

24. Shirvani, Hamid. *Urban Design Review: A Guide for Planners*. Washington, D.C: Planners Press 1995.

This book investigates city government's implementation of urban design. It intends to examine the effectiveness of specific models of review procedures presently in practice, to explore the relationship between model features and environmental considerations, and to draw conclusions about the ways in which models can be applied in different environmental situations. This book is divided into fourteen chapters. Following the introduction, Chapter 2 is a framework for comparison of the models of design review. Chapter 3-6 contain a careful analysis of the design review procedures in Boston and other cities. Chapter 7 compares the models in design review and classifies the components used in each city. Chapter 8-12 examine one representative case study in each of four cities. Chapter 13, Findings, includes an extensive discussion of the environmental factors that influence design review procedures. Chapter 14 offers recommendations for the further development of design review.

25. Watson, Donald, ed. *Time-Saver Standards for Urban Design*. New York: McGraw-Hill, 2003.

This handbook is a professional reference on the physical design of cities and urban places. Featuring articles by authoritative urban design scholars and practitioners, this book provides a visual and detailed archival record of: Context of global cities; Classic texts of urban design; Urban design history and design theory; Preservation, renewal, and extension of existing cities; Methods of urban design from regional to pedestrian scale; Sustainable communities; and Details and case studies of urban design practice. It covers the full-spectrum of allied disciplines such as transportation planning, bioregionalism, storm water management, parking, universal design, urban acoustics, and graphics. It provides a single source for the key reference articles on urban design and physical planning of cities, including social, environmental and economic data. It also provides a one-volume reference that is indispensable for urban design policy and practice.

26. Wolfe, Myer R., and R. D. Shinne. *Urban Design within the Comprehensive Planning Process*. Seattle: University of Washington, 1970.

The purpose of the book is to provide a guideline document that amplifies the role of a design element in the planning process and that clarifies concepts of urban design in comprehensive urban planning. A model approach is established and a demonstration is given by applying it to an actual case study. The case study is representative of a small city planning program. Basic concepts were applied to a case study community. Urban design in the comprehensive planning process considered: 1 the establishment of pertinent objectives; 2 identification and classification of the form giving elements and characteristics of the community; 3 possible conservation efforts to protect and enhance existing and emerging perceptual experiences; 4 public policies that set out urban design frameworks; 5 the development of alternative design schemes; and 6 measures possible for the implementation of alternatives with priorities.

3. CHINA'S DEVELOPMENT

3.1 CHINA'S URBANIZATION AND INDUSTRIALIZATION

- 1. BBC. "China Overtakes Japan as World's Second-Biggest Economy." *BBC Business News*, 2.14 2011.**

This reports that "Japan's nominal gross domestic product for the second quarter totaled \$1.288 trillion, less than China's \$1.337 trillion, the Japanese Cabinet Office said today. Japan remained bigger in the first half of 2010, the government agency said. Japan's annual GDP is \$5.07 trillion, while China's is more than \$4.9 trillion."

- 2. Fan, C. Cindy. "Uneven Development and Beyond: Regional Development Theory in Post-Mao China." *International Journal of Urban and Regional Search* 21 (1997): 620-39.**

This paper reviews the Chinese literature on post-Mao regional development, and attempts to explore the prevailing thoughts and deals which have influenced regional policy. It outlines the background and strategies of uneven regional development and then summarize the findings on the regional development gap. It reviews the criticisms on and alternatives to the uneven regional development policy, and discusses the Ninth Five-Year Plan, and a concluding section with some comments on China's regional development theory.

- 3. Li, Zhang. *China's Limited Urbanization: Under Socialism and Beyond*. New York: Nova Science, 2004.**

Under-urbanization, defined as the achievement of a high industrial growth without a parallel growth of urban population, is one of the profound features of socialist development. Under-urbanization in China, in effect, represents a seriously distorted relationship between urbanization process and economic development as conventionally understood on the basis of well-documented Western experience. In an attempt to theorize the Chinese urbanization experience, scholars often treat it simply as a by-product of restricted migration policies

driven by the overall strategy of industrialization. In contrast to the thrust of the extant influential literature on urbanization in the context of socialist economies, where industrialization strategies alone are taken as fundamental in explaining what we find evolving through time, this book has focused, rather, on systemic characteristics that have not received the thorough treatment already given the strategies of industrialization. From a perspective of political economy to analyze the impacts of economic system requirements on urbanization, this study argues that the root cause of Chinese under-urbanization is systemic, in which state controls and the state-biased nature play a decisive role.

- 4. Lin, George C. S. "State, Capital, and Space in China in an Age of Volatile Globalization." *Environment & Planning A* 32 (2000): 455-71.**

This study of China's economic performance against the recent Asian financial turmoil suggests that the Chinese central state has played a crucial role in the growth and restructuring of the national economy. The immediate impact of the financial crisis on China has been limited although the long-term effects remain uncertain. China has so far narrowly escaped the crisis primarily because of a state-led capital injection in mid-1998 to stop economic downturn, an austerity program that led the overheated economy to 'soft-land' prior to the crisis, and stringent state control of capital flow into and out of the country. Contrary to the 'end of the nation-state' claim made by many globalization prophets, the Chinese socialist state has remained an active agent interacting with global market forces. The interplay between the socialist state and transnational capital has been a place-specific phenomenon despite the pervasive assertion of 'the end of geography'.

- 5. Lin, Justin Yifu, and Yan Wang. "China's Integration with the World: Development as a Process of Learning and Industrial Upgrading." In *World Bank Policy Research Working Paper WPS 4799*, 2008.12.**

This paper attempts to distill lessons from China's reform and opening up process, and investigate the underlying reasons behind China's success in trade expansion and economic growth. This paper reviews the drivers behind China's learning and trade integration and provides both positive and negative lessons for developing countries with diverse natural endowments, especially those in Sub-Saharan Africa

- 6. Lin, Justin Yifu, Fang Cai, and Zhou Li. *China's Miracle: Development Strategy and Economic Reform*. Hong Kong: Chinese University Press, 2003.**

China's miracle that came about as a result of China's economic reform and development since the late 1970s has received worldwide attentions. In the past several hundred years, China's development fell behind that of other nations. Why was it able to catch up so fast and achieve tremendous economic progress in just a decade or so? This book reviews China's historical evolution of traditional economic system to pre-reform economic development, and to current economic reform process. It concludes that the fundamental cause of China's slow economic development before reform was the adoption of a heavy industry-oriented

development strategy, and the key to the rapid development after the reform was the better use of China's comparative advantages which was brought about by reforming the trinity of the traditional economic system.

This book explores the characteristics of China's economic reform that the reform started by improving micro-incentive through decentralizing and allowing micro-units to share newly created profits. The improvement in the micro-incentive mechanism produced a new stream of resources. Micro-management units obtained the right to allocate part of the newly created resources, and pressed for subsequent reform of the resource-allocation mechanism. After analyzing the difficulties and problems that have emerged during China's reform process, it reveals that China's reform of the macro-policy environment lags behind reform of the micro-management institution and resource-allocation mechanism, and the shift in the development strategy is thus incomplete. Thus it has become increasingly clear that reform of the macro-policy environment, and particularly of the factor-price formation mechanism, is imperative so as to complete to the transformation of China's development strategy.

7. Mao, Qizhi, et al. "The State of China's Cities." edited by UN Habitat, 2010.

This report is about China's cities' current status. It analyzes the development of China's modern cities in terms of 11 major themes. They are: urbanization and national economic development; regional and spatial distribution of cities and towns; urban housing development and reform; urban environment and infrastructure; floating population and rural migrant workers; medical and health insurance system; education development; community service and development; social assistance and charity; urban planning and management; and challenges and opportunities.

8. Pi, Qiansheng. *Introduction of Chinese Economic Development Zones*. Beijing: Sanlian Press, 2004. (Chinese)

Based on theoretical economy and regional economic, this book introduces the development of Chinese Economic Development Zones, and provides insights on management, land development, financing, investment, and enterprises on China's specific zones' development.

9. Sun, Wansong. *High-Tech Development Area Innovation and Competition Power*. Beijing: Chinese Economy Press, 2006. (Chinese)

This book introduces the historical evolution of international science park, and then develops a series of models, such as CIT model, to evaluate the performance of China's high-technology industrial development.

