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The role of typomorphology in sustaining the cultural identity of Chinese cities: the case study of Nanjing, China

by
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A thesis presented in fulfilment of the requirements for the degree of
Doctor of Philosophy
April 2009

Declaration

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Abstract:

There are two research problems in Chinese urban studies and contemporary Chinese cities. Firstly, Chinese cities have a remarkably long and rich history, but Chinese urban forms have not been sufficiently examined. Secondly, at present, Chinese cities are experiencing rapid growth and transformation, which presents great challenges in terms of the maintenance of cultural identity in their urban forms. Therefore, the research intends to sustain the local identity of Chinese cities through a deep understanding of their urban evolution.

Inspired by both western architectural typology and urban morphology theories, the research establishes an integrated typomorphological approach for Chinese cities, aiming to reveal local synchronic types and typological processes of particular urban forms, and accordingly, generate design suggestions for the local context to maintain cultural continuity and create quality urban spaces. Nanjing is selected as the case study since it has a strong presence of historical urban forms. These are organised according to seven elements within a hierarchical framework: the general plan and silhouettes at the city scale; street networks, streets and urban blocks at the district scale; urban public spaces at the block scale; public buildings and houses at the building scale.

The research makes three contributions to the field of urban studies. The first one explains the transformation of the city over time, and enriches the documentary material on Chinese urban morphology. The second outcome is design suggestions for each urban element of Nanjing, which enable new developments to fit into the local context and achieve cultural sustainability. The third outcome is the development of typomorphology as a methodology that can be applied to other Chinese cities, helping them to sustain their cultural identities through urban design in future development.

Keywords: typomorphology, cultural identity, urban form, urban design, Chinese cities

Publications Arising

CHEN, F. & Romice, O. (2008e) Operative tradition: The typological process of an urban settlement in Nanjing, China. *Traditional Dwellings and Settlements Working paper series*, Vol 219.

CHEN, F. (2008d) Is traditional housing typology an alternative to the development of urban housing in China? *The seventh Urban Housing Conference Proceeding.* Chongqing, China, China Construction Industry Press. p.738-44.

CHEN, F. & Romice, O. (2008c) Preserving the cultural identity of Chinese cities in Urban Design through a Typomorphological Approach, *Urban Design International*, (forthcoming)

CHEN, F. (2008b) Typomorphology and the crisis of Chinese cities, *Urban Morphology*, Vol.12 p.45-7

CHEN, F. & Gu, K. (2008a) The Incorporation and Reciprocity of Architectural Typology and Urban Morphology in Urban Design. *Architect* (in Chinese, Forthcoming)

CHEN, F. (2007c) Sustaining the Cultural Identity of Chinese Urban Form: A Typological Approach in Nanjing, China. IN KEINER, M. (Ed.) *Sustainable Urban Development in China--Wishful Thinking or Reality?* Munster, Monsenstein und Vannerdat, p.143-161.

CHEN, F. (2007b) Typomorphology in Chinese Urban Design: The Evolution of Urban Public Space in Nanjing, China. IN VILLASCHI, J. & COSTA, S.D.A.P. (Ed.) *ISUF XIV International Seminar on Urban Form.* Ouro Preto, Brazil, Escola de Arquitetura da UFMG, Universidade Federal de Ouro Preto.

CHEN, F. (2007a) Typology in Urban Design: The Evolution of Blocks and Houses in Nanjing. *The Sixth China Urban Housing Conference Proceeding.* Beijing, China, China Construction Industry Press.p.629-39

Acknowledgement

It has been a wonderful journey of exploration and personal growth towards the PhD, which gives me precious life experiences of being independent, thinking critically, solving problems and even being depressed and struggling during the past years. I am very grateful to have people guiding, accompanying me or giving me a hand to complete such an important journey in my life.

First and foremost, my deep gratitude goes to my supervisor Dr. Ombretta Romice, who has been directing me in the academic labyrinth with great patience and tolerance. Her perspectives, experiences and constructive criticism helped me to overcome challenges and improve the quality of the thesis towards its most potential. I would like to thank my previous supervisor Professor Wolfgang Sonne, who guided me into the spectacular academic world and gave me continuous encouragements and thoughtful comments. The journey would not be possible without their generous help. I also give my thanks to Professor Alan Bridges, Professor Gordon Murray and Dr. Kai Gu for their useful suggestions and kind support.

Second, assists from friends during my data collection process in Nanjing and Suzhou were truly appreciated, who were Liu Yuan, Wang Xinyu, Ni Zhengyu, Cheng Jiajia, Liu Qingqing and etc. Colleagues and friends in Glasgow, Sumbul Ahmad, Mark Campbell, Zaharah Yahya, Nina Baker and Lingc Tan showed their kind support for both my research and life in the foreign country. The journey would be much more difficult without their company.

Finally I would like to express special thanks to my parents and husband. They generously gave their love and strong belief in my ability that everything is possible, which was always the driving force for me to continue the journey especially in hardship. My husband, who was always the first reader of my thesis, helped me to make my writing legible and showed his patience, dedication and passionate devotion, which was a fortune in my life.

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SECTION 1

FOUNDAMENTALITY OF THE RESEARCH

CHAPTER 1 INTRODUCTION

Many Chinese cities have been established and shaped thousands of years before, dating back to the origins of Chinese civilisation and the development of society. The physical urban forms of Chinese cities embody the historical complexity of social, cultural, economical and political status and their transformation. This thesis explores the transformation of Chinese urban forms over time and the underpinning of changes. The exploration helps to understand particular Chinese urban forms as contexts for contemporary urban developments. Places are closely related to time, affecting human senses and providing infrastructures to fulfil human needs. The understanding of places, encompassing physical built forms, is important for human inhabitants.

Future development of urban forms in one place based on the understanding of that context is believed to be rational and effective. As explained by Sitte (1889, p151), the study of the past forms should not 'republish ancient and trite ideas' and 'reopen sterile complaints against the already proverbial banality of modern streets', but to seek out how the past forms had achieved harmonious effects and other aesthetic qualities. Apart from the aesthetic point of view, the understanding of context leads to the awareness of regional specificities, for example, socioeconomic conditions and cultural backgrounds, and therefore effective response to the particularities.

In China, extensive understanding has not yet been sufficiently gained by contemporary design professions and local authorities. Many historical Chinese cities are currently under great pressures of modernisation, urbanisation and globalisation. Although various conservation policies and projects have been launched and conducted, they protect and restore traditional urban forms at very limited scales, and have limited impact on new developments. Meanwhile, architectural forms which travel world-wide have landed in almost all the Chinese historical cities and gradually changed the appearance of them. As a result, the identities of those Chinese cities have become vague and been erased.

A scientific approach named typomorphology is developed and employed in this study for the purpose of understanding the development of Chinese urban forms and sustaining the cultural continuity. This approach was initially established in the western world two hundreds years ago. The theory has been developed and experimented on various contexts of western cities. The current problems faced by the development of Chinese cities—a limited understandings of urban forms and the loss of identities—have been encountered in the western context before. Therefore, the hypothesis of this research is whether the theory of typomorphology can be applicable and benefit Chinese cities. The study thus is an experiment to prove the hypothesis and to solve the problems. The hypothesis will be tested in a selected Chinese city as a case study to reveal applicability of findings throughout China.

In this chapter, the Chinese context of traditional built environments will be introduced in general to clarify the first research problem being the lack of understanding of the splendid cultural history and physical legacies of cities. Traditional concepts in Chinese urban design and planning will be addressed since they were the main driving forces for the formation of traditional urban forms. Thereafter, the crisis and challenges that contemporary cities are facing will be addressed as the second research problem for this study. A discussion on the relationship between 'identity' and 'tradition' elucidates the definition of identity and the importance of a local tradition. Based on the two problems in the urban study and design of Chinese urban forms, the objectives and possible findings of this research will be explained as the initiatives in this chapter.

1.1 Chinese cities as traditional built environments

1.1.1 Traditional Chinese urban forms

China is one of the world's largest countries with over 9,600,000 square kilometres land crossing the East Asian landmass bordering the East China Sea, Korea Bay, Yellow Sea and South China Sea. The coastline on the country's east extends 14,500 kilometres from North to South. The eastern half of the country has fertile lowlands, foothills and mountains, while the western half of the country is a region of sunken basins and rolling plateaus. The climate of China is greatly diverse: subtropical in the

south, subarctic in the north, and is dominated by monsoon winds. The geographic vastness and variety influences extremely diverse built forms (Liang, 1998).

Chinese urban development and planning has a remarkable long tradition (Appendix 1). The Chinese civilisation germinated in the middle and lower reaches of the Yellow River on the northern plains, and developed in the lower reaches of the Yangtze River on the eastern plains six or seven thousand years ago (Figure 1.1). The early settlements or clays were shaped for agriculture, animal husbandry and fishing. The first city[1] in China named Erli Tou was established in Henan province in the late Xia Dynasty (1600s BC) (Zhuang and Zhang, 2002). The city had two large scaled rectangular palaces, several streets and handcraft factories. The domestic archaeological investigation discovered that cities had three-fold city walls and palaces during the Shang Dynasty (1600-1066 BC). China was occupied by many small kingdoms during the Western Zhou period (1066-221 BC), when the social and political system was slavery, and they were united by the first emperor of the Qin Dynasty (221BC-206 BC). The earliest urban planning concept, which will be introduced in the later paragraphs, was formed during the Western Zhou period, which was the *Artificers' Record*[2] in the *Zhouli* (*Record of the rites of Zhou*).

Along with the social transformation from slavery to feudality in the Qin Dynasty, ancient urban forms had been developing on the basic concept suggested in the *Artificers' Record.* Early Chinese cities were rectangular, centred with a palace and walled. Influenced by the division of agricultural fields, cities were divided into regular lands by s grid street system. Before the period of Three Kingdoms (220-280

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[1] The criteria for 'city' were five: a city should occupy a certain large amount of land; a city should have large scaled building groups such as palaces and temples; a city should have market places for trading and commercial activities; a city should have basic infrastructures such as streets and drainage system; a city should accommodate certain large amount of population. ZHUANG, L. & ZHANG, J. (2002) *Zhongguo chengshi fazhan yu jianshe shi (The History of Development and Construction of Chinese Cities),* Nanjing, Southeast University Press.

[2] The author of the book is unknown, and the book is written probably in the Western Han period, which contains materials from the Western Zhou period. The modern version of the book is reprinted in 1980 by Zhonghua Shuju in Beijing.

AD), cities had merely axes along palaces or important ritual buildings, and since that period, central axes had been developed to cross the entire city (Wu, 1990).

Figure 1.1 The geographic map of China

During the period of 220 to 907 AD (the Three Kingdoms to the Tang Dynasty), feudal economy over the region of China had reached a climax, while urban lands had expanded towards the south along with some grand infrastructural constructions such as the Great Canal (610AD) in the Sui Dynasty. Urban population increased dramatically and exceeded a million in three Chinese cities: Jiankang (Nanjing as its modern name), Chang'an and Luoyang as capital cities of the Sui and Tang Dynasties.

The city of Chang'an was important in the history of Chinese urban development because it was built strictly following the traditional concepts of urban planning and

design. The city construction started in 582 AD and was completed one year later during the Sui Dynasty. It occupied a 4.2 square kilometres land, and was 2820 meters long in the east-west direction and 1492 meters long in the north-south direction. The city had a rigid rectangular shape, and the land was divided into square or rectangular Lifangs[3] as a residential organisation system by streets in a grid pattern. Lifangs were 515 by 515 meters, 515 by 662 meters and 515 by 955 meters. The city was symmetrical along a central axis across the palace on the north. Two market places were allocated in east and west of the city, each of which occupied one Lifang (Liang and Sun, 2003) (Figure 7.1).

Since the Song Dynasty (960-1279AD), trading activities were not restricted to allocated market places but distributed in cities along with the continuously developed economy. As a result, the Lifang system had been broken down and cities were commercialised. Traditional industries had emerged in cities in the east of China, for instance, the textile industry in Suzhou, the ceramics industry in Jingde Zhen, the rice processing industry in Wuxi and etc. Although changes occurred during this period, the basic pattern of traditional cities had been maintained. However, cities emerged under industrial or commercial development did not always follow the ancient concepts of city planning, for example, the city of Jingde Zhen (210s AD), which was established as a result of the ceramics industry, was in an irregular pattern. Other variations of general layouts also could be found in small Chinese cities and towns.

The ancient concept of capital city planning and design continued and was inherited in the later Yuan (1260-1368), Ming (1368-1644) and Qing (1644-1911) Dynasties. The capital city 'Yuan Dadu' of the Yuan Dynasty located in Beijing was an example. The city had three-fold walls, which enclosed the three building groups: the palace, the imperial city and the prefecture city. The layout was rectangular, contained grid street networks and a central north-south oriented axis, which was across the palace to emphasise the political power of the emperors. During the Ming

[3] The residential organisation system—Lifang will be further discussed in Chapter 7.

and Qing Dynasties, capitalism germinated in Chinese cities because of the great progress of industrial technologies and the increase of social division of labours (Wu, 1990). Previously family-run industries were enlarged, and commerce was the dominant activities. Although economic and social conditions of Chinese cities changed, the urban forms did not change much during this period due to the overwhelming feudal political power. This situation started to change since the Opium War in 1840.

In the late nineteenth century and early twentieth century, Chinese cities were affected by the outside world. With a few social reforms launched by some governmental officers of the Qing Dynasty, such as the 'Yangwu Campaign' (1860-1894), western modern technologies started to be used in both the domestic military and industries. Modern railways and roads were constructed, and urbanisation expanded towards suburbs of old city cores. Early industrialisation had also appeared in some Chinese cities in the eastern China. Meanwhile, some large Chinese cities, such as Qingdao, Dalian, Shanghai, Nanjing, Guangzhou and etc, opened treaty ports for international trading. Western concepts of urban design and planning had been implemented directly by western colonists in treaty ports, which changed traditional urban forms of them. For instance, the urban planning of Dalian followed the western Beaux-art tradition with radial street networks (Zhuang and Zhang, 2002). Similar development occurred in Changchun, Qingdao, Harbin and so forth. Furthermore, the nationalist government had adopted the Modernism idea and implemented them to some Chinese cities, such as Nanjing. The detailed planning actions will be addressed in the case study.