10. Walcott, Susan M. *Chinese Science and Technology Industrial Parks*. Aldershot, Hampshire: Ashgate Publishing, 2003.

This work examines types of advanced technology Chinese districts set aside for developing products for national and global markets. Of particular interest is their function in transferring innovative knowledge. Theories of corporate clusters are presented and compared to the Chinese situation. Case studies explore the role of park policies in accelerating economic growth in China, as well as the major steps in China's business development since 1978. Regional variations are explored in six locations, from Xi'an in the west to Beijing in the north, Suzhou-Shanghai on the east coast and Shenzhen-Dongguan in the southeast. The difference between zones concerned with promoting multinational corporations and those encouraging ties to local research forms a key distinction. The book culminates in a proposed best practice model for Chinese integration into global networks, based on China's own particular political economy.

11. World Bank. "Global Economic Prospects 2009." Washington D.C.: World Bank, 2008.12.

This report discusses the economic development situation in worldwide range, including both developed and developing countries.

12. Wu, Fulong, Jiang, Xu, and Anthony G. O. Yeh. *Urban Development in Post-Reform China: State, Market, and Space*. New York: Routledge, 2007.

Radically reoriented under market reform, Chinese cities present both the landscapes of the First and Third World, and are increasingly playing a critical role in the country's economic development. Yet, radical marketization co-exists with the ever-presence of state control. Exploring the interaction of China's market development, state regulation and the resulting transformation and creation of new urban spaces, this innovative, key book provides the first integrated treatment of China's urban development in the dynamic market transition. Focusing on land and housing development, the authors show how the market has been 'created' under post-reform urban conditions, and examine 'the state in action', highlighting how changing urban governance towards local entrepreneurial state facilitates market formation. A significant, original contribution, they highlight the key actors and their institutional contexts.

13. Zhang, Wei-wei. *Transforming China: Economic Reform and Its Political Implications*. Basingstoke: Macmillan Press, 2000.

This book intends to explore China's dramatic economic reform and its distinctive features as well as political implications. Based on a brief factual account of the economic reform, it examines a number of features including dual goal between development and transition, soft and hard reforms, dynamic gradualism, ideological reorientation, reform leadership, and the role of the overseas Chinese. With regard to political implications, it discusses the social structure, informal liberalization, corruption, and political reform, etc. This book provides a general background of knowledge for understanding the wide range covered by China's economic reform and its several key characteristics. However, it did not dig into a further

discussion of how this reform impacts the governance and planning activities, as well as its implication on city management and industrialization.

3.2 CHINA'S PLANNING AND DESIGN ACTIVITIES

- 1. Chen, Binzhao. "On Hierarchical Management, Comprehensive Management and Vertical Management in Urban Planning." *Urban Planning Review*, no. 5 (1999). (Chinese)**

This paper argues that in order to implement urban planning favorably, a hierarchical management, comprehensive management and vertical management must be carried on in the process of urban planning management.

- 2. Fu, Yuguang., and Linglong Kong. "On the Adaptability of Regulatory Detailed Planning." *Management*, no. 3 (2003). (Chinese)**

There exists a limitation to the regulatory detailed planning in its understanding, method of preparation, the content of preparation, technology and the process of management. This limitation has made it impossible to bring into full play the advantages and functions of the regulatory detailed planning in practical construction. The paper suggests that the existing planning method and system should be perfected by the control of target system, the classification of land use, the plotting of land block, the extent of development of land and space, the mode of control and the management system so as to increase the adaptability of the regulatory detailed planning.

- 3. Guo, Xujun., and Hong Xu. "Statutory Map Development in Shenzhen." *Planners*, no. 6 (2007). (Chinese)**

Statutory map in Shenzhen has achieved success and meanwhile shown problems. This paper argues that, compared with regulatory plan development, Shenzhen statutory map is still an institutional tool and needs to be integrated in many aspects.

- 4. Jin, Guangjun. "The Sustainability of Urban Design Outputs." *City Planning Review*, no. 3 (1999). (Chinese)**

Regarding the sustainability as major channel, based on the characteristics of urban design process, the paper discusses the sustainability of urban design outputs, the practicability of implementing decision making process, implementing institutions of urban design, and the ensuring system, to make sure that the urban design outputs are with strong capability of guiding, to reach the urban design targets.

5. **Liang, Jiang, and Hui Zhao. "The Legalization of the Approval Procedure: The Essential to the Reform on the Regulatory System of Urban Planning with Shenzhen as the Case." *City Planning Review*, no. 7 (2000). (Chinese)**

From the legal perspective, this paper compares approval management of Shenzhen's Statutory Plan and American Zoning Regulations.

6. **Song, Xiaodong, and Jian Xu. "The Challenges of the Authority Decentralization--Discussion on Administrative Mechanism of Urban Planning in Shanghai." *Urban Planning Review*, no. 6 (1999). (Chinese)**

This paper discusses the urban management in Shanghai Municipality, in terms of organization composition, conflicts between short-term and long-term benefits, and training professional. It provides a series suggestions to enhance legal capacity of planning regulation, and strengthen the professional skills of planning official.

7. **Tian, Li. "Regulatory Detailed Planning in China: Dilemma and Solution." *City Planning Review* 31, no. 1 (2007): 16-20. (Chinese)**

This paper presents the origin and framework of the regulatory detailed planning in China, and examines its problems. Through the analytical framework of the new institutional economics, it discovers that the nature of regulatory detailed planning is the development rights of land and it plays a critical role in interest allocation of land. It suggests that the improvement of regulatory detailed planning in the transitional period should not be the hasty legalization of planning documents, but the introduction of marketization approach. Therefore the "ultimate blueprint" plan should be replaced by the dynamic "procedural plan", and related policies should be formulated to enforce the implementation and feasibilities of the plan.

8. **———. "The Thinking of the Status Quo and the Reform of the Urban Planning Control System." *City Planning Review* 25, no. 12 (2001): 30-35. (Chinese)**

Along with the urban political and economic reform, the jurisdiction for urban management has experienced continuous change. This paper analyses some individual modes of this kind and some problems brought by those centralized or not. It also raises the requirement for the shift of the jurisdiction under the situation of the rapid urbanization and global economic integration, followed with the related suggestions for a rational and scientific urban planning management system.

9. **Wang, Ka. "Study on Process Supporting System of Urban Design." PhD Thesis, Zhejiang University, 2006. (Chinese)**

Based on the theory of process supporting system of urban design, this research aims to provide a good supporting system for the process of urban design on its surrounding environment.

10. Wang, Shifu. "Legal Protection on City Design." *Planners*, no. 4 (2003). (Chinese)

City design is more and more applied to the present city planning management. But, in reality, the effect of city design is only at the technical level. It is suggested to revise the issues about city design in the Statute of City Planning and the Making of City Planning to provide better legal protection system for city design.

11. Xiong, Guoping. "The Legislation Study of Regulatory Detailed Planning." *City Planning Review*, no. 3 (2002). (Chinese)

This paper studies the way of legislation sustain, the law sustain and procedure sustain, as well as the requirement of the regulatory plan, urban planning and administration rules, zoning, its content definition such as the general control technology, the regulation of urban planning, construction management technology and statutory map. It also puts forward the relative counter measure to some problems like the public open space, the rule of the special provision, bonus FAR, the public involvement, the urban planning committee and the appeal committee.

12. Zhang, Tingwei. "Challenges to China's City Planning." *City Planning Review*, no. 6 (1997). (Chinese)

Based on a survey of Shanghai, Hangzhou, Ningbo, Xiamen, and Wuhan regarding planning and design activities, the author summarizes a series of key issues emerging in current China's planning practices, such as management responsibility in planning, land leasing, housing, and regional construction.

13. Zhang, Weiyang. "Law--a Behaviour Regulation through the Third Party." *Reading 11* (2000): 76-81. (Chinese)

This paper discusses the power of law in changing the expectation of human and entities so as to change the balanced results. It also discusses the relationships between the law and the culture.

14. Zhao, Jian and Su Liu. "Urban Design in Regulatory Detailed Planning." *City Planning Review*, no. 5 (1995). (Chinese)

This paper focuses on the management of regulatory detailed plan, and addresses its content as well as characteristics from two dimensions: conceptual content at the first stage, and guidance in later stage.

15. **Zhao, Yanjing.** "City Planning in the Perspective of Institutional Economic." *City Planning Review* 2005, no. 6, 7 (2005). (Chinese)

Institution has long been an element that can not be properly analyzed in urban planning, and many plans are based on the presumption that the influence of institution is zero. Once the "ideal" plans are put into practice, they are distorted by the force of institutional elements. For half a century institutional economics has gradually developed a series of methods which could be helpful to understand the institutional element in urban planning. Therefore it is important to establish a framework for institutional analysis in urban planning by referring to the progress in institutional economics.

3.3 SCIENCE PARKS IN CHINA

1. **Chen, Jun, and Bin Fan.** "Highlights in Regulation of Zhongguancun Science Park." *Beijing's View* 2001. (Chinese)

This paper discusses several key important issues in *Regulation of Zhongguancun Science Park*, which is the first legal document in national HIDZ.

2. **Chen, Yisheng.** *An Incubator for Innovation in the High-Tech Industry: A Study of Science Parks*. Beijing: Chinese Economic Publisher, 2008. (Chinese)

Take international science parks as background, this book widely studies the historical evolution, spatial characteristics, systematical structure, function, environmental feature, strategies and legislation, and management of China's science parks.

3. **Jing, Tihua; and Liu, Zhizong.** "From Development Zone to a New Town: Beijing Zhongguancun Science Park." *Beijing Planning View* 1 (2006). (Chinese)

Yizhuang Science Park is an important part of Beijing Zhongguancun Science Park. As a specialized district enjoying preferential policies from both national HIDZs and national Economic Development Zones, it has achieved great economic growth and develops towards a mixed-used new town. This paper introduces its historical evolution and the features of construction.

4. **Li, Jinkui, and Zhanjun Liu.** *Economic Motivation to Shenzhen High-Technology Industrial Park*. Shenzhen: Haitian Press, 2000. (Chinese)

This book discusses several motivations to the economic development of Shenzhen, especially on the development of high-technology industries. The motivations include: globalization, information and network, new innovation economy, E-government, educational reform, and advanced scientific research.

5. **Li, Lingji, Ping Hu, and Lei Zhang. "Roles, Models and Development Trends of Hi-Tech Industrial Development Zones in China." *International Journal of Transport Management* 28, no. 3/4/5 (2004).**

This paper focuses on the development of High-Technology Industrial Development Zones (HIDZ) in China. Following the historical review and simple comparison of Economic-Technological Development Area (ETDA) and HIDZ, it examines three management models of HIDZ: government-oriented, enterprise-oriented, and comprehensive management models.

6. **Ma, Bo-Qiang. "A Project for the 21st Century in China: Kwanghua Science Park." *International Journal of Transport Management* 16, no. 8 (1998).**

This paper describes a project for a science-based park, the Kwanghua Science Park, to be constructed in Shanghai, China. The construction of Kwanghua Science Park draws upon the Hsinchu practical experience and the Cabral-Dahab Paradigm for policy guidelines.

7. **Ming, Jun. *The National Mission: Focus on Zhangjiang*. Shanghai: Shanghai Science and Technology Literature Press, 2009. (Chinese)**

This book reviews the development history of Shanghai Zhangjiang Park from 1992 to 2009, especially since the implementation of national strategy of "Focus on Zhangjiang" in 1999. It describes private domestic companies, research institutes, and management in Zhangjiang Park.

8. **Ni, Feng. "Spatial Development of High-Technology Industrial Parks: Zhongguancun Science Park as an Example." PhD Thesis, Tsinghua University, 2003. (Chinese)**

This dissertation starts from the history of international science park development, summarizes Zhongguancun area growth history and realistic problems, studies the major conflicts and related policies during the city changes and developments. It analyzes the development of Zhongguancun area, and exposes the main problems during Zhongguancun science park physical planning development. The research argues that the imbalanced policies and massive real estate development have negative impacts on Zhongguancun area's innovation environment and social structure, the chaotic concepts and systematic weakness of current city planning cannot meet the challenge of city development, and that the physical planning of Zhongguancun science park needed new concepts and arrangements.

9. **Suzhou Municipality, ed. *Recoding Suzhou: Stories of Suzhou Industrial Park*. Suzhou: Guwuxuan Press. 2009 (Chinese)**

This book compiles the stories happening throughout development of Suzhou Industrial Park. Based on historical evolution, it demonstrates many aspects of SIP's development, such as design, planning, management, housing, neighborhood, commercial and business activities, and governance.

- 10. Wang, Jici and Jixian Wang. "An Analysis of New-Tech Agglomeration in Beijing: A New Industrial District in the Making?" *Environment & Planning A* 30, no. 681-701 (1998).**

Based on the assumption of the strong embedding of the stable and 'pure' district model, in this paper examines a new-tech agglomeration in Beijing, as a variant of such districts in the making, and explains it with the use of concepts adopted from the industrial districts school. The Beijing case represents an experiment in the conscious public creation of new industrial spaces founded on the spontaneous action of key individuals. Initially it progressed as an embryonic industrial district that, in its early development, appeared to contain all three elements of entrepreneurship: small firms, new firm formation, and innovativeness. However, it has eventually been stranded by a unique combination of weaknesses. These include strong hierarchical restraints from the state-owned institutions or firms on local networking, and direct global linkages with the multinationals, which expose local economies to volatile world competition.

- 11. Wang, Lihong. "Agglomeration of Beijing Zhongguancun Science Park." *Investment and High-Tech Industry in China* 2006, 25-27. (Chinese)**

This report is a survey of effects of the agglomeration of Beijing Zhongguancun Science Park since its beginning to present. It reports the economic growth, industrial types, construction of industrial bases, innovation capacities, international cooperation, and the governance and management of Zhongguancun Science Park.

- 12. Wei, Dazhi. *Important Factors of High-Technology Industrial Development: Shenzhen High-Technology Industrial Park as an Example*. Shenzhen: Haitian Press, 2002. (Chinese)**

This book analyzes a series of factors that determine the success development of high-technology industries, such as advanced management system, industrial strategy, intellectual resources, technical innovation, and abundant risk investment.

- 13. ———. *What We Learn from High-Technology Industrial Development from Shenzhen*. Shenzhen: Haitian Press, 2000. (Chinese)**

This book systematically introduces the experiences, theories, methods, and strategies in developing high-technology industries in Shenzhen, and proves the importance of high-technology industry in economic development in China.

- 14. Wu, Hequan "The Progress of Communication Technology Subject of Hi-Tech Research Development Plan of China." *International Conference on Communication Technology Proceedings* 1 (2000).**

In 1986, China put a high-technology research development plan, named the 863 plan, into operation. The subject of communication technology was formally included into the 863 plan in 1992, and the research projects were put into operation in 1993. After reviewing the research achievements in communication technology and introducing the research projects in progress and their key technologies, this paper presents the research direction of communication technology for the S-863 plan, which will start in 2001 after the 863 plan.

15. Xu, Guanhua. "Ten Years' Review on the Development of High-Tech Industrial Development Zones in China 1991-2001." Ministry of Science and Technology of China, 2001. (Chinese)

As a minister of the Ministry of Science and Technology of China, Xu provides a report on the conference of tenth anniversary of national High-Technology Industrial Development Zones. He summarizes the accomplishments of national HIDZs, and discusses current challenges and future development trends.

16. Xue, Lan. "Promoting Industrial R&D and High-Tech Development through Science Parks: The Taiwan Experience." *International Journal of Technology Management* 13, no. 7/8 (1997).

This paper offers a comprehensive review of the development of Hsinchu Science –based Industrial Park (HSIP) in Taiwan. After examining the technical and economic background of HSIP, the research discusses the critical factors contributed to the success of HSIP, and identifies several salient features of HSIP and their implications for developing countries, such as the active involvement of the government, accumulation of knowledge and skill, and focus on manufacturing and demand-motivated R&D.

17. Zhao, Chuan. *Ten High-Technology Industrial Bases in Shenzhen*. Shenzhen: Haitian Press, 2002. (Chinese)

This book introduces ten high-technology industrial bases in Shenzhen, including Shenzhen High-Technology Industrial Park, Longgang Large Industrial District, Baolong District, Ecological Agricultural Base, etc. The discussion focuses on their features, location, advantages, historical evolution, and management.