To sum up, the traditional urban forms of Chinese cities had the greatest degree of cultural continuity and absorbed limited outer impact until the late nineteenth century. They had been maintained continuously for thousand years (Liu, 1989, Gaubatz, 1998, Liang, 1998). At present, traditional urban forms are still prevalent in many contemporary cities, which will be identified in Chapter 3. They provide the physical context of traditional built environment for future developments, which can not be ignored.

1.1.2 Traditional concepts in Chinese urban design and planning

The physical urban forms of Chinese cities were a representation of the historical Chinese society, which embodied the profound Chinese culture including cosmology, philosophy, social custom and political regulations. The above briefly described traditional Chinese urban forms were established by these forces. The following paragraphs address the traditional cosmology, philosophies and social conventions as the influential factors of traditional Chinese urban forms, which were working at the same time throughout the entire feudal period (221 BC—1911).

1.1.2.1 Cosmology (Daoism)

The ancient Chinese cosmology was strongly related to the attitude towards nature. Chinese people believed that 'man emerged from the bowels of the earth like any mountain or plant, and therefore was one of them in spirit. Hence his love of antique tradition and the worship of ancestors, for the spirits in all nature were friendly' (Jellicoe and Jellicoe, 1975, p68). They believed that nature had the most power and inherent self-organising order, which was obeyed by every creature and natural settings such as human being, the sun, and the moon. The best explanation of the relationship between nature and human being was Daoism.

The philosopher of Daoism was Lao Zi, who lived in the fifth century BC, as Confucius. The basic idea of Daoism is the search for harmony between human actions and the world through the study of nature. Dao is 'the way', which implies the ordering principle of creatures and the world and inherent pattern of nature. An important life attitude of Daoism to face the reality is 'to be content to accept the negative side of being as well as the positive side, and to leave completion to nature'(Chang, 1981, p4). This attitude is regarded as largely 'anti-rational' and 'anti-authoritarian' (Moffett et al., 2003, p88). Furthermore, another important principle of Daoism is the need to keep the balance between 'Yang' and 'Yin', which is essential for the balance of nature, human body and the universe. 'Yang' and 'Yin' represent the male force and the female force respectively, and the two fundamental meta-elements composing the physical world.

The influence of Daoism on Chinese painting, landscaping and garden design was encompassing. For instance, according to Jellicoe (1975, p69), 'the basic elements of Chinese landscape were that of rock, hill or mountain ('Yang') and still water ('Yin'). All perceived forms were thought to be forms of cosmic forces with certain characters combining 'Yin' and 'Yang'. Gardens were then planned for every mood and occasion, daylight and moonlight, all the year around, and for mist, rain or clear skies. Boundaries were subdued or eliminated, for the imagination must roam in worldly space as well as that of spirit. Stillness was essential, for the gardens were for meditation, conversation and poetry-reading; and all were fragrant with trees, flowers and shrubs.

1.1.2.2 Fengshui

Influenced by the cosmology embodied in Daoism, Fengshui is 'the understanding of how the geographical features of a site and its topography affect buildings internally and externally'(Lip, 1995, p61). The analysis of the morphological and spatial expressions of the cosmic breath (Shi) in the surface features of the earth, which changes from place to place and from time to time, constituted the Fengshui theory, and the art of adjusting the features of the cultural landscape in conjunction of forms is favourable (Wheatley, 1971). 'Shi' was what Chinese ancestors believed to be the energy of the universe, existing in the entire environment or a single tree. An urban artefact could gain fortunes if it was in a good location and orientation to have 'Shi', which could also benefit the people within. Therefore, Fengshui was important for site selection, plan orientation and opening position in a building in historic Chinese urban planning and architectural design. For example, the ideal site of a city was heading the mountain, being surrounded by a river and facing the shield. Similarly, a house were against water, facing a street (He, 1988). It is because mountains are able to obstruct the north wind that is cold and dusty, while a house can receive sunshine and warm wind by facing the south.

1.1.2.3 Confucianism (Lizhi)

Confucianism, as the orthodox philosophy promoted by feudal governments, had been dominating the feudal Chinese society from the Qin Dynasty (221-206 BC). Its influence on every aspect of the society was intensive, especially on urban planning

and architecture. Confucius systematised earlier rites and ideas into a moral code of social behaviour (Jellicoe and Jellicoe, 1975). Chaos, absence of officially sanctioned and enforced rules was seen as the greatest evil to be prevented (Murphey, 1984). By contrast to Daoism, Confucianism proclaimed 'rational', 'authority' established by the state, and the metempsychosis as Buddhism, the latter of which was introduced into China from India during the Tang Dynasty. Moreover, it advocated the order of the world, which consisted of the heaven, the earth, emperors, ancestors, masters and common people as positional descending in society. The social hierarchy promoted by Confucianism was the reason why emperors canonised this philosophy and employed it as a social moral code, which was called Lizhi (the social hierarchy).

In terms of urban planning, the feudal ideology of Lizhi was shown in the ideal city planning recorded in the *Kaogong Ji* (The *Artificer's Record*, 5th BC) as mentioned before, which materialised the mixture of patriarchal system promoted in Confucianism. According to Moffet's translation,

'*A capital city should be oriented to the cardinal directions and have a square plan roughly 4000 feet on each side. In the wall that surrounds the city, there should be three gates in each side, and roads projecting out from these establish the grid of the city's plan. The central road on the south is the entrance for the major thoroughfare, nine cart lanes wide, which runs north to the palace complex. The palace itself is walled off from the rest of the city, preceded by an impressive courtyard and flanked by place of worship: the ancestral temple (to the east), and an altar to the earth (to the west). The city's marketplace is to the north of the palace compound. Otherwise, there are no public open spaces. Walls and a moat around the city provide protection from enemies without, while walls around the palace and residential blocks establish barriers that clarify the social hierarchy.*' (Moffett et al., 2003, p93) (Figure 1.2)

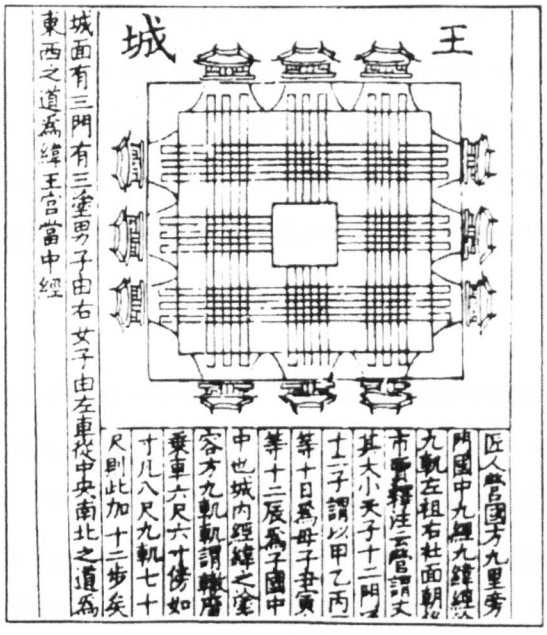

Figure 1.2 The Ideal City Plan recorded in Kao Gong Ji (Wu, 1985, p4)

The ancient concept of city planning was an obvious reflection of the Lizhi system, because it stipulated different scales of the city for emperors, for feudal lords and those of the princes. The areas of cities, the heights of city walls, the widths of roads were scaled down as ranks became lower. Furthermore, strict regularity was emphasised in the general layouts of cities. Later this was regarded as a model for building capitals of all successive dynasties with few innovations (Wu, 1985).

1.1.2.4 Symbolism

In China, ancient cities or buildings were meant to imitate Celestial archetypes, and the planning success was dependent upon symbolism (Wheatley, 1971). This concern came from the ancestors' respect of nature. Natural forces were significant for the agricultural society, which inspired highly developed astronomic observation and mythologies. Furthermore, they conceived nature as an extension of their personalities and spontaneously apprehended it in terms of human experience, thus 'the real world transcended the pragmatic realm of textures and geometrical space, and was perceived schematically in terms of an extramundane, sacred experience' (Wheatley, 1971, p416). The Chinese ancestors considered that the heaven was round and the earth was square, which was then reflected in city plans to be rectangular. Furthermore, they divided the square earth into nine continents and gave

the most emphasis on the central one, which belonged to the emperors. The ideal city plan in the *Artificers' Record* was an example. There were monumental architecture in the emperor's city—the palace was the symbol of imperial presence, which was centred on the official buildings and the temple of the god, they were 'firmly anchored in both temporal and spiritual authority' (Friedmann, 2006, p264) (Figure 1.2).

Individual houses were also a symbol of the patriarchal system at the family level according to the Confucian principles of ancestor worship and respecting one's elders. Harmony and rituals generated the layout and axial form of traditional courtyard houses. The square and symmetric shape of a house was 'a symbol for peace and eternal stability retreating from the world outside' (Liu, 1989, p83). The axial alignment of rooms embodied the elders' authority and centrality within the family. In addition, the symbolic meaning sometimes was represented by totemic imitation of deiform animals such as turtle and fish, or the Chinese characters, which implied the auspicious and prosperous wishes.

During the four thousand years of feudality, political forces played a very important role in the urban development. The emperor power reinforced the implementation of the philosophies and symbolism in urban forms, for instance, the Lifang system, which divided urban lands into squares to imply the social order and the shape of the earth.

The ancient cosmology, Daoism, Confucianism, Fengshui and Lizhi together have determined the general urban forms of traditional Chinese cities. Chinese people have created two dramatically different kinds of designs. One was the romantic, irregular and asymmetrical landscape, while the other was the rational, geometric, symmetrical physical forms. The concerns of the balance between manmade world and nature, and the symbolic meanings of every aspect of urban architecture are the essence of traditional concepts of Chinese urban planning and design.

1.1.3 The first research question

Despite having remarkably long and rich history, the urban developments of Chinese cities have not been sufficiently examined. Little urban research was produced in print before the 1920s and 1930s, mainly by the first generation of Chinese scholars who had been educated in the West. It was not until well after the Second World War, when publications on urban form studies became more numerous (Whitehand and Gu, 2006). Chinese architectural research including building principles, grouping rules and techniques were much more focused than the research of urban environments in the early twentieth century (Liang, 1985, Liu, 1989). In the latest ten years, the quantity of research of Chinese urban forms conducted by both Chinese and foreign scholars is comparable with that in the previous fifty years (Whitehand and Gu, 2006). However, the published research described accurately as 'urban morphological study'[4] in China has not been given adequate attention by scholars until the 1990s (Zheng and Lin, 2002). The methodology used in previous research on Chinese urban forms was not systematic and comprehensive, either merely describing the major shape and structure of a city (Wu, 1990, Hu, 1995), or explaining the various forces that determine the urban changes (Han, 1998, Duan, 1999), or modelling the growth of cities according to physical or mechanical theories (Huang, 2004). Those researches have no direct link to design practices.

Moreover, the historical records of Chinese urban forms, for instance, urban maps containing accurate information of block and plot boundaries, resource of historical houses and etc, are almost absent, because traditional Chinese architecture was made of timber, a less durable material than stones and bricks. Consequently, they were largely destroyed in the continuous wars occurring in late feudal and modern time. For instance, the city of Suzhou had been massively destroyed during the late Sui Dynasty (Chen, 2006). The second reason is that the way of producing maps in feudal era was largely different from today, by which only important civic buildings, streets and surrounding natural settings were portrayed but not in scale, for example,

[4] Urban morphological study refers to the study of urban forms using the theories of urban morphology and typology, which are developed in the West. The theories and their development will be addressed in detail in Chapter 2 and Chapter 3.

the map of Chang'an in the Tang Dynasty and the map of Kaifeng in the Song Dynasty (Wu, 1985). During the early socialist era, records of land and property ownership, which is important for defining land use pattern and plots, have been destroyed as legacies of feudalism. Therefore, historical maps showing accurate morphological information were greatly absent. Only during recent decades, municipal governments started to survey numerous cities and produce scientific maps, however, they are far from sufficient (Whitehand and Gu, 2006).

Appropriate field surveys and scientific examinations of the transformation of Chinese cities are urgently needed to trace their history, and benefit future developments. Therefore, the first research question related to the problem of lack of studies and understanding of Chinese traditional urban forms is: how do Chinese physical urban forms develop and transform over time?

1.2 The crisis of contemporary Chinese cities

1.2.1 The transformation of Chinese cities

A few social reforms[5] and economic growth have brought China into a new era of drastic development since the beginning of 20th century, especially the recent three decades. The previous feudal social structure has been interrupted by the concussion of various outside forces equipped with new technologies. After the scrimmage of over half a century, urban developments over the country was extremely slow. Industrialisation and modernisation have become the mainstream of the society after the P.R.C. (People's Republic of China) was founded (1949). Before the 1970s, the function and productivity of buildings was the major concern because of the increased urban population and sprawled industries. As a result, harsh concrete boxes were being built fast over the country regardless of different functional types, contexts and aesthetics. Furthermore, with the influence of soviet socialism ideology and several unrealistic social reforms during the 1950s to the 1970s (Xie and Costa,

[5] Social reforms carried on in China since the early 20th century include the Republic of China founded (1912), P.R.China founded (1949), the country's five-year plans and etc. Some important social reforms in relation to urban forms are addressed in the following paragraphs.

1993, Wang and Gao, 2002, Wu and Ma, 2007), the general Chinese urban forms have been transformed, especially in big cities, because early investments by the socialist state in industrial development were concentrated in those cities and satellite towns on the eastern coast line. For instance, Danwei, the work unit which was at the core of Mao's vision for a socialist city of production, had been largely built in the East coast cities. One Danwei, which was walled, contained multiple functions aiming to completely fulfil workers' needs from their birth to their death (Friedmann, 2006). This social system altered cities to become isolated small societies[6]. The state's investments resulted in a gradual rise of urban populations in these cities as well.

Along with the launch of a social and economic reform—the 'Open Door' policy (1978), the new market-oriented economy has largely changed the direction of urban development in China, such as the policy for foreign investment and trades, which has brought numerous economic opportunities for China (this period is called post-reform era). Increasing economic development has been accompanied by many changes in the urban pattern, for instance, suburbanisation in big cities such as Beijing and Shanghai. The suburbanisation resulted in parting from the displacement of permanent city residents from city cores to suburbs due to renewal activities by the state. Also, new housing vastly increased and was located in suburbs because of the availability and price of land (Logan, 2002). Additionally, the relaxed attitude to population movement and the granting of official permission to former urban residents to return to cities[7] have resulted in a sudden increase of urban population during 1978-81 (Sit, 1985).