BIBLIOGRAPHY

SECONDARY SOURCES AND LITERATURE:

- Abu-Lughod, Janet L. *New York, Chicago, Los Angeles: America's Global Cities*. Minneapolis: University of Minnesota Press, 1999.
- Alexander, Christopher. *A New Theory of Urban Design*. New York: Oxford University Press, 1987.
- Anttiroiko, Ari-Veikko. "Global Competition of High-Tech Centers." *International Journal of Transport Management* 28, no. 3/4/5 (2004).
- Bailly, Antoine S., et al. *Socially Sustainable Cities: Principles and Practices*. London: Economica, 2000.
- Bakouros, Yiannis L., Dimitri C. Mardas, and Nikos C. Varsakelis. "Science Park, a High Tech Fantasy?: An Analysis of the Science Parks of Greece" *Technovation* 22 (2002): 123-28.
- Barnett, Jonathan. *An Introduction to Urban Design*. New York: Harper & Row, 1982.
- . *Redesigning Cities: Principles, Practice, Implementation*. Chicago: American Planning Association, Planners Press, 2003.
- BBC. "China Overtakes Japan as World's Second-Biggest Economy." *BBC Business News*, 2.14 2011.
- Beatley, Timothy and Kristy Manning. *The Ecology of Place: Planning for Environment, Economy, and Community*. Washington D.C.: Island Press, 1997.
- Ben-Joseph, Eran. *The Code of the City: Standards and the Hidden Language of Place Making*. Cambridge, MA: MIT Press, 2005.
- Bigliardi, Barbara, et al. "Assessing Science Parks' Performances: Directions from Selected Italian Case Studies." *Technovation* 26, no. 4 (2006).
- Birch, Eugenie L. "U.S. Planning Culture under Pressure, Major Element Endure and Flourish in the Face of Crisis." In *Comparative Planning Cultures*, edited by Bishwapriya Sanyal, 2005.
- BMI, (Battelle Memorial Institute). "Characteristics and Trends in North American Research Parks: 21st Century Directions." AURP (Association of University Research Parks), 2007.10.

- Brand, Stewart. "Shearing Layers." In *Urban Design Reader*, edited by Matthew Carmona, and Steve Tiesdell. Burlington, MA: Architectural Press, 2007.
- Braun, Bradley M., and W. Warren McHone. "Science Parks as Economic Development Policy: A Case Study Approach." *Economic Development Quarterly* 6 (1992): 135.
- Brebbia, C. A. et al, ed. *Sustainable City: Urban Regeneration and Sustainability*. Boston: WIT Press, 2000.
- Brooks, Michael P. *Planning Theory for Practitioners*. Chicago: American Planning Association, Planners Press, 2002.
- Brower, Sidney. *Good Neighborhoods: A Study of in-Town & Suburban Residential Environments*. Westport, Conn: Praeger, 1996.
- Bugliarello, George. "Knowledge Parks and Incubators." In *The Technology Management Handbook*, edited by R.C. Dorf. Boca Raton, FL: CRC Press, 1999.
- . "Urban Knowledge Parks, Knowledge Cities and Urban Sustainability." *International Journal of Transport Management* 28, no. 3/4/5 (2004).
- Cabral, Regis. "The Cabral-Dahab Science Park Management Paradigm: An Introduction." *International Journal of Transport Management* 16, no. 8 (1998).
- Castells, Manuel, and Peter Hall. *Technopoles of the World: The Making of 21st Century Industrial Complexes*. London: Routledge Press, 1994.
- Chen, Binzhao. "On Hierarchical Management, Comprehensive Management and Vertical Management in Urban Planning." *Urban Planning Review*, no. 5 (1999).
- Chen, Jun, and Bin Fan. "Highlights in Regulation of Zhongguancun Science Park." *Beijing's View* 2001.
- Chen, Yisheng. *An Incubator for Innovation in the High-Tech Industry: A Study of Science Parks*. Beijing: Chinese Economic Publisher, 2008.
- Chou, Tsu-Lung. "The Science Park and the Governance Challenge of the Movement of the High-Tech Urban Region Towards Polycentricity: The Hsinchu Science-Based Industrial Park." *Environment & Planning A* 39 (2007): 1382-402.
- Cooke, Philip. "The Role of Research in Regional Innovation Systems: New Models Meeting Knowledge Economy Demands." *International Journal of Transport Management* 28, no. 3/4/5 (2004).
- Creswell, John W. *Qualitative Inquiry & Research Design: Choosing among Five Approaches*. 2nd ed. Thousand Oaks: Sage Publications, 2007.

- Devas, Nick, and Crole Rakodi, ed. *Managing Fast Growing Cities: New Approaches to Urban Planning and Management in the Developing World*. Harlow, Essex, England: Longman Scientific & Technical, 1993.
- Dutton, John A. *New American Urbanism: Re-Forming the Suburban Metropolis*. Milan: Skira, 2000.
- Elstrom, Peter., Paul M. Eng, Paul Judge, and Gary McWilliams. "It Must Be Something in the Water." *Business Week-Silicon Valley Special Report* 1997.08.
- Evans, Graeme and Jo Foord. "The Generation of Diversity: Mixed Use and Urban Sustainability." In *Urban Sustainability through Environmental Design: Approaches to Time-People-Place Responsive Urban Spaces*, edited by Kevin Thwaites, et al. New York: Routledge, 2007.
- Fan, C. Cindy. "Uneven Development and Beyond: Regional Development Theory in Post-Mao China." *International Journal of Urban and Regional Search* 21 (1997): 620-39.
- Farr, Douglas. *Sustainable Urbanism: Urban Design with Nature*. Hoboken J: John Wiley, 2008.
- Ferguson, Richard. "Why Firms on Science Parks Should Not Be Expected to Show Better Performance -- the Story of Twelve Biotechnology Firms." *International Journal of Transport Management* 28, no. 3/4/5 (2004).
- Francis, Mark, Lisa Cashdan, and Lynn Paxson. *Community Open Spaces: Greeting Neighborhoods through Community Action and Land Conservation*. Washington, D.C.: Island Press, 1984.
- Frej, Anne, et al. *Business Park and Industrial Development Handbook*. Washington, D.C.: Urban Land Institute, 2001.
- Fu, Yuguang., and Linglong Kong. "On the Adaptability of Regulatory Detailed Planning." *Management*, no. 3 (2003).
- Gehl, Jan. *Life between Buildings: Using Public Space*. New York: Van Nostrand Reinhold, 1987.
- Gehl, Jan and Lars Gemze. *Public Spaces, Public Life* Copenhagen: Danish Architectural Press, 1996.
- Glasmeyer, A. "The Japanese Technopolis Programme: High-Tech Development Strategy or Industrial Policy in Disguise?" *International Journal of Urban and Regional Research*, no. 12 (1988): 268-84.

- Glazer, Nathan. "The Public Image of the Profession." In *The Profession of City Planning: Changes, Images and Challenges, 1950-2000*, edited by Lloyd Rodwin, and Bishwapriya Sanyal. New Brunswick, NJ: Center for Urban Policy Research at Rutgers, 2000.
- Golany, Gideon S. *Ethics and Urban Design: Culture, Form, and Environment*. New York: J. Wiley, 1995.
- Goldstein, Harvey A. and Michael I. Luger. "University-Based Research Parks as a Rural Development Strategy." *Policy Studies Journal* 20, no. 2 (1992).
- Gosling, David, and Barry Maitland. *Concepts of Urban Design*. New York: St. Martin's Press, 1984.
- Greenbie, Barrie B. *Spaces: Dimensions of the Human Landscape*. New Haven, CT: Yale University Press, 1981.
- Guo, Xujun., and Hong Xu. "Statutory Map Development in Shenzhen." *Planners*, no. 6 (2007).
- Hack, Gary. "Planning Metropolitan Regions." In *Planning for a New Century*, edited by Jonathan Barnett. Washington, D. C.: Island Press, 2001.
- Hall, A. C. *Design Control: Towards a New Approach*. Oxford: Butterworth Heineman, 1996.
- Hall, Peter. *Urban and Regional Planning*. 3rd ed. London: Routledge, 1992.
- Henton, D. "Lessons from Silicon Valley: Governance in a Global City-Region." In *Global City-Regions: Trends, Theory, Policy*, edited by Allen J. Scott. New York: Oxford University Press, 2001.
- Hester, Randolph. *Neighborhood Space*. Stroudsburg, PA: Dowden, Hutchinson & Ross, 1975.
- Hillier, Bill, and Julienne Hanson. *The Social Logic of Space*. Cambridge: Cambridge University Press, 1984.
- Hoch, Charles J., Linda C. Dalton, Frank S. So, ed. *The Practice of Local Government Planning*. 3rd ed. Washington, D.C.: International City/County Management Association, 2000.
- Hommen, Leif, David Doloreux, and Emma Larsson. "Emergence and Growth of Mjärdevi Science Park in Linköping, Sweden." *European Planning Studies* 14, no. 10 (2006).

- Hopkins, Lewis D. "How Plans Work." In *Urban Development, the Logic of Making Plans*, edited by Lewis D. Hopkins. Washington, D. C: Island Press, 2001.
- IASP. "Survey of International Science Parks." International Association of Science Parks, 2002.
- . "Survey of International Science Parks." International Association of Science Parks, 2006-2007.
- Jacobs, Allan B. *Looking at Cities*. Cambridge, MA: Harvard University Press, 1985.
- Jacobs, Allan B. *Great Streets*. Cambridge, MA: MIT Press, 1993.
- Jacobs, Jane. *The Death and Life of Great American Cities*. New York: Vintage Books, 1961.
- Jenks, Mike, and Nicola Dempsey, ed. *Future Forms and Design for Sustainable Cities*. Amsterdam: Elsevier, 2005.
- Jin, Guangjun. "The Sustainability of Urban Design Outputs." *City Planning Review*, no. 3 (1999).
- Jing, Tihua; and Liu, Zhizong. "From Development Zone to a New Town: Beijing Zhongguancun Science Park." *Beijing Planning View* 1 (2006).
- Jones, John Chris. *Design Methods*. New York: John Wiley, 1992.
- Keeble, David. "High-Technology Industry and Local Environments in the United Kingdom." In *High Technology Industry and Innovative Environments: The European Experience*, edited by Philippe Aydalot and David Keeble. London: Routledge, 1988.
- Komninos, Nicos. *Intelligent Cities and Globalisation of Innovation Networks*. New York: Routledge, 2008.
- Krieger, Alex. "The Planner as Urban Designer: Reforming Planning Education in the New Millennium." In *The Profession of City Planning: Changes, Images and Challenges, 1950-2000*, edited by Lloyd Rodwin, and Bishwapriya Sanyal. New Brunswick, NJ: Center for Urban Policy Research at Rutgers, 2000.
- Kuang, Shi, Gary Hack and Zhongjie Lin. *Urban Design in the Global Perspective*. Beijing: China Architectural and Industrial Press, 2006.
- Lang, Jon. *Urban Design: A Typology of Procedures and Products*. New York: Architectural Press, 2005.

- . *Urban Design: The American Experience*. New York: Van Nostrand Reinhold, 1994.
- Larice, Michael and Elizabeth Macdonald, ed. *The Urban Design Reader*. London: Routledge, 2007.
- Li, Jinkui, and Zhanjun Liu. *Economic Motivation to Shenzhen High-Technology Industrial Park*. Shenzhen: Haitian Press, 2000.
- Li, Lingji, Ping Hu, and Lei Zhang. "Roles, Models and Development Trends of Hi-Tech Industrial Development Zones in China." *International Journal of Transport Management* 28, no. 3/4/5 (2004).
- Li, Zhang. *China's Limited Urbanization: Under Socialism and Beyond*. New York: Nova Science, 2004.
- Liang, Jiang, and Hui Zhao. "The Legalization of the Approval Procedure: The Essential to the Reform on the Regulatory System of Urban Planning with Shenzhen as the Case." *City Planning Review*, no. 7 (2000).
- Lin, George C. S. "State, Capital, and Space in China in an Age of Volatile Globalization." *Environment & Planning A* 32 (2000): 455-71.
- Lin, Justin Yifu, and Yan Wang. "China's Integration with the World: Development as a Process of Learning and Industrial Upgrading." In *World Bank Policy Research Working Paper WPS 4799*, 2008.12.
- Lin, Justin Yifu, Fang Cai, and Zhou Li. *China's Miracle: Development Strategy and Economic Reform*. Hong Kong: Chinese University Press, 2003.
- Lincoln, Yvonna S., and Egon G. Guba. *Naturalistic Inquiry*. Beverly Hills, Calif.: Sage Publications, 1985.
- Lindelof, Peter, and Hans Löfsten. "Academic Versus Corporate New Technology-Based Firms in Swedish Science Parks: An Analysis of Performance, Business Networks and Financing." *International Journal of Technology Management* 31, no. 3/4 (2005).
- Lindelof, Peter, et al. "Science Park Location and New Technology-Based Firms in Sweden--Implications for Strategy and Performance." *Small Business Economics* 20, no. 3 (2003).
- Link, Albert N., et al. "U.S. Science Parks: The Diffusion of an Innovation and Its Effects on the Academic Missions of Universities." *International Journal of Industrial Organization* 21, no. 9 (2003).

- Lozano, E. *Community Design and the Culture of Cities: The Crossroad and the Wall*. Cambridge: Cambridge University Press, 1990.
- Luger, Michael Ian, and Harvey A. Goldstein. *Technology in the Garden: Research Parks and Regional Economic Development*. Chapel Hill, N.C.: University of North Carolina Press, 1991.
- Lynch, Kevin. *The Image of the City*. Cambridge, MA: MIT Press, 1960.
- . *What Time Is This Place*. Cambridge, MA: MIT Press, 1972.
- . *A Theory of Good City Form*. Cambridge, MA: MIT Press, 1981.
- Lynch, Kevin, and Gary Hack. *Site Planning*. 3rd ed. Cambridge, MA: MIT Press, 1984.
- Ma, Bo-Qiang. "A Project for the 21st Century in China: Kwanghua Science Park." *International Journal of Transport Management* 16, no. 8 (1998).
- Madanipour, Ali. *Design of Urban Space: An Inquiry into a Socio-Spatial Process*. Chichester, UK: John Wiley & Sons, 1996.
- . "Roles and Challenges of Urban Design." *Journal of Urban Design*. 11, no. 2 (2008): 173-93.
- Mao, Qizhi, et al. "The State of China's Cities." edited by UN Habitat, 2010.
- Marcus, Clare Cooper, and Wendy Sarkissian. *Housing as If People Mattered: Site Design Guidelines for Medium-Density Family Housing*. Berkeley: University of California Press, 1986.
- Markusen, Ann. "Sticky Places in Slippery Space: A Typology of Industrial Districts." *Economic Geography* (1997): 293-310.
- Massey, Doreen, and Richard Meegan. *The Anatomy of Job Loss: The How, Why and Where of Employment Decline*. London: Methuen, 1982.
- Massey, Doreen, Paul Quintas, and David Wield. *High-Tech Fantasies: Science Parks in Society, Science and Space*. London: Routledge, 1992.
- McGlynn, Sue, and Paul Murrain. "The Politics of Urban Design." In *Urban Design Reader*, edited by Matthew Carmona, and Steve Tie. Burlington, MA: Architectural Press, 2007.
- Ming, Jun. *The National Mission: Focus on Zhangjiang*. Shanghai: Shanghai Science and Technology Literature Press, 2009.

- Moore, Gary T., D. Paul Tuttle, and Sandra C. Howell, ed. *Environmental Design Research Directions, Process and Prospects*. New York: Praeger, 1985.
- Moudon, Anne Vernez. *Built for Change: Neighborhood Architecture in San Francisco*. Cambridge, MA: MIT Press, 1986.
- . "A Catholic Approach to Organizing What Urban Designers Should Know." *Journal of Planning Literature* 6, no. 4 (1992.05): 332-49.
- Ni, Feng. "Spatial Development of High-Technology Industrial Parks: Zhongguancun Science Park as an Example." PhD Thesis, Tsinghua University, 2003.
- O'Mara, Margaret Pugh. *Cities of Knowledge: Cold War Science and the Search for the Next Silicon Valley*. Princeton: Princeton University Press, 2005.
- Park, S-C. "The Transformation of the South Korean Economy and International Economic Development in East and Southeast Asia." *International Planning Studies* 2, no.2 (1997).
- Park, Sam Ock. "Networks and Embeddedness in the Dynamic Types of New Industrial Districts." *Progress in Human Geography* 20 (1996): 476-93.
- Phillips, Su-Ann Mae, et al. "A Place for R&D? The Singapore Science Park." *Urban Studies* 40, no. 4 (2003).
- Pi, Qiansheng. *Introduction of Chinese Economic Development Zones*. Beijing: Sanlian Press, 2004.
- Porter, Michael E. "Location, Competition, and Economic Development: Local Clusters in a Global Economy." *Economic Development Quarterly* 14 (2000): 15-34.
- Preiser, Wolfgang F. E., ed. *Environmental Design Perspectives: Viewpoints on the Profession, Education, and Research*. Blacksburg: College of Architecture, Virginia Polytechnic Institute and State University, 1972.
- Priest, Donald. et al. *Large-Scale Development: Benefits, Constraints, and State and Local Policy Incentives*. Washington: Urban Land Institute, 1977.
- Punter, John. *Design Guidelines in American Cities: A Review of Design Policies and Guidance in Five West Coast Cities*. Liverpool: Liverpool University Press, 1999.
- Punter, John and Matthew Carmona. *The Design Dimension of Planning: Theory, Content, and Best Practice for Design Policies*. New York: E & FN Spon, 1997.
- Rowley, Alan. "Private-Property Decision Makers and the Quality of Urban Design." In *Urban Design Reader*, edited by Matthew Carmona, and Steve Tie. Burlington, MA: Architectural Press, 2007.