At the later stage of the post-reform era, on one hand, large industries were removed from city cores due to environmental reasons and the increasing land price in city centres; on the other hand, large amount of developing zones were built up at suburbs

[6] Detailed explanations of Danwei system can be found in Chapter 7.

[7] At the end of 1968, Mao issued a call to send urban youth to the countryside and in 1969 started the massive organised urban-rural population movement—'Shang Shan Xia Xiang'. The aim of this movement was to train the mental and physical abilities of urban youth by doing heavy field works.

of big cities to accommodate industries during the past two decades. Furthermore, contemporary phenomenon of rural migrants has drawn great attention of Chinese scholars (Fan and Tanbmann, 2002). Migrants from the countryside largely moved to cities to seek job opportunities. Due to the low level of education and skills, migrants largely concentrated in urban fringes and facilitate social inequality and spatial segregation, for instance, the urban villages (Wu, 2004). High-quality new housing is continually developed in suburbs to fulfil the housing market. Driven by profits, international style building models are largely applied to contemporary developments at enormous scales. The transformation of spatial structures in Chinese cities has been concluded by Wu (2002) (Figure 1.3).

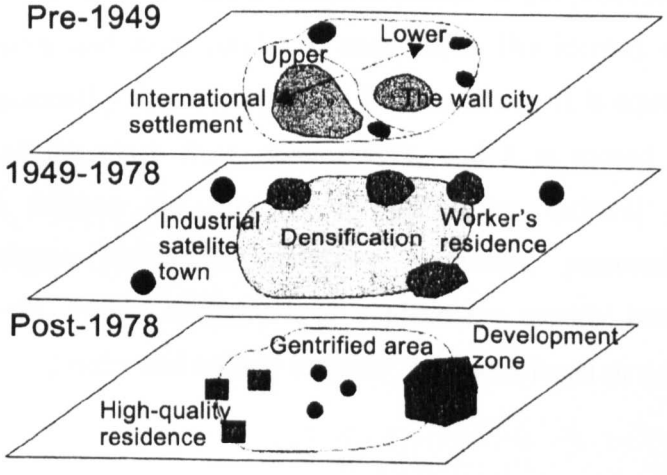

Figure 1.3 The urban spatial structures in three periods of China's urban development (Wu, 2002, p164)

At present, the urban image of contemporary cities is, 'glittering office buildings and skyscrapers in the financial district and Central Business Districts (CBDs), foreign retail outlets and shopping complexes, clustered suburban villas and downtown condominiums, development zones, high-tech, university and science parks, dilapidated workers' villages and migrant enclaves' mixing together (Wu and Ma, 2007, p268). The contrast of scattered historical remains and the overwhelming massive new urban forms in Chinese cities is striking. The cultural legacy of cities is threatened by the up-growing mega structures and standardised architecture. The intensive globalisation, fuelled by the rapid economic growth, with materials globally sourced, design ideas globally disseminated, and development guidelines

based on the principle of a supposed universal rationality, make traditional Chinese cities more and more like everywhere else.

Why the sameness or placelessness of the Chinese urban forms is negative for the society? What is the right attitude towards place identity and cultural tradition? These questions are the premises of the Chinese typomorphological study.

1.2.2 'Identity' and 'Tradition'

Driven by technological and economic processes, globalisation implies de-localisation, standardisation, interconnectedness, mobility and homogeneity (Eriksen, 2007). As far as urban forms are concerned, places in the process of globalisation are developed more and more similar to each other. The identity of a place is the character and personality that distinguishes it from others. It is equal to locality and distinctiveness of the place from other places, and it is rooted in a space-time framework and follows the contours of geography, cultural projects, power apparatuses, religion revelation, collective memories, personal fantasies and meanings (Castells, 1997). Characters of a place are usually interpreted by 'the building form, topography and natural features' such as a canal or a river (Wu, 1999, p279).

The main reason why the identity of a place is so important is that it is strongly related to the inhabitants' sense of belonging to the place and community membership. It is argued that when people talk about the identity of a place, they usually have in mind some sort of meanings the place has in terms of their own identity: how the place affects the way they conceive themselves, or how they imagine it will affect the way other people will conceive them (Watson and Bentley, 2007).

For Chinese historical cities, the identities lie within their local traditions and are embodied in traditional urban forms, because the built forms crystallises meaningful cultural patterns that are differentiated according to the medium and the circumstances imposed on respective human expression (Giddens, 1991). According to Kevin Lynch, the sense of well-being of an individual depends on the stable

references from the past forms that provide him or her with a sense of continuity. Historical cities, as the 'collages of time', are the very references connecting past, present and future (Lynch, 1972, p235). Historical cities represent a familiarity, stability and links to the past, which are not simply collections of ancient relics, but hold meanings of the local culture[8]. The formation of traditional forms (types) is a process of interpreting local culture (Gauthier, 2005). Therefore, meanings of a community, collectiveness and personal consciousness are embedded in traditional urban forms. The distinctiveness of traditional urban forms, urban and spatial aspects, sense of place and lifestyle, represents ownership to local communities through a sense of territorial belonging (Serageldin et al., 2001).

Apart from the merit of cultural representation, traditional forms use natural resources, and regard the natural properties, qualities and limitations of materials. Furthermore, traditional buildings have 'simple geometric, logical and rational forms and spaces', which are easily identifiable and with human-oriented proportions (Papadakis and Steil, 1987, p6).

The attempts of searching for identity within built forms have already begun with the so called Postmodernism against Modernism in the 1970s[9]. Since Modernism called univalent buildings regardless of regions and cultures, Postmodernists advocated, in terms of urbanity, 'a centre, a usable past, a sense of community, vernacularism, cultural diversity, meanings, origins and roots', which focus on a place itself and its past (Ellin, 1996, p5). In the scope of Postmodernism, an architectural movement—Contextualism, represented by Robert Venturi, suggested that forms should respond to their contexts and 're-establish the intimate and mutual comprehension between

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[8] Amos Rapoport defines culture as a way of lifestyle, a particular way of doing things; a system of symbols, meanings and cognitive schemata transmitted through symbolic codes; a set of adaptive strategies for survival related to the ecological setting and its resources RAPOPORT, A. (1984) Culture and the Urban Order. IN AGNEW, J. A., MERCER, J. & SOPHER, D. E. (Eds.) *The City in Cultural Context.* Winchester, USA, Allen & Unwin. p50

[9] According to Charles Jencks, modern architecture died in St. Louis, Missouri on July 15, 1972 along with the failure of the Pruitt-Igoe housing scheme. JENCKS, C. (1991) *The Language of Post-Modern Architecture,* London, Academy Editions.

architects and clients to achieve plural coding' (Connor, 1989, p82). Another approach to the identity of forms was Historicism, which reinstated traditional forms, and produced historical simulations. Gottfried Semper (1803-1879) was a representative of this doctrine, which considered his work was part of a continuous process of cultural evolution and revitalised historical architectural elements, such as Greek architecture, Gothic architecture and etc, in his design (Hvattum, 2004). Moreover, the approach called Critical Regionalism combined the attention to context and the attention to history of a place. Regionalism is 'a source of inspiration for form-givers to respond to regional factors' (Ali, 1985, p92), which make Modernism more palatable for local consumption. Critical Regionalism, defined by Kenneth Frampton in the late 20th century, is an attitude towards architecture that resisted the tendency to flatten out cultural differences into the uniformity of a universal language of forms. It is not a simply nostalgic, but sensitive to the regional inflections of climate and geography, as well as local traditions. Critical Regionalism 'alerts us to the homogenising and often placeless nature of Modernity, while attempting to reinforce a contemporary and phenomenological-based authenticity—one that is more representative of places and local constraints' (Kelbaugh, 2007, p183). Additionally, Neo-rationalism is another thought to search for specificity of regional and historical architectural and urban forms, which generates the theory of typology in the European continent in the 1960s and 1970s (Chapter 2 and 3). These theories mentioned above were trying to search for identities in urban forms, either through historical analysis or regional adaptation.

The perception of identity of local urban forms is closely related to two urban qualities—imageability and legibility (Lynch, 1981), which assure the inner logic and architectural language understandable for people, and express the social value and cultural meanings. Legibility allows people take advantages of grasping the place's layout and make choices. It can be achieved through the visibility of Lynch's five urban elements—nodes, edges, paths, districts and landmarks when people travel around the city (Bentley et al., 1985). Imageability of an urban form is formed by 'the intensity and singularity of their apparent movement, contour, size, shape, surface, quality and signs' (Appleyard, 1980, p138). Imageability is one of the

reasons that people can recall and remember a place. These qualities are also found in traditional Chinese cities, as will be illustrated in the later chapters.

In sum, the identity of a place is important for society, and it is closely connected to local traditions, and expressed through formal representation. This lays a foundation for the first research question—the study of the evolution of Chinese urban forms is necessary for searching the identity of cities.

1.2.3 The second research question

The conservation and renovation of historical built environment is largely taking place in contemporary Chinese cities. For instance, the first conservation law has been launched in China in 1982 and 99 Cultural Historical Cities have been targeted for conservation planning since 1982 (Ruan and Liu, 2005, He et al., 2006) (refer to Chapter 3). However, the current actions are inadequate to deal with the problem of loss of identities of Chinese cities. The following is the reason.

Three attitudes to traditions exist in contemporary China. Complete demolishment of historical remains and replacement with brand new modern buildings is the first one, because old buildings are out of fashion or in poor condition. This kind of demolishment has been taking place over the country, especially in developed Chinese cities such as Guangzhou, Shanghai and etc because of the increasing demanding of urban land. One example is the activity of 'one city nine towns' in Shanghai, introduced by the local government to completely imitate nine western successful towns in the suburb areas of Shanghai in the 2000s. The Planning Bureau of Shanghai said the projects 'show the eagerness of Chinese municipal government in pursuing city identity, urbanisation speed and introducing the advanced planning concepts from the foreign countries'(Xue and Zhou, 2007, p32). One of the designers said 'we don't know that more people in the rapid-developing China are aspiring towards the future, they are always forward looking, and eager to see the changes and new things. They even want to forget the past'(Xue and Zhou, 2007, p35).

The second attitude towards tradition is 'targeted preservation', which focuses on individual historical buildings such as temples, pagodas and big family houses

regardless of their surrounding environments. As a result, these individual buildings have been preserved as 'islands' within a completely renewed urban environment. One example was Beijing's master plan in the 1990s, which attempted to define the preservation-worth objects and clear the spaces around them (Abramson, 2007). Such action is still common in other Chinese cities.

The third attitude is linked to the flourish of tourism industry. Tourists from outside intend to experience the authentic cultural environment of local places. Local identity has become a commodity—the unique selling proposition. For the interest of tourism, imitated or fake traditional architecture have been built to fulfil their curiosity. Historic landscapes are reduced to a chosen interpretation of history, a specifically selected and packaged product (Al-Sayyard, 2001, cited in (Handal, 2003, p7). With the influences of tourism, the preserved and imitated tradition becomes the 'cultural product' for market selection, and is segregated from the reality. Various examples can be found in many of the urban regeneration projects in China (Qian, 2006).

These three attitudes towards traditions lead to inadequate actions. Both the 'targeted preservation' and 'tourism-oriented regeneration' have neglected the precious traditional social values and social network. The living experiences of the local inhabitants on a daily basis have been devalued. These attitudes also limit the possibility of future development of traditional urban forms.

In fact, even the most vernacular artefacts are 'hybrids of indigenous and imported types and these types also change and adapt' (Mitchell, 2004, p33). Tradition is not a frozen image but 'representative of ongoing historical processes that remains incomplete' (Mitchell, 2004, p33). The identity of a place lies on the continuity between the past and the present, with necessary adaptation to new technology, materials, functions and local people's preferences. By doing so, a new local 'tradition' can be made as a progressive posterity of the old 'tradition', because it is still known by the inhabitants, related to them and produced by them. Therefore, the second research question which is related to the problem of the loss of identity is:

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CHAPTER 2 TYPOMORPHOLOGY IN THE WEST AND IN CHINA

2.1 Introduction

Research on the impact of urbanisation and globalisation for local cities is abundant in western literature. Since the failure of Modern Movement in the 1970s, a number of theories such as postmodernism that pays attention to cultural diversity, regionalism that advocates the benefit of using local design language have risen to attempt to guide place making towards better qualities. Among those theories, typology and morphology focus particularly on cultural continuity in the transformation of urban forms over time, and they are consistently developed to analyze built environment and create new spaces which are harmonious in a local context. Typology and morphology are one of the main resistances against the permeation of the so-called 'global culture' and the world-wide uniformity of urban forms. The urgency of reintroducing and emphasising the cultural identity of Chinese cities, especially in the discipline of architectural and urban design, which have been explored in the previous chapter, leads to questions if it is possible to adapt typology and morphology theory to deal with the crisis of becoming placeless in contemporary Chinese cities, and to what extent Chinese designers can learn from their western counterparts. These two questions shall be answered through reviewing the trajectory of typology and morphology theories in the western world over two hundred years.

In this chapter, the most important concept of 'type' in relation to architectural and urban design will be explained in detail. The definition and meanings of 'type' and its merits for architecture and urban design need to be clarified firstly before exploring its potential in the Chinese context. Furthermore, typological theory, which has been founded by a group of architects in Italy, will be explained, because it covers a series of essential ideas relating to the study of Chinese urban forms. It provides direct references to establish a scientific and comprehensive methodology for the analysis of Chinese urban forms. Moreover, the theory of urban morphology, mainly developed by geographers in Germany and Britain in the second half of 20th

century is particularly dealing with urban forms. At last, the integrated typomorphology based on the reciprocity of the two theories will be elaborated in this chapter in order to draw inspirations for the study of Chinese cities. In relation to the Chinese traditional urban planning concepts in general, the potentials of the typomorphological approach for the current crisis of Chinese cities will also be discussed to build the theoretic foundation of the typomorphological examination of Chinese cities.

2.2 Type

2.2.1 Definitions of 'type'

'Type' is a classification of certain objects in a small group according to their common features, which are distinguished from other objects in a bigger group (Oxford English Dictionary). Within architecture, the most common schemes of classification have been by function and by form, and the corresponding relationship of functional types (Pevsner, 1976) and morphological types is always under debate (Forty, 2000), in which morphological types are emphasised in most of the literature on type and typology.

The notion of type, firstly used in the Bible, referred to religious symbolism, to describe Solomon's temple as the true type of architecture, which joined 'the world of nature and the world of politic' (Vidler, 1987, p147). Ancient philosophers such as Plato, Aristotle, Kant, Goethe and Hegel considered that 'type' had aesthetic foundations in human instinct. During the first century B.C, Vitruvius, in his *Ten Books of Architecture*, claimed that the analogy method, used to imitate the natural world in architecture in the ancient time, is a fundamental human behaviour (Vitruvius, 1960). Type as a composition of nature's ideal beauties, a standard of perfection, implies a possibility of imitation, and carries symbolic meanings. Vitruvius's 'three Orders of architecture' are examples, in which, for instance, the Doric Order represents the power of masculine while the Ionic Order represents the feminine beauty.

In the late Eighteenth century, along with the aspiration to find the origins and aesthetic kernels of architecture, French theorist Quatremere de Qincy (1825) brought the most authoritative definition of 'type', which was first introduced into the English-speaking world by Giulio Carlo Argan (Bandini, 1984). The definition is given by the comparison between type and model.

> *"The word 'type' represents not so much the image of a thing to be copied as the idea of an element that must itself serve as a rule for the model... The model, understood in terms of the practical execution of art, is an object that must be repeated such as it is; type, on the contrary, is an object according to which one can conceive of works that do not resemble one another at all. Everything is precise and given in the model; Everything is more or less vague in the type. Thus we see that the imitation of types involves nothing that feelings or sprite cannot recognize... "(Quatremere de Quincy, 1825)*

Quatremere de Qincy's doctrine has already been interpreted and discussed by many researchers. For instance, Lavin said that Quatremere de Qincy 'used type to express an abstract notion of historical continuity in architecture produced by men', and he also proposed that there were three principal architectural types, the cave, the hut and the tent, in which, according to him, the tent was the origin of Chinese architecture (Lavin, 1992, p61-73). Vidler said that Quatremere de Qincy's type was so ideal, never realised, never tangibly visible, and never to be slavishly copied, but it was the 'representative form of the principle or idea of the building' (Schneekloth and Franck, 1994, p20). 'Type is a constant, it is recognisable in all architecture, it is also a cultural element' (Bandini, 1981, p109). Furthermore, for Qunatremere de Qincy, type can be achieved 'by imitation, analogy, by application of intellectual relationship, principles and combination of styles' (Anderson, 1982, p112). The definition of type is so diverse that covers the ideal, origin, principle and aesthetics of architecture which root in particular cultural environment, and can be abstracted from particular forms through imitation and analogy.

Apart from the widely acknowledged definition given by Quatremere de Qincy, different researchers' and designers' understandings of the concept of type are different, for example, type is 'a structural abstraction of a particular building' (Krier,

1998, p42); type is the symbol of local collective memory (Rossi, 1984); type is an idea before particular building has been built (Caniggia and Maffei, 1979). These different understandings are addressed in the following paragraphs. In addition, the comparisons of 'type' and some similar terms—'archetype' and 'prototype' is useful for better understanding the concept of type (Figure 2.1), which is also discussed below.

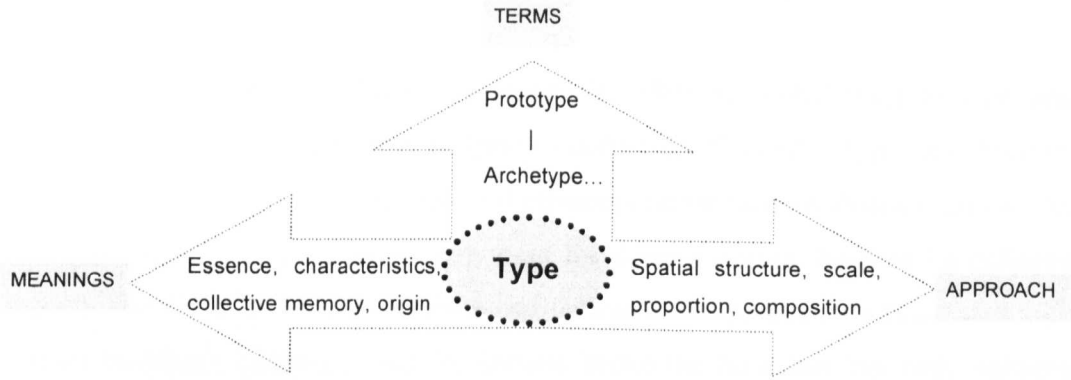

Figure 2.1 Type related issues: meanings, approaches and terms (by the author)

2.2.2 Typologists and their concepts of 'type'

'Type' is the intermediate between nature and the man-made world. This view point is rooted in the rationalist philosophy, which believes that 'things can exist without the benefit of anyone's ever experiencing them, and these include such concepts from arithmetic and geometry as number, shape, three dimensional form and so on' (Broadbent, 1995, p84).

Theorist Abbe Laugier (1753) is one of the first trying to translate rationalism into design principles. In his point of view, the true principle and origin of architecture was the 'primitive hut', which consisted of posts, beams and a pediment roof. He considered the three structural elements were essential for buildings, and other additional elements weakened the pure beauty of architecture. Thus the primitive hut was the only type for architecture in Laugier's concept. His concept generated substantial criticisms on the origin of architecture. An important one was from Gottfried Semper (1830s). He believed nothing came from nothing, and 'architecture must have an antecedent', which coincided with Quatremere de Qincy's type as a generic idea (Forty, 2000, p305). Furthermore, differed from Laugier's ideal vision,

Semper proposed that the hut consisted of four elements, the hearth, the platform, the roof and the enclosure, which were the basic principle of architecture. He also suggested that architects' works should represent the basic types in their own culture and tie them to human needs (Anderson, 1982). His concept made a vital progress compared to Laugier's and Quatremere de Qincy's that he placed types into particular cultural soils. He admitted that architecture belonged to a society, which should reflect human requirements rather than being a pure expression of nature.

French architect Jean-Nicolas-Louis Durand's (1802-5) contribution to type and typology influenced Quatremere de Qincy's definition. Durand's 'type' was built on a pragmatic composition of architectural elements rather than an abstract notion. For him, previous buildings were so important for current design, because he believed that the familiarity and needs of space lied on forms and proportions associated with ancient buildings (Durand, 1802-5). Durand broke the boundary not only between different kinds of stylish architecture in European classical tradition, such as ancient Greek architecture, Roman architecture and academic architecture, but also between buildings with different functions proposed by designers in all periods of history. He abstracted and standardised building elements into various compositional types and necessary functional needs (Figure 2.2). In his book *Precis*, compositional types, which were converted from all existing buildings, appeared as design vocabulary and syntax in linguistic analogy (Picon, 2000). Designers could pick up any part of the standardised elements such as circle, square and some repetitive patterns of basic units, and assemble them to form a new building plan or elevation. Durand also believed that a city could be assembled by buildings, just like buildings were assembled by walls, columns and etc. His theory and methods became a turning point in western architectural history in terms of the concept of architecture itself and the role of architects in the building process, which was, according to Antoine Picon, architectural design was changing from 'poetry of art' in classical era to a scientific method (Picon, 2000, p1). Durand's composition greatly influenced the Beaux-art tradition, and the method achieved success in architectural education in France. However, there were some criticisms on his method that it interrupted the classic tradition, and criticisms on himself that he was a simplifier and populariser.

According to Szambien (1982, p33), his composition was 'regardless of historical truth of archaeological authenticity and sometimes regardless even of the building's function', but became 'an abstract, schematic demonstration of compositional rules and principles'. Durand's method opened an experimental possibility of using traditional architectural elements in design through compositional types.

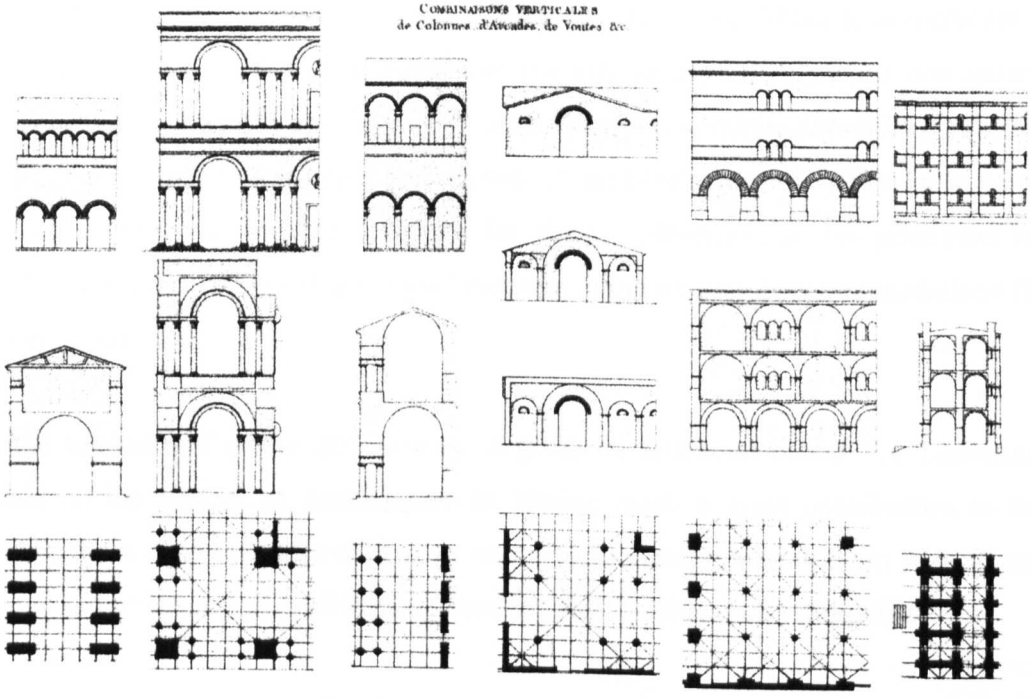

Figure 2.2 Examples of Durand's vocabulary of building plans and elevations (Durand, 1802-5)

Camillo Sitte was considered as a milestone in the literature on the building of cities, and the 'father of modern city planning' because of his practical and aesthetic principles of urban public space configuration (Collins and Collins, 1965, p100). Even though he never mentioned the word 'type' in his study of Italian plazas, his principles and diagrams of urban space planning were typical examples of typological analysis of urban forms. In his book *City Planning according to Aesthetic Principles*, he proposed three principles of plaza design with relation to the surrounding urban settings, for example, a plaza should be related to monumental buildings; the centre of a plaza should be kept free; a plaza should be enclosed. He also illustrated the appropriate size and shape of plazas, which basically depended on 'whether observers can perceive the important structures and sculptural decorations of nearby monumental buildings' (Sitte, 1965, p177). Despite the rationale behind

those principles being merely aesthetic, and inspired by the eighteenth-century Picturesque Romanticism and the nineteenth-century French Utopia Socialism (Ellin, 1996), he was the first to convert art views to design practice. His work provided great reference for the subsequence movement of civic art, such as Hegmman and Peet's viewpoint (1988) in America (Collins, 1988). However, his theory has also been criticised by scholars. For instance, according to Rossi, 'Sitte's lesson contained a gross misconception in that it reduces the city as a work of art to one artistic episode having more or less legibility rather than to a concrete, overall experience' (Rossi, 1984, p35). Aesthetic perspective of architectural and urban form is an important point but not the only one for design. Nevertheless, his principles for public plazas act as a typological guidance that suggests useful recommendations for urban design.

In the second half of the 20th century, a group of architects called 'La Tendenza' based on the School of Architecture in Venice made a great contribution to the development of the concept of type in relation to urbanity; among them Also Rossi, Carlo Aymonino, and Rafael Moneo were the most well-known rationalists.

As a theorist and architect, Rossi's doctrine of type and his design works have drawn great attention in the academia. His understanding of the concept of type was recorded in the first part of his most important book, *Architecture of the city* (Rossi, 1984), firstly published in 1966 in Italian. Similar to Quatremere de Qincy, type for Rossi was something 'permanent and complex, a logical principle that was prior to form and that constituted it' and it was behind and underlying all the particular buildings, such as houses, churches, schools and so on (Rossi, 1984, p40). He believed that types were the constant structuring principles of architecture[1], and a type was the mostly close one to the essence of architecture.

[1] For example, he stated that there were only three historically determined house types, which were the central court type, the gallery type and the separate dwelling type, which also became the source of his later design.

Moreover, opposite to the popular functionalism promoted by the Modern Movement at the same time which was considered as a naïve idea for Rossi, he said 'architecture was born out of need, it is autonomous, in its highest form it creates museum places which are drawn upon by technicians to be transformed and adapted to the multiple functions and needs to which they have to be applied' (Rossi, 1983, p25). Rossi's autonomy of architecture depended on the idea that elements only referred to their own nature, and their geometries were neither scientific nor technical but essentially architectural (Marche, 1994). Thus architectural types were something out of any social and political impact, and embodied only in the historical monuments of a city to present the eternity and monumentality of a culture. Therefore, his notion of type was so called 'independent typology'. Moreover, he also attempted to turn typology into an operational tool to capture reality, and to make it 'intelligible and manageable' so that it could be used for reproduction (Bandini, 1981, p110) His various architectural projects expressed his idea of employing precedent types, for instance, a house type without walls was applied to accommodate people's afterlives in the project of Modena Cemetery (Moneo, 1973)(Figure 2.3).