- Scheer, Brenda Case, and Wolfgang F.E. Preiser. *Design Review: Challenging Urban Aesthetic Control*. New York: Chapman and Hall, 1994.
- Seamon, David. "Phenomenology and Environment/Behavior Research." In *Advances in Environment, Behavior, and Design*, edited by E.H. Zube and Gary Moore. New York: Plenum Press, 1987.
- Shirvani, Hamid. *The Urban Design Process*. New York: Van Nostrand Reinhold, 1985.
- . *Urban Design Review: A Guide for Planners*. Washington, D.C: Planners Press 1995.
- Siegel, Donald S., et al. "Assessing the Impact of University Science Parks on Research Productivity: Exploratory Firm-Level Evidence from the United Kingdom." *International Journal of Industrial Organization* 21, no. 9 (2003).
- Simmie, James, et al. "Local Innovation System Governance and Performance: A Comparative Analysis of Oxfordshire, Stuttgart and Toulouse." *International Journal of Transport Management* 28, no. 3/4/5 (2004).
- Song, Xiaodong, and Jian Xu. "The Challenges of the Authority Decentralization-- Discussion on Administrative Mechanism of Urban Planning in Shanghai." *Urban Planning Review*, no. 6 (1999).
- Southworth, Michael. and Eran Ben-Joseph. *Streets and the Shaping of Towns and Cities*. New York: Mcgraw-Hill, 1981.
- Spirn, Anne Whiston. *The Granite Garden: Urban Nature and Human Design*. New York: Basic Books, 1984.
- Stake, Robert E. "Case Studies." In *Strategies of Qualitative Inquiry*, edited by and Yvonna S. Lincoln Norman K. Denzin, 134-64. Thousand Oaks: Sage Publications, 2003.
- Staudt, Erich, and Jurgen Bock. "Technology Centres and Science Parks: Agents or Competence Centres for Small Businesses?" *International Journal of Technology Management* 9, no. 2 (1994).
- Steiner, Frederick R., and Kent Butler. *Planning and Urban Design Standards*. Hoboken, N.J.: J. Wiley, 2007.
- Sternberg, Rolf. "Technology Centres in Germany: Economic Justifications, Effectiveness and Impact on High-Tech Regions." *International Journal of Transport Management* 28, no. 3/4/5 (2004).
- Storey, D. J., and B. S. Tether. "Public Policy Measures to Support New Technology Based Firms in the European Union." *Research Policy* 26 (1998): 1037-57.

- Sun, Wansong. *High-Tech Development Area Innovation and Competition Power*. Beijing: Chinese Economy Press, 2006.
- Suzhou Municipality, ed. *Recoding Suzhou: Stories of Suzhou Industrial Park*. Suzhou: Guwuxuan Press. 2009
- Suzuki, Shigeru. "Technopolis: Science Parks in Japan." *International Journal of Transport Management* 28, no. 3/4/5 (2004).
- Tian, Li. "Regulatory Detailed Planning in China: Dilemma and Solution." *City Planning Review* 31, no. 1 (2007): 16-20.
- . "The Thinking of the Status Quo and the Reform of the Urban Planning Control System." *City Planning Review* 25, no. 12 (2001): 30-35.
- Trip, Jan Jacob. "The Role of Urban Quality in the Planning of International Business Locations: The Case of Amsterdam Zuidas." *Journal of Urban Design* 12, no. 2 (2007): 275-93.
- Vale, Lawrence J. "Urban Design for Urban Development." In *The Profession of City Planning: Changes, Images and Challenges, 1950-2000*, edited by Lloyd Rodwin, and Bishwapriya Sanyal. New Brunswick, NJ: Center for Urban Policy Research at Rutgers, 2000.
- Vidler, Anthony. "The Third Typology." *Oppositions* 7 Winter 1976 (1976): 251-55.
- Walcott, Susan M. *Chinese Science and Technology Industrial Parks*. Aldershot, Hampshire: Ashgate Publishing, 2003.
- Wang, Ka. "Study on Process Supporting System of Urban Design." PhD Thesis, Zhejiang University, 2006.
- Wang, Lihong. "Agglomeration of Beijing Zhongguancun Science Park." *Investment and High-Tech Industry in China* 2006, 25-27.
- Wang, Jici and Jixian Wang. "An Analysis of New-Tech Agglomeration in Beijing: A New Industrial District in the Making?" *Environment & Planning A* 30, no. 681-701 (1998).
- Wang, Shifu. "Legal Protection on City Design." *Planners*, no. 4 (2003).
- Watson, Donald, ed. *Time-Saver Standards for Urban Design*. New York: McGraw-Hill, 2003.
- WCED, (World Commission on Environment and Development). "Towards Sustainable Development, Our Common Future." New York: Oxford University Press, 1987.

- Wei, Dazhi. *Important Factors of High-Technology Industrial Development: Shenzhen High-Technology Industrial Park as an Example*. Shenzhen: Haitian Press, 2002.
- . *What We Learn from High-Technology Industrial Development from Shenzhen*. Shenzhen: Haitian Press, 2000.
- Whyte, William H. *The Social Life of Small Urban Spaces*. Washington, D.C.: Conservation Foundation, 1980.
- Wolfe, Myer R., and R. D. Shinne. *Urban Design within the Comprehensive Planning Process*. Seattle: University of Washington, 1970.
- World Bank Report. "Global Economic Prospects 2009." Washington D.C.: World Bank, 2008.12.
- Wu, Fulong, Jiang, Xu, and Anthony G. O. Yeh. *Urban Development in Post-Reform China: State, Market, and Space*. New York: Routledge, 2007.
- Wu, Hequan "The Progress of Communication Technology Subject of Hi-Tech Research Development Plan of China." *International Conference on Communication Technology Proceedings 1* (2000).
- Xiong, Guoping. "The Legislation Study of Regulatory Detailed Planning." *City Planning Review*, no. 3 (2002).
- Xu, Guanhua. "Ten Years' Review on the Development of High-Tech Industrial Development Zones in China 1991-2001." Ministry of Science and Technology of China, 2001.
- Xue, Lan. "Promoting Industrial R&D and High-Tech Development through Science Parks: The Taiwan Experience." *International Journal of Technology Management* 13, no. 7/8 (1997).
- Yin, Robert K. *Applications of Case Study Research*. 2nd ed. Thousand Oaks, Calif.: Sage Publications, 2003.
- . *Case Study Research: Design and Methods*. 3rd ed. Thousand Oaks, Calif.: Sage Publications, 2003.
- Dongxue Yu, *Observation of Electronic Market in ZGC*, February, 2002, <http://www.ccidnet.com>
- Yuen, A.F. Foo, Belinda, ed. *Sustainable Cities in the 21st Century*. Singapore: Faculty of Architecture Building & Real Estate, National University of Singapore, 1999.
- Zhang, Tingwei. "Challenges to China's City Planning." *City Planning Review*, no. 6 (1997).

- Zhang, Wei-wei. *Transforming China: Economic Reform and Its Political Implications*. Basingstoke: Macmillan Press, 2000.
- Zhang, Weiying. "Law--a Behaviour Regulation through the Third Party." *Reading* 11 (2000): 76-81.
- Zhang, Yuehua. "Critical Factors for Science Park Development: The Case of the Singapore Science Park." *International Journal of Technology Transfer & Commercialisation* 4, no. 2 (2005).
- Zhao, Chuan. *Ten High-Technology Industrial Bases in Shenzhen*. Shenzhen: Haitian Press, 2002.
- Zhao, Jian and Su Liu. "Urban Design in Regulatory Detailed Planning." *City Planning Review*, no. 5 (1995).
- Zhao, Yanjing. " City Planning in the Perspective of Institutional Economic." *City Planning Review* 2005, no. 6, 7 (2005).

PUBLIC DOCUMENTS:

General Documents

National Bureau of Statistics of China, ed. *China High-Technology Industry Development Yearbook*. 2002.

———. 2003.

———. 2004.

———. 2005.

———. 2006.

———. 2007.

———. 2008.

———. 2009.

National Bureau of Statistics of China, ed. *China Statistics Yearbook*. 1980-1990.

———. 1991.

———. 1992.

———. 1993.

———. 1994.