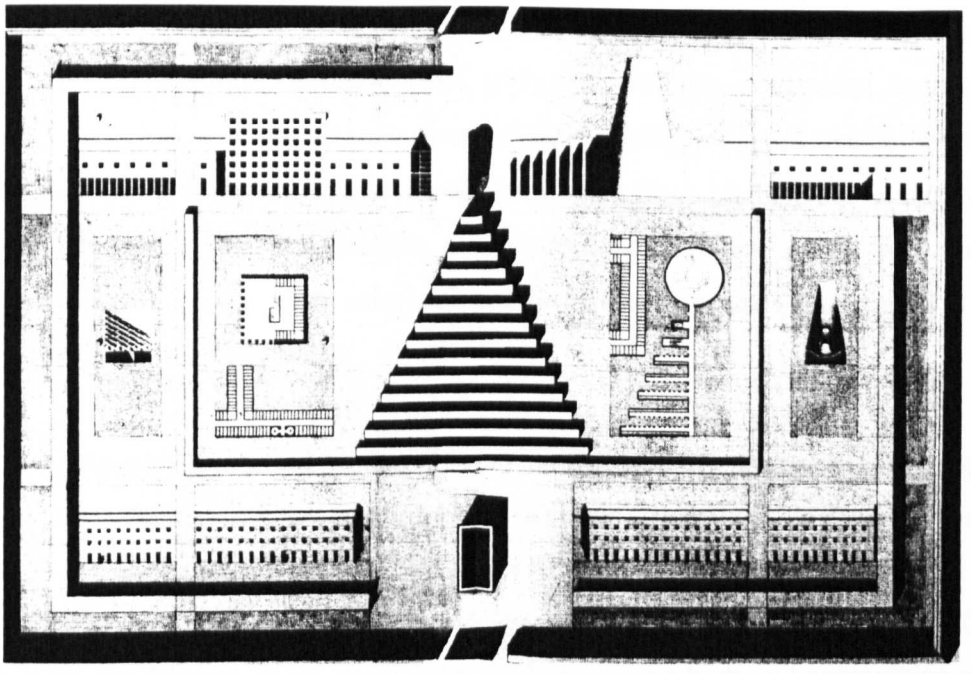

Figure 2.3 The collage of the drawings of Modena Cemetery project (Braghieri, 2005, p54-5)

For Rossi, typology was also a perfect hierarchical tool to bridge the gap between the urban scale and the building scale, which was expressed by his important idea of

'analogy city'. The city was a collage of urban artefacts from different historical periods, which embodied collective memories from different times. The transformation of a city was 'a collective process, slow and traceable over a length of time, in which the whole of the city, society and humanity with all its different forms play a part'(Rossi, 1983, p18). As such the urban evolution, the changing face of the city, was a slow and indirect process which needed to be studied by following its laws and peculiarities. However, he denied the determinant role of context for design, because he believed only the permanent monumental artefacts can influence design. This view point of Rossi determined that his works mainly focused on building design rather than urban design.

Carlo Aymonino worked closely to Rossi mainly in design practice. His detailed study of house types reflected Rossi's advocacy of building types. His explanation of 'type' lied on two levels, the first of which was formal, that a type was a classification according to formal differences; while the second of which was functional, that type could be used to understand its endurance in the historical transformation of artefacts. Thus compared to Rossi's, his type and typology was so called 'applied typology' (Bandini, 1984, p77). The differences between Aymonino and Rossi also lied on their considerations of the durability of types. Aymonino kept a critical distance from the attempt to identify types from history, but preferred to identify types from the post-modern and modern architecture, which was also a different approach from other scholars' points of view on traditional types in the Tendenza group (Marzot, 2002).

Similar to Aymonino, Rafael Moneo (1970s) admitted that type described a group of objects characterised by the same formal structure. Type was 'neither a spatial diagram nor the average of a serial list, and it is fundamentally based on the possibility of grouping objects by certain inherent structural similarities' (Bandini, 1984, p73). For Moneo, 'type' was not beyond upon some high-end explanation such as origin and essence, but upon simple structural characteristics.

The Krier brothers are two influential architects with several fruitful design projects and academic writings. 'Type' was a vital concept for their theory both in urban analysis (L.Krier, 1979a) and architectural composition (R.Krier, 1988). A type for them 'represented the organisational structure of a building in plan and section', which was associated with particular 'functions, customs and rites'(L.Krier, 1998, p42, 185). In Rob Krier's projects, he emphasised the important traditional urban elements of European cities and their corresponding interpositions, such as the streets, public squares with monuments, and quarters (R.Krier, 2003). Similar to his brother, Leon advocated the low, dense, small, simple traditional buildings[2], defined streets, great squares and high roofed public halls of tree-lined escarpments and distant views as opposite to Modernist uniformity of building forms and short-term consumption (Porphyrios, 1984, Graves, 2003). The doctrine of the Krier brothers was calling for a return to small scaled and mixed-use traditional city. However, there were some criticisms to their design works. For instance, Frampton pointed out that the Krier's works were beyond strict classical proportional control to become expressionistic products, which 'broke down the original interrelations between classic building elements' (Frampton, 1982, p8). Moreover, according to Berke (1982, p11-2), their urban housing scheme failed to demonstrate a complete urban social history and suffered from 'isolation from other architectural episodes, even though it had decent interrelation with perimeter blocks, streets and squares'. All in all, the Krier brothers exerted the concept of type as design inventory in their works, especially the traditional types.

Besides the above mentioned, there are several other architects and urban designers using the concept of type as an approach to examine buildings and create designs, such as Alvar Aalto (Colquhoun, 1981a), Holl (1982), Colin Rowe (Ellis, 1998), and etc. Meanwhile, type and typology is employed in architectural education as a way

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[2] For L. Krier, traditional buildings refer to classic or vernacular buildings, which is the reason he is also a neo-classicist. Elements of classic architecture largely appeared in his projects. While R. Krier is considered as either a Expressionist or 'Romanesque'. FRAMPTON, K. (1982) Krier in Context. IN FRAMPTON, K. & KOLBOWSKI, S. (Eds.) *Rob Krier: Urban Projects 1968-1982.* New York, Rizzoli. p110

of initiating students' comprehension of architecture. The terminology of 'types' implies some social meanings. According to Anthony King (1994), building types, as the social production, generated building forms and languages as means of differentiating building forms and spaces. People could experience spaces from the way they talked about them. For instance, terms such as 'detached house', 'bungalows', 'semidetached house', 'terrace house', and 'apartment' not only proposed different spatial structures of these houses, but also implied their social classes and political statistics (King, 1994, p144). This kind of hidden meaning involved in the names of building types exercises in a global scale (King, 1994). Those typologists' interpretations of 'type' and works can be references for comprehensively understanding the definitions of 'type' and how this concept can be applied to practice. This is explained in more detail in 2.2.4.

2.2.3 Type, archetype, prototype and the three typologies

'Type', 'archetype' and 'prototype' are mentioned very often in literature as three similar but not identical terms. In order to better understand the term 'type', it is necessary to clarify the similarities and differences among them.

An archetype is not intended to be proven, but is required as purely imagined backgrounds for understanding human experience. Archetypes are neither a statistical averaging nor a logical reasoning, but are 'made of words, ideas, and beliefs, representing imagined, remembered, or otherwise cognitively constructed places' (Schneekloth and Franck, 1994, p17, p20). An archetype is usually expressed in artists' works or people's mental maps of the material world. There are four differences between these two terms according to Mike Brill's interpretation. Firstly, 'in type, the form is emphasised more than the meaning, but in archetype, it is the opposite'. Secondly, 'type depends on a cultural history of manifestations in form, and archetypal place experiences happen often in strange place, place outside of one's culture'. Thirdly, 'the tendency to construct type seems cognitive, a way to categorise, repeat and know, while the tendency towards archetype seems more spirit driven, a way towards an intensification of reality'. Finally, 'type is largely about physical form, it over privileges the visual sense, and diminishes the value of other senses, conversely, one characteristic of an archetypal charged experience is that it

seems to integrate all the senses' (Brill, 1994, p76). Simply speaking, an archetype is abstract, merely in human mind, and can be evoked in any place by any senses such as visual, audio and tactual senses. A type is more tangible which can be abstracted through visual analysis.

Laugier's notion of type coincides the meaning related to archetype, as well as Rossi, and other scholars who believe that collective memories are inserted in types. For them, one of the reasons type is useful for place making is that it is similar to archetype; it can evoke people's sense of familiarity and thus produce the sense of belonging. For example, people always re-orientate themselves by rearranging furniture according to their preference to let them feel 'personal' and familiar when they first move into new apartments. The new spaces they have created follow their previous experiences so that there are types involved. All the sacred places such as churches, temples and Chinese palaces are designated to evoke people's reverence, belief, permanence and homage by the archetypes of their large scaled spaces.

'Prototype' is practical and closely related to the material world. Prototype presents the preliminary characteristics of particular forms, which can be used for replication (Oxford English Dictionary). A simple example is a model for making steel tool, which sculptures the three dimensional figures of the tool, and produces a number of replications. Prototype is important in mass production industries.

In the author's opinion, 'type' contains the emotional recharging quality of 'archetype', but it is more tangible than 'archetype'. A type cannot be copied exactly as a prototype. The notion of type is developed from the archetype-like concept as one extreme at the very beginning, to the prototype-like concept as the other in the period of Modern Movement, and it becomes a sophisticated concept at the present. This process is observed by Anthony Vidler, who defines the notions as 'three typologies'.

Vidler traced the first typology back to Laugier's primitive hut, which referred to the natural world that building elements represented their 'species' in the same way as

animal species. This analogy were also followed in the later functional and constitutional classification of architectural elements in the nineteenth century, for instance, Durand's typology was a constitutional organization of species. The second typology emerged along with the Modernism concept, in which architecture was equivalent to the range of mass-production objects. The relationship between the smallest tool and the most complex machine was analogous to the link between columns, houses and cities (Vidler, 1978). According to Vilder, both of the two typologies compared and legitimised architecture with either 'nature' or 'machine' rather than architecture itself. While the third typology, mainly in the neo-rationalists' works, came back to the pure domain of architecture. The link of columns, houses and urban spaces was a chain of continuity, whose geometries were 'neither naturalistic nor technical' (Vidler, 1978, p320). Based on this classification, the first typology leans to the ideal archetype, while the second typology leans to the monotonous prototype. In sum, type has some similarities to archetype and prototype, but its meanings are much richer than theirs.

2.2.4 How type benefits urban studies and design

The concept of type has been developed in the western world by the ancient philosophers, architects, rationalists and contemporary neo-rationalists. According to Bandini (1984), during the development of the concept of type and typology, there were three different attitudes: first, typology was used as a scientific methodological tool for reading and investigating the city; second, typology acted as a way of discussing 'high' architecture in stylistic and cultural terms. Treatment of the topic wavered between investigation and interpretation, and it was often only scholarly restraint which prevented typology from becoming a criterion for aesthetic evaluation; thirdly, it was a theoretical tool for the production of architecture. The merits of the concept of type in the scope of urban study and design are interpreted in the following four points. First, 'type' makes local cultural and morphological continuity possible through symbolism to resist the universalism of Modernist urban forms since the middle of twentieth century. Secondly, types that indwell local context are the most suitable and robust choices for the built forms in that region in terms of being sustainable. Thirdly, types can be very practical for morphological design references as the third point of Bandini's statement. Finally, conventional

types as pre-existing concepts in people's mind facilitate good communication between designers, clients and laymen.

2.2.3.1 Cultural symbolism

When the concept of type was re-discovered by the Neo-rationalists in the 1960s, it was used against the widely-spread of Modernism, and to call for the return to European traditional urban spaces with their preferable qualities. The main negative impact of Modernism on urban forms at that time was a disconnection between physical forms and humanity due to 'the emphasis of functionalism or a sort of biotechnical determinism'; furthermore, the overly dependence on professionalism (Ghirardo, 1996, p10). The mechanisation of forms caused several problems, for instance, urban spaces became dull and lifeless places which were full of automobiles; massive highways replaced previous peaceful pedestrian streets; monotonous and harsh modern building blocks lost the aesthetic quality and became pure 'machines of living'; buildings in international style were everywhere in the world. Along with the failure of Modern Movement in the second half of twentieth century, not only the neo-rationalists, but also other post-modernists such as regionalists (Cullen, 1971), contextualists (Tugnutt and Robertson, 1987), classicists (Krier, 1979a) and etc signified the importance of cultural and social diversity and identity in the built environment.

How does type represent the social and cultural meanings of specific form? A local type closely connects to the collective memory of certain place as a 'theatre of memories', which is from different periods of the history of the place, and is related to every event happening in that place. Memories overlap in the physical buildings, and are regarded as important spirits of architecture because they are shaped by the unconsciousness of the culture (Downing, 1994). In such sense, 'type' is similar to a language that expresses certain meanings through metaphor, symbolic sign, icon, and etc, which consists of words, syntax and semantics, just like literal language (Jencks, 1991). 'Type' as the structural principle of forms indicates certain rules and is understandable by local people. A language is unique to a specific culture and can not be easily changed. In some cases, a type is transplanted to other cultural context. Its meaning maintains for a long time, for example, the Chinese symbolic gate,

which is formed in China thousands years ago. The conventional type of the symbolic gate is embodied in every such gate in Chinatowns around the world to show the Chinese culture.

As some scholars proposed, convention itself is constantly changing, thus the meanings embodied in a form can also change over time (Colquhoun, 1981b, Anderson, 1982). However, as Colquhoun said, the changing of convention does not mean that type is not necessary for design but needs some modification in terms of its iconic system, because traditional forms are not completely abandoned but are transformed, even though they are not able to give us a ready made solution to new problems, they provide the context within which we operate design. In some cases, designers referring to local typology are not trying to express the cultural meaning of particular regions, but are using 'local features as motifs in a compositional process in order to produce original, unique and context-relevant architectural ideas' (Colquhoun, 1997, p19).

2.2.3.2 Sustainability

The concept of type is able to contribute to the ecological sustainability of a city, because traditional forms are greatly robust. Local people have been modifying forms constantly to respond to the local weather condition, customs and topography, while traditional forms have been adapting to the social economical and political changes. Traditional buildings are usually built of local materials and placed in a site to take advantage of the nature environment. For instance, traditional Chinese houses were arranged in the optimum position of their sites with appropriate height, orientation and distance from the road for the purposes of ventilation, sunlight prevention and rainwater utilisation. The sizes of building clusters indicate the preferable dimension of a neighbourhood, while the layouts of building clusters show the conventional social interactions between neighbours.

In ancient history when technology was limited, building activities were based on how to adapt buildings to the nature. According to Hough (1984), the attitude towards resource use, design values, energy, nature and technology makes the city environment what it is. For instance, contrary to that of the traditional time, urban

plants in the modern time are conceived more as decorative elements than their potentially useful function to enhance urban climate, create wildlife habitat, provide wood or produce food. Environmental sensitive design relies not only on new technologies, but also on the urban forms: the location, sizes, density, layout and appearances of buildings; the transport system; open spaces; water features and vegetation (Pitts, 2004). Traditional types are precious examples to explore the harmonious relationship between human and nature.

2.2.3.3 Formal reference

Type benefits urban design by providing direct references for form-making. It supports the profession not just by making 'high-style monuments, but by illuminating the need for socially acceptable design to be based on recognisable precedent.' It makes it easier for architects to 'develop and maintain successful practices because there will be less likely to make idiosyncratic, frivolous, or simply unworkable design choices' (Francescato, 1994, p269). Type has the ability of holding a store of previous experiences and permitting flexible response to complex design problems. It has both the combinations of vagueness and precision, which bring ambiguity as well as flexibility to architectural practice (Colquhoun, 1981b, Bandini, 1984, Symes, 1994). Type is a mental construction which is 'not embodied in any specific form but adapted and elaborated by designers'(Bandini, 1993, p387).

An example showing how types can be converted to forms is given by the New Urbanism[3] group in America, which is one of the most active groups of designers at

[3] New Urbanism (NU) is an urban design movement derived in the US in the 1980s. The movement advocates traditional neighbourhood design and transit-oriented development. For neighbourhood design, NU promotes diverse uses, population and building forms, walkable streets and well-defined open spaces. LECCESE, M. & MCCORMICK, K. (Eds.) (2000) *Charter of the New Urbanism,* New York, McGraw Hill. P4 KATZ, P. (Ed.) (1994) *The new urbanism: Toward an Architecture of Community,* New York, McGraw-Hill, Inc. NU has gained great political support in the US and is quickly dispersed in Europe. Examples of NU projects are Seaside in Floria, Stapleton, Poundbury in England and etc. A criticism to NU is that the most famous projects such as the Seaside was built on the previous open land, and therefore was another kind of urban sprawl. Some scholars said that NU

the present. In order to generate new urban forms to fulfil traditional planning principles and create classic images of western towns (Krier, 1991, Leccese and McCormick, 2000, Meuser, 2003), Duany and Plater-Zyberk's design team developed a transect-based design code, called SmartCode (Duany and Plater-Zyberk, 2003). The design group divided a city fabric into six zones, each of which had a series of design codes gained from the measurement and investigation of the urban form of that zone to control new buildings in that context. This method was very similar to the identification of types. They successfully applied the local 'types' to new forms by following their design codes, which will be further mentioned in Section 3 of this thesis.

2.2.3.4 Communication

Another important advantage of the concept of type is that it facilitates communication and understanding between designers, clients and the general public. According to Symes' explanation, 'type summarises and holds together a whole range of already interpreted information about the detailed implications of possible actions. They offer a 'shortcut' that can be economically sensible for producing a form, educationally satisfactory for explaining idea to clients...' (Symes, 1994, p167). In the convention of a designer and his clients, pre-existing types have already been understood and well-performed. In architectural education, a tutor can deliver ideas of certain local building easily to his students since the basic characteristics of the building type have already been imprinted in people's consciousness.

An example is from the planning project for French alpine housing conducted by Ivor Samuels (1999). The information recorded in different types defined by a range of dimensions of buildings, position on plots, relation to topography, access arrangement, roof forms and opening patterns were used to inform the construction of arguments at various stage of the planning process. These types helped clients understand the potential of local types, and also helped the designer design coherently in different levels of planning.

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has become a profit-making brand that helps to sell houses. SAMUELS, I. (2008) Typomorphology and Urban Design Practice. *Urban Morphology*, 12, p58-62.

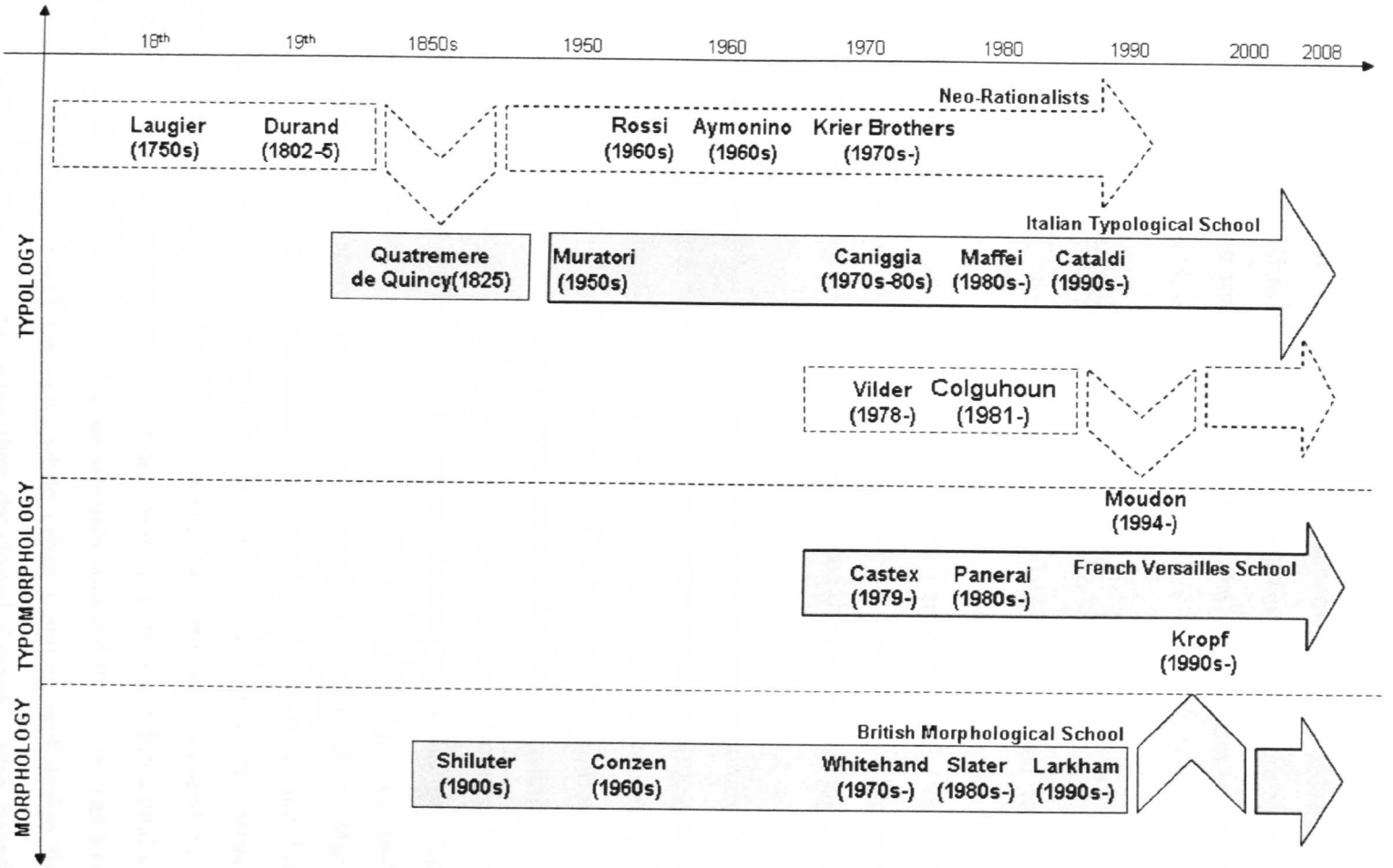

Figure 2.4 Scholars in the theory's development (by the author)

The above four main advantages of the concept of type make it a powerful idea in architectural and urban design practice, which has been experimenting with numerous projects by western designers. Besides the above mentioned Neo-rationalists and other designers, the three schools—Italian Typological School, British Morphological School and French Versailles School in the recent fifty years in Europe have been making great effort for the development of the theories of typology and morphology (Figure 2.4).

2.3 Italian Typological School

The Italian architect Saverio Muratori (1910-1973) contributed to the theory of architectural typology in the late 1950s, which was based on the interpretation of Italian Rationalism. His followers Gianfranco Caniggia (1933-1987), Gian Luigi Maffei, Giancarlo Cataldi, Nicola Marzot, Paolo Vaccaro and etc inherited and developed his theory in the later years, and formed the Italian Typological School.

The cultural background of Muratori's philosophy was very important for his theory. In the early 1930s, Italian universities offered great academic atmosphere for lively debates between scholars, which became the foundation of Muratori's thoughts. Giovannoni was considered to be the father of Italian urbanist tradition, who believed the complementarities between the tradition and the modern within a concept of 'organicity'. The concept had been inherited by the Italian Typological School later on. Another scholar who directly influenced Muratori was Guiseppe Pagano, who advocated that the logic of architecture was 'its constructive process rather than a universal system of shared value, independent of time and location'(Marzot, 2002, p62). Pagano's thoughts emphasised the essentialality of time and location for architecture. Architectural rationality was an attribute of forms, structures and historical process of transformation, because a form was reduced to a simple aesthetic matter when it remained but deprived of its previous functional constraints (Marzot, 2002). They and other Italian scholars believed that there was a connection between the tradition and the new, while urban planning and design theory was deeply rooted in history. Muratori then developed Pagano's idea based on such common belief.

In his early days in the school of architecture in Rome, he started his research from the architecture issue of technique and language (Cataldi, 2003). He criticised the Modernist architecture as a split between structure and form. In his early essays, he proposed that the town was a living organism and collective work of art, and supported the idea of planning new buildings in continuity with the culture of the place, which was called 'operative history' (Cataldi et al., 2002, p4). In 1952, he moved to Venice, where he was able to survey the city and published *Studi per una operante storia urbana di Venezia* (Muratori, 1959), in which he initially defined the ideas of building type, urban fabric, and urban organism. Later on, he came back to Rome and made great efforts to disseminate his ideas to university education.

The definition of type in Muratori's thought was a priori synthesis, which was initially generated from designers' minds as the spontaneous cultural outgrowth of their background. Thus it was not only based on the built environment but also in people's unconsciousness, which 'instinctively assimilates it in an asymptotic process of progressive technical optimization and functional adaptation[4]'(Cataldi, 2003, p23). Furthermore, he regarded urban organisms as the real backbone of the general built environment which restricts buildings to be aggregated serially to the urban synthesis. He indicated four degrees of organism, the 'occasionally serial', 'systematically serial', 'episodically organic' and 'totally organic' (Cataldi, 2003, p27). An essential role of design concerned by Muratori was how to fit new design into the existing urban organism or the built environment. In addition, Muratori applied his ideas to many planning and design projects, such as the 'low cost housing in Tuscolano Quater in Rome'; 'competition for the residential quarter at Barene of San Giulianc in Venice' (Cataldi, 1995), in which the term of 'typological process' was frequently used that would be explained more in the next chapter.

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[4] Aldo Rossi has also been influenced by this idea, although he does not belong to the Italian Typological School. Similar thought advocated by Rossi can be found in his *The Architecture of the City* (1984).

Muratori's assistant Caniggia was very influential for the School's development. Caniggia's starting point was the utilisation of Muratori's definition of building types, and to apply it to the urban tissue and to develop Muratori's other concepts of 'elementary cell', 'pertinent areas' and 'strips'. If Muratori was regarded as more theoretic, Caniggina was more practical. Caniggia translated some of Muratori's important terms into more understandable architectural terms, for instance, from organism to structure, from architectural organism to architectural type. According to Cataldi, Caniggia's major contributions to the design typology of the Italian School were as below.

'first, his examination and development of Muratori's concept of type, typology, structure, tissue, series and seriality; secondly, his setting up of the so-called method of 'processual typology' including the concepts of substratum type, leading type, synchronic variant, diachronic transformation and typological yield; thirdly, his discovery and recognition of the domus courtyard substratum as the matrix, within Roman planning, of all subsequent basic and specialized building; fifthly, his theory of 'medievalization' regarding the spontaneous utilization procedures of planned structures—this theory in particular explains the typological processes of 'insulization' and 'tabernization' that determined the building tissues of numerous small Italian towns of Roman origin; and finally, the method of interpretation by phases of a town's history, in connection with basic typological processes'. (Cataldi, 1995, p31)

With Gian Luigi Maffei, Caniggia published his most important book *Composizione Architettonica e Tipologia Edilizia, Lettura Dell'Edilizia Di Base* (Caniggia and Maffei, 1979) to interpret the terms and methods of analysing basic building types, structures and urban tissues. For Caniggia, buildings were so closely related to human beings that buildings were extensions of the human species, while a city was the physical expression of human life. Buildings were part of human experience regardless whether the building had been constructed physically or only existed conceptually in people's mind. Thus the concept of type in Caniggia's idea was 'a concept in the builder's mind before the actual building had been built', which was generated by spontaneous consciousness of the builder (Caniggia and Maffei, 2001,

p53). 'Spontaneous consciousness' was opposite to 'critical consciousness', of which the former one meant 'the attitude of subjects adapting to the builder's inherited civil substance, without needing or requiring mediations or choices', while the latter referred to something determined by choice and posterior knowledge. He regarded the spontaneous consciousness was essential for one cultural as the cradle of massive ordinary buildings, which were the real cultural products. Through the interpretation of the 'basic building types' of collective buildings in a series of time phases, the hidden 'typological process' could be distinguished, and what remained in the process was the cultural language of producing buildings understood by the local people, which also overcame the crisis of confusing building languages in different linguistic areas, for instance, the travelling international style buildings around the world.

Despite most of Muratori and Caniggia's ideas being related to buildings, they always extended their theory to the urban scale. Similar to Caniggia's definition of building types, he said 'an urban tissue is the concept of the coexistence of several buildings existing in the minds of builders before the act of buildings, at the level of spontaneous consciousness, as a civil result of the experience of putting together several buildings and summing up all interesting aspects, including aggregation' (Caniggia and Maffei, 2001, p119) (Figure 2.5). Type can be abstracted from buildings, urban objects, urban organism and territory at different levels of resolutions and in different degrees of specificity. For instance, natural materials produce a building; buildings make up a piece of urban fabric; several pieces of fabric fit together to make a city; several cities or settlements belong to a larger landscape. All of the objects at different scales have basic types which are the first or dominant types in certain areas. The levels of resolution and levels of specificity suggest the most important methodology which will be explained in the next chapter and used in the Chinese urban analysis.

The scholars of the third generation within the school are carrying on the typological study and disseminating the two founders' theory in the world. The marriage of

typology theory with morphology theory achieves great success in urban study and design because of their complement to each other, which will be elucidated later.