———. 1995.

———. 1996.

———. 1997.

———. 1998.

———. 1999.

———. 2000.

———. 2001.

———. 2002.

———. 2003.

———. 2004.

———. 2005.

———. 2006.

———. 2007.

———. 2008.

———. 2009.

National Bureau of Statistics of China, ed. *China Torch Statistical Yearbook*. 2008-2009.

———. 2009.

Code for Design of Wastewater Reclamation and Reuse. 2003.

National Code for Planting Planning and Design on Urban Road, 1998.

National Code for Transport Planning on Urban Road, 1995.

Code for Urban Electric Power Planning. 1999.

Code for Urban Engineering Pipeline Comprehensive Planning. 1999.

Code for Urban Land Use. 1992.

Code for Urban Planning Engineering Geotechnical Investigation and Surveying. 1994.

Code of Urban Wastewater Engineering Planning. 2001.
Design Code of District Heating Network. 2003.
Standard for Basic Terminology of Environmental Sanitation. 1996.
Standard for Basic Terminology of Landscape of Architecture. 2002.
Standard for Basic Terminology of Urban Planning. 1999.
Standard for Market Planning of Town and Township. 2000.
Standard of Town and Village Planning. 1994.
Standard of Water Quality for City's Residential Use. 2002.
Urban Planning Formulation Regulation. 2006.
Urban and Rural Planning Law. 2008.

Beijing ZGC Science Park

Beijing Comprehensive Plan, 1993.
Beijing Haidian Park Development Yearbook. 2002.
———. 2003
———. 2004
———. 2005
———. 2006
———. 2007
———. 2008
Beijing High-Technology Industrial Development Plan 2001-2006.
Beijing Youth Daily (Newspaper)
Beijing Zhongguancun Science Park Development Record 1980-2009, 2010.
Development Plan of Haidian Park, 2001.
Dushiguangyu Co. Ltd. ed. *Report of Zhongguancun Science Park Real Estate Market, 2008-2010*.
Environmental Standards of Zhongguancun Science Park. 2005.
Regulations of Zhongguancun Science Park. 2001.
Regulation of Beijing Development Experimental Zone for New Tech and Industry, 1988.
Site Plan, Zhongguancun Software Park. 2001.
Site Plan, Zhongguancun West Zone, 2000

Shanghai Zhangjiang High-Technology Park

1995 Amendatory Structural Plan of Zhangjiang High-tech Park

1999–2020 Comprehensive Plan of Shanghai Municipality.

2010 Zhangjiang High-Technology Park Plan

Shanghai Statistics Yearbook. 1994.

———. 1995.

———. 1996.

———. 1997.

———. 1998.

———. 1999.

———. 2000.

———. 2001.

———. 2002.

———. 2003.

———. 2004.

———. 2005.

———. 2006.

———. 2007.

———. 2008.

———. 2009.

Shanghai Yearbook. 1996.

———. 1997.

———. 1998.

———. 1999.

———. 2000.

———. 2001.

———. 2002.

———. 2003.

———. 2004.

———. 2005.

———. 2006.

———. 2007.

———. 2008.

Pudong Yearbook. 2000.

———. 2001.

———. 2002.

———. 2003.

———. 2004.

———. 2005.

———. 2006.

———. 2007.

———. 2008.

———. 2009.

Several Provisions of Shanghai Municipality Promoting the Development of Zhangjiang Park, 1999.

Zhangjiang High-Technology Development Company Annual Report, 2007.

Zhangjiang High-Technology Park Development Company Regulations and Agreement of Transferring Land Use Right of ZJ Park, 1992.

Suzhou Industrial Park

Detailed Plan of Suzhou Industrial Park Phase 1, 1994

Comprehensive Plan of Suzhou Industrial Park Phase 2 and 3, 1995

Master Plan of Suzhou Industrial Park, 1994

Structural Plan of Suzhou Industrial Park Phase 2 and 3, 1995

Suzhou Industrial Park Development Guide Plan Phase 2, 1995

Suzhou Industrial Park's Development Strategy 2011-2015

Suzhou Industrial Park's Economics and Social Growth Plans 2011-2015

Suzhou Statistics Yearbook. 1994.

———. 1995.

———. 1996.

———. 1997.

———. 1998.

———. 1999.

———. 2000.

———. 2001.

———. 2002.

———. 2003.

———. 2004.

———. 2005.

———. 2006.

———. 2007.

———. 2008.

———. 2009.

Suzhou Yearbook. 1994.

———. 1995.

———. 1996.

———. 1997.

———. 1998.

———. 1999.

———. 2000.

———. 2001.

———. 2002.

———. 2003.

———. 2004.

- . 2005.
- . 2006.
- . 2007.
- . 2008.

Shenzhen High-Technology Industrial Park

Comprehensive Plan of Shenzhen Municipality 1996-2010.

Development Plan of High-Technology Industrial Belt in Shenzhen, 2010.

District Plan of Nanshan District in Shenzhen 2002-2010.

Land Use Plan of Shenzhen High-Technology Industrial Park, 1998.

Amends on Regulation of City Planning in Shenzhen Municipality 2001.

Shenzhen Statistics Yearbook. 1995.

- . 1995.
- . 2002.
- . 2003.
- . 2004.
- . 2005.
- . 2006.
- . 2007.
- . 2008.
- . 2009.

Shenzhen Yearbook. 1997-2009

- . 1998.
- . 1999.
- . 2000.
- . 2001.
- . 2002.
- . 2003.
- . 2004.
- . 2005.
- . 2006.
- . 2007.
- . 2008.
- . 2009.

Statutory Plan of Shenzhen High-Technology Industrial Park, East Part in Middle District, 2002.

Statutory Plan of Shenzhen High-Technology Industrial Park, East Part in North District, 2002.

Statutory Plan of Shenzhen High-Technology Industrial Park, South District, 2002.

Statutory Plan of Shenzhen High-Technology Industrial Park, West Part in Middle District, 2002.

Statutory Plan of Shenzhen High-Technology Industrial Park, West Part in North District, 2002.

WEBSITES:

General Website

Ministry of Science and Technology of China: <http://www.most.gov.cn/>

China Torch Plan: <http://www.chinatorch.gov.cn/>

Ministry of Housing and Urban-Rural Development: <http://www.mohurd.gov.cn/>

Beijing ZGC Science Park

Beijing ZGC Park Development Record: <http://yqz.zgc.gov.cn>

Changping Park in ZGC: <http://www.zgc-cp.gov.cn/chpy/>

Daxing Biomedical Industrial Base in ZGC: <http://www.bjcbp.com.cn/>

Desheng Park in ZGC: http://www.bjxch.gov.cn/pub/xch_zhuzhan/zjxc/B8/B8_4/B8_4b/

Electronic Technology Park in ZGC: <http://www.zgc-dzc.gov.cn/xcms/index.html>

Fengtai Park in ZGC: <http://www.zgc-ft.gov.cn/sites/outer/index.jsp>

Haidian District Government: <http://www.bjhd.gov.cn/>

Haidian Park: <http://www.zhongguancun.com.cn/hdyglwyh/>

Peking University Park: <http://www.pkusp.com.cn/>

Shijingshan Park in ZGC: <http://www.zgc-sjs.gov.cn/>

Tongzhou Park in ZGC: <http://zgc-tzp.bjtzh.gov.cn/>

Tsinghua University Park: <http://www.spmember.com/>

Yizhuang Economic Development Zone in ZGC: <http://www.bda.gov.cn/cms/>

Yonghe Park in ZGC: <http://www.bjdch.gov.cn/n1569/n2458434>

Zhongguancun Science Park: <http://www.zgc.gov.cn/>

ZGC Software Park: <http://www.zpark.com.cn/>

Shanghai Zhangjiang High-Technology Park

Caohejing New Technology Development District in Zhangjiang HIDZ:
<http://www.caohejing.com/>

China Textile Technology Park in Zhangjiang HIDZ: <http://www.cttc.sh.cn/>

Jiading Private Company High-technology Agglomeration Zone in Zhangjiang HIDZ:
<http://www.jdhitech.com/>

Jinqiao Modern Technology Park in Zhangjiang HIDZ: <http://www.jinqiao.gov.cn/>

Pudong New Area Development Committee: <http://www.pudong.gov.cn>

Shanghai University Park in Zhangjiang HIDZ: <http://www.sustp.shu.edu.cn/>

Zhangjiang National HIDZ: <http://www.sh-hitech.gov.cn/>

Zhangjiang Park Development Company: <http://www.600895.com/>

Zizhu Science Park: <http://www.zizhupark.com/>

ZJ Park: <http://www.zjpark.com/>

Suzhou Industrial Park

CSSD: <http://www.cssd.com.cn/>

Dushu Lake Higher Education Town: <http://www.sipedi.com/front/>

Dushu Lake Science and Educational Innovation District: <http://seid.gov.cn/yqkjcxw/>