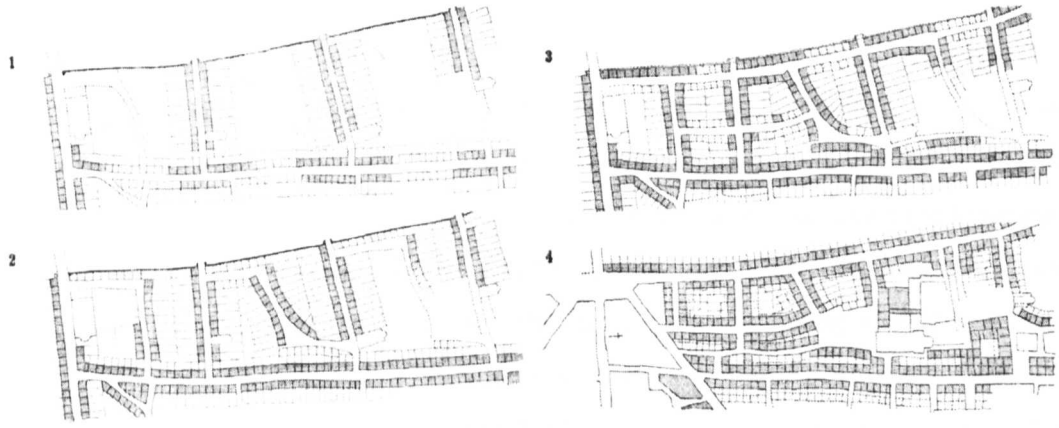

Figure 2.5 Theoretical model of the phases of the formation of the urban fabric in Rome: 1, pertinent strips are formed along the matrix routes; 2, more buildings are built along the connecting routes; 3, planned routes are formed allowing more buildings to be built; 4, the completion of the block built-up. (Caniggia and Maffei, 1979)

2.4 British Morphological School

The concept of 'urban morphology' referred to the urban physical forms, including their appearances, shaping process and relations with social and economical context, which emerged in the late 19th century in Germany (Whitehand, 1987, Whitehand, 1981a). The theory derived to respond to the lack of a comprehensive theory of urban form capable of providing a basis for application to planning before M.R.G. Conzen's research (Whitehand, 1981a). This concept later further developed by Conzen and his followers such as J.W.R. Whitehand, Slater, Larkham and Kropf based on the University of Birmingham in Britain. As a researcher of urban morphogenesis, German geographer Schluter's (1899) work was essential for the development of Conzen's ideas, because firstly, he suggested the research objects of urban morphology was the ground plan of a town; secondly, he published his views on wider aspects of settlement geography, which was defined as 'urban landscape' by him (Whitehand and Larkham, 1992, Whitehand, 2001, Hofmeister, 2004). The study of urban landscape then was actively conducted not only in geography, but also in architecture, planning and urban social history for understanding and managing the built environment.

M.R.G Conzen brought the morphogenetic research of Schluter to the English-speaking world in the middle of 20th century. Conzen published his theory and methodology with two survey works on the English small towns 'Alnwick' and 'Newcastle' (Conzen, 1969, Conzen, 1981). Compared to the founder of the Italian School--Muratori, Conzen was more practical. His ideas permeated his precise terminology of analysis methods. In his study of Alnwick, he surveyed the town plan in great details. He conceptually divided the townscape into three research objects, which were widely accepted nowadays, the 'town plan', 'building forms' and 'land use'. A town plan itself could be divided into 'streets and streets system', 'plots and their arrangement' and 'building block-plans'(Conzen, 1969). In the threefold analysis, the town plan was the most fruitful one, because 'it has not only provided an important method for the reconstruction of a fundamental aspect of urban landscapes but also contributed to underpinning a method for their regionalisation and management'(Whitehand and Gu, 2007, p91), and the other two were regarded as 'three dimensional' analysis and functional analysis respectively. The method of town plan analysis developed by Conzen could be applied to any settlement in any cultural area (Conzen, 1990, Slater, 1990).

Furthermore, his other two important concepts, 'fringe belt' and 'burgage cycle' were also fundamental in the theory. Fringe belts were 'the physical manifestations in the landscape of periods of slow movement or even standstill in the outward extension of the built-up area; they tend to be used initially for purposes requiring large sites and having little need for accessibility to the commercial core'(Larkham and Jones, 1991). The burgage cycle was the 'progressive filling-in of plots with buildings, leading to a climax phase of maximum coverage and, ultimately, the clearance of plots preparatory to redevelopment' (Larkham, 1998, p163). The concept of 'burgage cycle' was related to the boundaries and dimensions of plots, which showed that the morphological analysis could construct the historical boundaries of buildings and plots. Moreover, the concept of 'fringe belt' connected to his other concept of 'morphological frame' and 'morphological regions'. This concept allowed the division of the town plan into areas of different plan types,

building types and land utilisation types (Whitehand, 2001). Thus the term of 'morphological region' indicated the structural and transformation relationship between the different parts of the plan of a city. For instance, in his study of the historical town Ludlow in England, he divided the town into five morphological regions (Conzen, 1988). In each of his subdivision of a plan according to plan types, building forms and land utilisation types, a hierarchical framework with four or five or more orders was applied (Figure 2.6). Theoretically, the hierarchy was constituted by the fact that one complex contained the second which in turn contained the third (Kropf, 1993). For instance, the town plan contained streets and street system, blocks and plot-series at the first order, and the block or plot-series contained plots at the second order, while the plot contained building forms at the third order (more detailed explanation is in Chapter 3). In these containments, the relationship between land utilisation division and the plot-series division was not very clear due to the fact that land utilisation always changed inconsistently with the changes of its plot boundary. A building form was contained in a land utilisation unit and a plot. However, the plot boundary and the boundary of the land utilisation unit are not always consistent over time. This vagueness remains inconvenience in Conzen's methodology.

Conzen's theory and methodology was inherited by the other members of the school in their applications and development. According to Whitehand's summary, the extension and development of Conzen's idea lied on the four points in the school, firstly, the town plan analysis; secondly, the burgeoning literature on the fringe-belt concept; thirdly, the induction of Conzen's different approaches and techniques in landscape studies, for instance, the radical difference between plan analysis and fringe-belt analysis; finally, the largely unexplored potential of Conzen's approach to townscape management (Whitehand, 1981b). Whitehand himself put great efforts on the development of the Conzenian School. For example, he examined the fringe belt of Birmingham in order to explore the land-use associated with the redevelopment of site, the relationship between planning policy and planning decisions, the discussion between developers, local authority and common people (Whitehand and Morton, 2004). This study proved that Conzen's concept of fringe belt could be influential in

the decision making and managing process of the governmental planning. Furthermore, he exemplified the redevelopments and their reasons and frequencies of Glasgow's commercial core during 130 years (Whitehand, 1987). Moreover, he established the journal of Urban Morphology which aimed to advocate the school's ideas and enhance intellectual discussion from other thoughts in a multi-disciplinary scope. The journal was recently published many papers about the Italian School and etc. In addition, he started to dedicate himself on the study of Chinese urban form, for instance the study of Ping Yao (Whitehand and Gu, 2007), which was a pioneer application of Conzen's ideas to the Chinese context (Whitehand and Gu, 2003, Whitehand and Gu, 2006a).

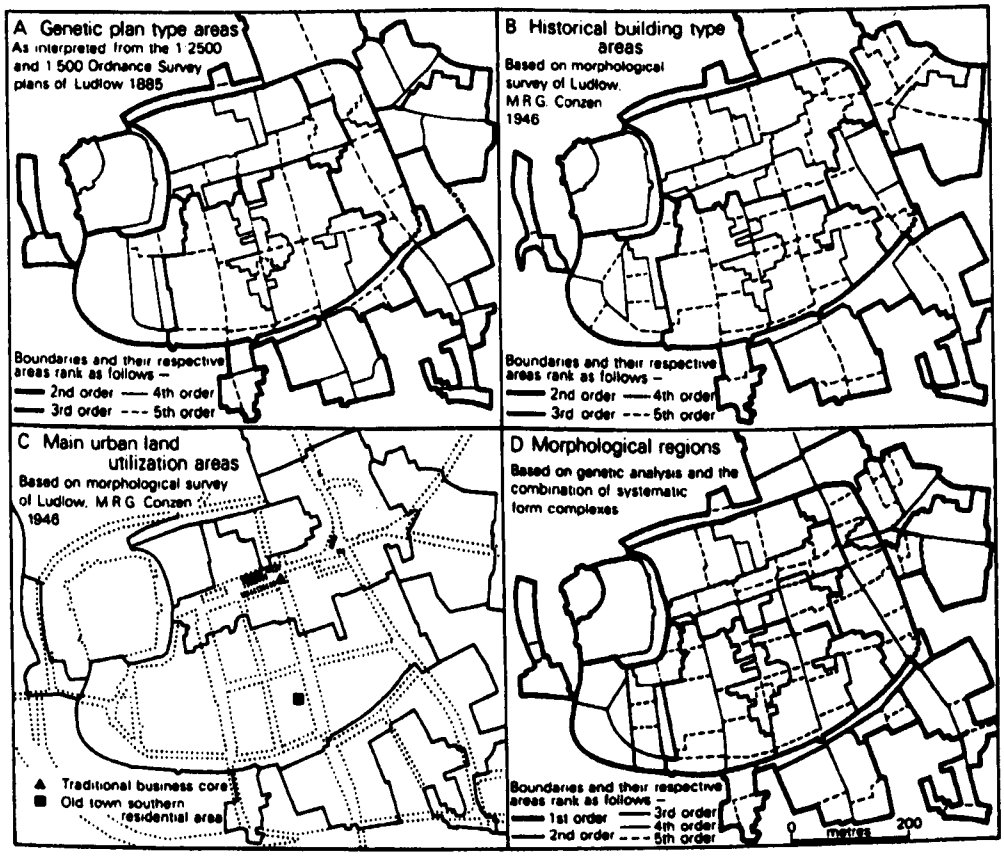

Figure 2.6 Conzen's definition of the morphological regions of Ludlow according to different plan unit types, building types and land use types (Conzen, 1988, p258)

Apart from Whitehand, Slater (1978, Slater, 1989, Slater, 1990) further developed the concept of fringe belts. Larkham reviewed the development of urban morphology

in the UK and built the glossary of terminology in the Conzenian School. Kropf was the first one trying to connect the school's idea with the Italian school from his careful identification of the similarities and differences between the terminologies and methodologies of the two Schools in his PhD thesis and later works (Kropf, 1993), which applied typology of urban tissue in urban morphological study (Kropf, 1995). In addition, Samuels (Samuels, 1999, Samuels, 2008) also contributed to the school's extension by his plenty of practices.

The concepts and terminology of the two theories and the two Schools indicate the possibility of integration as a more capable theory of typomorphology, which will be explained in the following paragraphs. Furthermore, the concepts and terminology of the two theories, such as types, typological process, morphological regions and etc inspire the study of Chinese cities in this thesis based on the similar belief that the identity of urban forms of a particular culture relies on its tradition. The methodology for the Chinese context will be addressed in the next chapter.

2.5 Typomorphology

2.5.1 The reciprocity of typology and morphology

During the early stages of development of the two Schools in the middle of 20th century, both of the Italian Typological School and British Morphological School are developing their theories and approaches independently. Their founders Muratori and Conzen worked in different places. However, their theories are greatly similar, and complementary to each other to a certain degree (Moudon, 1994, p297). The two theories should be considered and applied synthetically and simultaneously to benefit urban studies, urban planning and design in a wider range.

The comparisons of the two theories can be outlined under the following four points—their rationales, research objects, objectives and methodologies (Chen and Gu, 2008). In terms of origin, the concept of type and typology derived from the mysterious archetype, machinery prototype to the rational type of urban forms in the contemporary time, while the morphology derived from the morphogenetic research on human geography and urban geography (Whitehand, 1981a). The philosophy

behind typology was rationalism, which considered that urban artefacts were independent from human perceptions. Morphologists were trying to interpret the urban transformation in relation to its social, political and demographic aspects, which were more comprehensive and sensible. Furthermore, typologists mainly exemplified their theory on buildings, while morphologists based their study on urban forms. However, typologists admitted the importance of urban tissues and advocated that the typology of urban tissues provided generic design references for placing a new building in contexts. Morphologists analysed morphological regions according to different building types. Moreover, one of the most important objectives of both typology and morphology was how to fit a piece of form into the existing urban landscape. In the typology theory, the 'typological process' was vital for this objective, while in morphology theory, the 'morphological region' and 'fringe belt' were important, which indicated the process of 'how the urban parts of the earth surface were configured and reconfigured' (Whitehand, 2001, p108). However, a vital difference was that typology aimed to 'guide' city design from designers' perspectives, but morphology aimed to 'read' the city fabric and benefit landscape management and conservation from geographers' points of view. In addition, both the methodology of the two theories declared a hierarchical framework. As explained before, typologists divided urban forms into 'territory organism', 'urban organism', 'urban tissue', 'building organism' and 'building elements', while morphologists divided urban forms into different 'morphological regions' according to several orders of plan units types, building types and land-use types, and they divided the plan units into streets system, plots and building arrangement. Even though terms and definitions of the two theories were not identical, both of them provided handy tools for urban study and design.

During the past two decades, communication between scholars in the two schools is more and more active. The two theories have been gradually combined together. In terms of reciprocity, on the one hand, morphological analysis is able to provide comprehensive and detailed information for the transformation of urban tissues, and helps to build the typological process for particular urban forms; on the other hand, typology reinterprets existing urban architecture with new meaning and function

rather than invents new forms, which maintains the stability and identity of particular urban forms, and further benefit the management and conservation of urban landscape for the purpose of morphology.