Education Platform in SIP: <http://sipedu.sipac.gov.cn/>

Jinji Lake-side Center: <http://www.sipjinjilake.com/>

SIP: <http://www.sipac.gov.cn/>

SIP City Planning and Management Department: <http://yqcg.sipac.gov.cn/yqcg/>

SIP Design and Research Institute: <http://www.sipdri.com/>

SIP Environmental Production: <http://epb.sipac.gov.cn/>

SIP Land Investigation: <http://www.dpark.com.cn/>

SIP Plan and Construction: <http://www.dpchina.com/dpchina/>

SIP Science and Technology Development Center: <http://tech.sipac.gov.cn/>

SIP Train and Management Center: <http://tmc.sipac.gov.cn/>

Shenzhen High-Technology Industrial Park

Nanshan District Government: <http://www.szns.gov.cn/index.jsp>

Shenzhen Bureau of Planning and Management: <http://www.szplan.gov.cn>

Shenzhen Development and Reform Committee: <http://www.szpb.gov.cn/>

Shenzhen Science and Technology Department: <http://www.szsti.net/>

SHIP: <http://www.ship.gov.cn/>

National Scan

Anshan High-Technology Industrial Development Zone: <http://www.asht-zone.gov.cn/>

Baoding High-Technology Industrial Development Zone:
http://www.bdgxq.cn/portal/xzsp_xianqu

Baoji High-Technology Industrial Development Zone: <http://www.bj-hightech.com/>

Baotou Xitu High-Technology Industrial Development Zone: <http://www.rev.cn/>
Bengbu High-Technology Industrial Development Zone: <http://www.bbhnz.gov.cn/>
Changchun High-Technology Industrial Development Zone: <http://www.chida.gov.cn/>
Changsha High-Technology Industrial Development Zone: <http://www.cshtz.gov.cn/>
Changzhou High-Technology Industrial Development Zone: <http://www.czxd.gov.cn/>
Chengdu High-Technology Industrial Development Zone: <http://www.cdht.gov.cn/>
Chongqing High-Technology Industrial Development Zone: <http://www.hnzcq.com.cn/>
Daliang High-Technology Industrial Park: <http://www.ddport.com/>
Daqing High-Technology Industrial Development Zone: <http://www.dhp.gov.cn/>
Foshan High-Technology Industrial Development Zone: <http://www.fs-hitech.gov.cn/>
Fuzhou Science Park: <http://www.fzhitech.com/>
Guangzhou High-Technology Industrial Development Zone:
<http://www.getdd.gov.cn/web/html/ydy/>
Guilin High-Technology Industrial Development Zone: <http://www.eguilin.org/>
Guiyang High-Technology Industrial Development Zone: <http://www.gyhtz.gov.cn/>
Hainan International Science Park: <http://www.gkygfgs.com/>
Hangzhou High-Technology Industrial Development Zone: <http://www.hhtz.gov.cn/>
Harbin High-Technology Industrial Development Zone: <http://www.kaifaqu.com.cn/>
Hefei High-Technology Industrial Development Zone: <http://www.hefei-stip.com.cn/>
Huizhou Zhongkai High-Technology Industrial Development Zone: <http://www.hzzk.cn/>
Jiangmen High-Technology Industrial Development Zone: <http://gxq.jiangmen.gov.cn/>
Jilin High-Technology Industrial Development Zone: <http://www.jlhitech.gov.cn/>
Jinan High-Technology Industrial Development Zone: <http://www.jctp.gov.cn/>
Jingdezhen High-Technology Industrial Development Zone: <http://www.jdzgxq.com/>
Jining High-Technology Industrial Development Zone: <http://www.jnhn.gov.cn/>
Kunming High-Technology Industrial Development Zone: <http://www.kmhnz.gov.cn/>
Kunshan High-Technology Industrial Development Zone: <http://www.ksnd.gov.cn/>
Lanzhou High-Technology Industrial Development Zone: <http://www.lzhtp.gov.cn/>
Liuzhou High-Technology Industrial Development Zone : <http://www.lzgxq.com/>
Luoyang High-Technology Industrial Development Zone: <http://www.lhdz.gov.cn/>
Mianyang High-Technology Industrial Development Zone: <http://gaoxinqu.my.gov.cn/>
Nanchang High-Technology Industrial Development Zone: <http://www.nchdz.com/Index.shtml>
Nanjing High-Technology Industrial Development Zone: <http://www.njnhz.gov.cn/>
Nanning High-Technology Industrial Development Zone: <http://www.nnhitech.gov.cn/>

Nanyang High-Technology Industrial Development Zone:
<http://gxq.nanyang.gov.cn/structure/shouye/>

Ningbo High-Technology Industrial Development Zone: <http://gjgxq.ningbo.gov.cn/>

Qingdao High-Technology Industrial Development Zone: <http://gxq.qingdao.gov.cn/>

Qiqihar High-Technology Industrial Development Zone: <http://www.qkq.gov.cn/>

Shanghai Zhangjiang HIDZ: <http://www.sh-hitech.gov.cn/structure/>

Shaoxing High-Technology Industrial Development Zone: <http://www.sx.gov.cn>

Shenyang High-Technology Industrial Development Zone: <http://www.hunnan.gov.cn/>

Shenzhen High-Technology Industrial Park: <http://www.ship.gov.cn/>

Shijiazhuang High-Technology Industrial Development Zone: <http://www.shidz.com/>

Suzhou Industrial Park: <http://www.sipac.gov.cn/>

Taiyuan High-Technology Industrial Development Zone : <http://www.tyctp.com.cn/>

Tangshan High-Technology Industrial Development Zone: <http://www.tsgxq.gov.cn/>

Tianjin New Technology Industrial Park : <http://www.thip.gov.cn/>

Urumqi High-Technology Industrial Development Zone: <http://www.uhdz.gov.cn/>

Weifang High-Technology Industrial Development Zone: <http://www.wfgx.gov.cn/>

Weihai Torch High-Technology Industrial Development Zone: <http://www.whtdz.com.cn/>

Weinan High-Technology Industrial Development Zone: <http://www.whnz.gov.cn/>

Wuhan East Lake New Technology Industrial Park:
<http://www.wehdz.gov.cn/structure/index.htm>

Wuhu High-Technology Industrial Development Zone: <http://www.wuhu-tech.com/>

Wuxi New District: <http://www.wnd.gov.cn/>

Xiamen Torch High-Technology Industrial Development Zone: <http://www.xmtorch.gov.cn/>

Xi'an High-Technology Industrial Development Zone: <http://www.xdz.com.cn/>

Xiangfan High-Technology Industrial Development Zone: <http://www.xfhdz.org.cn/>

Xiangtan High-Technology Industrial Development Zone: <http://www.xtctp.com/>

Xinyu High-Technology Industrial Development Zone: <http://www.xyhdz.gov.cn/index/>

Yangling Agriculture High-Technology Industrial Zone: <http://www.ylagri.gov.cn/>

Yanji High-Technology Industrial Development Zone: <http://www.yjkfq.gov.cn/>

Yanjiao High-Technology Industrial Development Zone: <http://www.yanjiao.gov.cn/col/col206/>

Yantai High-Technology Industrial Development Zone: <http://www.ytgxq.gov.cn/>

Yichang High-Technology Industrial Development Zone: <http://www.yckfq.gov.cn/>

Yinchuan High-Technology Industrial Development Zone: <http://www.ycda.gov.cn>

Yinkou High-Technology Industrial Development Zone: <http://www.ykhi-tech.gov.cn/>

Zhaoqing High-Technology Industrial Development Zone: <http://www.zqgx.gov.cn/>

Zhengzhou High-Technology Industrial Development Zone: <http://www.zzgx.cn/>

Zhongguancun Science Park: <http://www.zgc.gov.cn/>

Zhongshan Torch High-Technology Industrial Development Zone:
<http://www.zstorch.gov.cn/2010cn>

Zhuhai High-Technology Industrial Development Zone: <http://www.zhhbi.com/>

Zhuzhou High-Technology Industrial Development Zone: <http://www.zzty.gov.cn/>

Zibo High-Technology Industrial Development Zone: <http://www.china-zibo.com/>

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