The compositional word 'typomorphology' lacks of a widely acknowledged definition yet in literature, but it has been used in many scholars' works as a combination of typology and morphology. According to Hwang's (1994) research on the reciprocity of the two theories, the meaning of typomorphology referred to forms presented as types to be 'imitated, interpreted or concretised, or to elements whose hierarchy and composition can be reorganised through new formal organisations and a new presence in a specific field'. 'Their position can determine qualitatively well-defined aggregations or relationships; it can result from a transformative process on the same materials, through techniques and new associative chains starting from the historical mutations of the meanings of materials'(Hwang, 1994, p198-9). Furthermore, according to Hwang, there were four advantages of the integrated theory, of which the detailed explanations could be found in his thesis. Briefly, the first was that it re-equipped urban architecture with traditional meanings, which was good for architectural representation. Secondly, typomorphology could re-direct the city with a certain order through design control. Thirdly, it particularly benefited urban public spaces such as parks and streets by the reconstitution of architectural vocabularies; finally, typomorphology was a way to protect the regional characteristics of urban architecture against the process of socio-cultural globalisation, which was one of the objectives of the study in this thesis. Moudon (1994) is the first scholar to mention typomorphology. She concluded that typomorphology perfectly bridges the gap between the building scale and the city scale, and it defined types by time as well.

There is another school called French Versailles School, which has been developing the integrated typomorphology theory. The school has scholars from multi-disciplinarians including architects, sociologists, historians, geographers and planners, who are working together to achieve an improved understanding of the city. As one of the representatives of the school, Jean Castex (1979) examined Versailles'

architectural types and urban forms in order to understand the relationships between the architecture and the city in his assay *Space as representation and Space in Practice: A Reading of the City of Versailles*, which was considered to be the best study of urban form in France (Darin, 1998). Another important scholar is Philippe Paneral (Paneral et al., 2004), who focused on large transformation of urban forms and its historical reasons. The dual purposes of their study were both the descriptive research of architecture and urban form in morphology and the identification of design models, like that in Italian Typology. However, their attitude towards Modernism differed from Muratori's, who considered Modernism was completely opposite to the tradition. Scholars in the French School believed that 'Modernism is not a temporary state of crisis, but a set of new design principles that have gradually infiltrated the city-building process over a relatively long period of time' (Moudon, 1994, p306). They argued that the modern forms in contemporary cities would also become 'prior types' for the future design, thus the history of design theory was not only operational, but also critical (Moudon, 1994).

Design method used in the French School focused on four levels of analysis that were clearly articulated:

- the overall urban form set in relationship simultaneously with the territory and with the stages of its growth;
- the monuments and institutions in relation to their placements in the urban structure;
- the ordinary fabric;
- the dispositions of ordinary buildings such as houses. (Castex and Panerai, 1982, p94)

Through the analysis of urban forms at the four levels, they identified two categories of building types in use today. The first one was called 'consecrated types' of buildings that could be found repeatedly in various buildings, such as Roman villas and cathedrals. The second one was 'typical plan' type, which was similar to prototype aiming at mass production (Moudon, 1994, p305). The choice of proper scale was essential for their studies, at which the relationship of types of urban forms, the typology, could be established. The major contribution that French Versailles

School made was developing the integrated typomorphology theory in a multidisciplinary context through solid urban design practices and design education.

In sum, the three schools together with and their theories and methodologies provided a substantial foundation for reading urban forms and affecting urban design and management. Particularly, the British Morphological School provided comprehensive and practical approaches for urban form analysis, which helped understand the formation and transformation process of urban forms, while the Italian Typological School provided theoretical and philosophic soil for urban and building design within a local cultural context. The French school stood in-between the other two schools, and combined their theories for critical analysis and design of urban forms. The integrated typomorphology theory inspires the Chinese study within this thesis.

2.5.2 Form-based design theory

Urban design initially focused on the design of major civic buildings and their relationship with the surrounding open spaces before the 1950s, such as the City Beautiful Movement. In this tradition, aesthetic issue was the major concern. Since the 1950s, the dimension of urban design turned to 'effective problem solving and the process of delivering or organising development' (Carmona et al., 2003, p3). Urban design was defined as 'creating a vision for an area and then deploying the skills and resources to realise that vision'(English Partnerships, 2000, p10).

The built landscape must be understood according to three fundamental dimensions: time, form and scale, as acknowledged in the three schools (Moudon, 1994). The understanding and application of previous types was placed in the temporal dimension and at different scales in typomorphology, which considered that urban forms were the fundamental objects of urban design, and could be called form-based design theory. There are several perspectives on urban design in literature. The form-based design theory is only one of several, such as the perceptual perspective, the social perspective, the visual perspective, the functional perspective and the temporal perspective, which are explained as following (Carmona et al., 2003).

The emphases of the other perspectives are different from the form-based theory in terms of research methodologies and objectives. The perceptual approach of urban design concerned people's perception and experience of a place, and the 'sense of place' was very important in design achievement. This approach was deeply rooted in the philosophy of empiricism, which regarded 'human being's ideas were based on what they had received from the outside environment by means of senses and reflection' (Broadbent, 1995, p80). Therefore the impact of an environment towards human being's senses of vision, hearing, smell and touch was essential for a place. Empiricists' purpose was building the imageability of the space in terms of physical qualities relating to identity and structure through mental mapping exercises, which was also called environmental behavioural study. Kevin Lynch's five urban elements were the typical examples (Lynch, 1960). The symbolic meaning of the place was also important for the perceptual perspective of urban design.

Another design perspective was the social relationship between space and people, which was closely related to functional perspective as well. A space should fulfil people's physiological needs, affiliation needs and self-actualisation needs. A place should enhance social activities in a neighbourhood, and insure people's safety and security (Carmona et al., 2003). The doctrines of Jane Jacobs (1961), William Whyte (1984) and Jan Gehl (2001) are typical examples. They established connections between human activities and physical forms, which consider how people behave in spaces.

The visual perspective focused on the aesthetic quality of an urban space and townscape, which had a long tradition in the realm of urban design as mentioned before. Before the Modern Movement, the aesthetic quality of traditional cities was always considered to be the most important issue, which could be seen from the Picturesque tradition in England in the 18th century, Camillo Sitte's (1965) work, Hegemann and Peets' (1988) contributions to urban space making, Gordon Cullen's (1971) *the Concise Townscape*, the Townscape Movement in America during the 1960s-80s (Ellin, 1996).

The temporal perspective considered the role of 'time' played in a space, for instance, the utilisation of space could change at different time, and people's needs from a space could change in a temporal cycle. For instance, a public square was used for different purposes during special events and normal days; commercial pedestrian streets were used by different people in the day and in the night.

These five perspectives in urban design are not completely separated but embrace a certain degree of similarity. For example, even though typomorphology is a form-based theory, it is concerned about sense, identity and continuity of spaces, and the social economical and political reasons of the transformation of spaces. In terms of its rationale, it is closely related to regionalism (or critical regionalism) and contextualism, which regard traditional and local spaces as the resource of future design. Apart from typomorphology, there are other scholars' works also on urban form design, such as Christopher Alexander's (1987) ecological planning and Robert Venturi's (1994) contextural design, which will not be explained in detail.

In sum, typomorphology as a form-base theory is only one of the five perspectives of urban design, but it has relations with the others. Its rationale and approaches mainly focus on the contextural manipulation of urban space.

What determines a good urban space? This question is important for the typomorphological study of Chinese cities because the objective of urban design should be clarified and meet the requirements of Chinese urban development. The answer was explored by various scholars in literature. In a chronological order, Lynch (1960, Lynch, 1981) advocated legibility and imageability of urban structures which were made of his five elements—paths, nodes, districts, landmarks and edges. He also proposed that good urban forms should have vitality, sense, fit, access and control of a space[5]. Jane Jacobs (1961) asserted that an urban form should support

[5] Lynch identified five performance dimensions of urban design: Vitality, the degree to which the form of places supports the functions, biological requirements and capabilities of human beings. Sense is the degree to which places can be clearly perceived and structured in time and space by uses. Fit, the degree to which the form and capacity of spaces matches the pattern of behaviours that people

the social diversity[6]; Cullen advocated the continuity, variety and individual responsibility of urban forms; Krier (1979b) emphasised aesthetic quality of urban spaces; Ian Bentley (1985) illustrated the importance of permeability, variety, safety and legibility of a space; Christopher (Alexander et al., 1987) said designers must create an environment with continuous structure of wholeness[7]; Allan Jacobs and Donald Appleyard (1987) suggested seven goals for urban design, which were liveability, identity, accessibility to opportunities, authenticity, community-involved, urban self-reliance, and equality[8]; New urbanists (Leccese and McCormick, 2000) advocated economic vitality, community stability, environmental health and a coherent and supportive urban environment in neighbourhoods, urban blocks, streets,

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engage in or want to engage in. Access is the ability to reach other persons, activities, resources, services, information, or places, including the quantity and diversity of elements that can be reached. Control, the degree to which those who use, work, or reside in places can create and mange access to spaces and activities. LYNCH, K. (1981) *Good city form,* Cambridge and London, MIT Press.

[6] According to Jacobs, to generate diversity in a city's streets and districts, four conditions are indispensable: The district must serve more than one primary functions; Most blocks must be short; the district must mingle buildings that vary in age and condition; There must be a sufficiently dense concentration of people. JACOBS, J. (1961) *The Death and Life of Great American Cities,* New York, Vintage Books.

[7] The ideal of a growing whole is that every new act of construction has just one basic obligation: it must create a continuous structure of wholes around itself. He further developed seven rules to achieve the wholeness. ALEXANDER, C., NEIS, H., ANNINOU, A. & KING, I. (1987) *A New Theory of Urban Design,* New York, Oxford, Oxford University Press.

[8] They suggests seven goals that are essential for a good urban environment: (1), Liveability: A city should be a place where everyone can live in relative comfort; (2), Identity and control: People should feel that some part of the environment belongs to them, individually and collectively, whether they own it or not; (3), Access to opportunities, imagination and joy: people should find the city a place where they can break from traditional moulds, extend their experience, and have fun; (4), Authenticity and meaning: people should be able to understand their city, its basic layout, public functions and institutions, and the opportunities it offers (5) community and public life; (6) urban self-reliance: increasingly cities will have to become more self-sustaining in their uses of energy and other scarce resources; (7), An environment for all: good environments should be accessible to all. Every citizen is entitled to a minimal level of environmental liveability, and of identity, control and opportunity. JACOBS, A. & APPLEYARD, D. (1987) Towards an Urban Design Manifesto. *Journal of American Planning Association,* 53, p 112-120.

and buildings. Furthermore, they also gave specific approaches to these qualities in their researches, which are described here in detail. The most proposed criteria of a good urban space are permeability, continuity, identity, density, legibility, variety, stability, safety and equity, which are the necessary properties of good urban spaces and the objectives of urban design.

Typomorphology does not directly contribute to all these qualities, but mainly deals with the continuity and identity of urban spaces, and is in relation to historical diversity and stability. However, it indirectly influences the other qualities, which will be addressed through the examination of Chinese cities. The creation of the sense of identity of an urban space refers to the interaction between physical space and people. Thus it may connect to other scopes of research beyond typomorphology. However, the typomophological approach is still the most effective approach within urban design for the identity crisis of Chinese cities, because it is able to build the continuity of urban forms with its context, and cultural representation between form and convention. Moreover, it provides comprehensive framework of urban form analysis in order to build the solid information database for particular urban forms over time, which is also important for future research on place identity.

2.6 Typomorphology in China

Western typology theory has been introduced into China by overseas Chinese scholars during the late 1980s and early 1990s. The earliest Chinese paper on typology was an introduction of Aldo Rossi and his theory by Shen Kening (Shen, 1988). Later on, the concept of type and its applications to architectural design in the west were published in Chinese journals (1988, Ma, 1990, Zhang, 2003). Meanwhile, the development of typology in America in relation to DPZ's New Urbanism and their urban design projects were introduced by Shen (1994). In addition, scholars in Chinese universities started to pay attention to typology in the late 1990s, and discussions on typology and its applications to the conservation of Chinese cities were proposed in some students' dissertations, for instance, Zhang Lin (1997) and Wang Lijun (Wang and Peng, 2001, Wang and Gao, 2002). Thereafter, more Chinese scholars began to consider and reflect upon this theory. However, most of their

attention was on Aldo Rossi's theory (see, for example (Jing, 1999, Cao et al., 1999, Zheng, 2005), Krier brothers' practices (Zhuang and Zhang, 2002), Durand's composition (Qu, 2005) and the typological applications mainly at the building level (see, for example (Qi, 2000, Wang and Peng, 2001, Wang and Shu, 2005, Li, 2002). All these works believed in the potential of typology in abstracting the traditional architectural forms and delivering cultural meanings (Liu, 2007). These papers facilitated the distribution and development of the concept of typology in the Chinese academia. However, those scholars' introduction and understanding were far from comprehensive and accurate, as well as their experiments. For instance, they neglected the transformation process of types in one place over time; they analysed urban architecture at limited scales rather than in a systematic research framework.

The application of typology shown in several domestic design practices during that time was not fully successful. One of the earliest design projects using typology as the guiding principle was the regeneration of Ju'er Hutong in Beijing conducted by Professor Wu Liangyong since 1987 till the late 1990s. The project aimed at rehabilitating the housing stock in an inner city neighbourhood so as to improve the physical environment while integrate modern living requirements. There were several problems in the original housing which designers needed to confront such as overcrowding, dilapidation, temporary houses and poor ventilation. The chief designer Wu referred to traditional typology with modern amenities serving as models for the house reform (Ghirardo, 1996). The design technique employed in the project was following his concept of 'abstractly inheriting the tradition' ('chouxiang jicheng') [9] as the right attitude towards Chinese traditional architecture. The typological design of this project was carried out in three steps. Firstly, designers

[9] 'Abstractly inheriting the tradition' ('chouxiang jicheng') was proposed by Wu Liangyong in his paper. It includes two aspects of the traditional architecture which can be inherited in the contemporary design: the first one is the philosophical and cosmological concern embodied in the traditional architecture, and the second one is the most distinctive Chinese traditional architectural details, which can be the resource of the contemporary formative creation. His concept is similar to Typology theory, which emphasises the continuity of form over time. WU, L. (1999) Guanyu zhongguo gu jianzhu lilun yanjiu de jige wenti (Problems in the current research on the theory of Chinese historical architecture). *Jianzhu Xuebao (Architectural Journal)*, p38-40.

abstracted the traditional house type from the traditional houses, as the basis of their plan configuration. Courtyards were the centres of plans, and living units surrounded courtyards. The relationship between courtyard houses and Hutongs (neighbourhood streets) was also acknowledged. Secondly, the type of houses and the type of the relation between houses and Hutong were converted into new forms. Thirdly, modern facilities were introduced into the new courtyard houses and neighbourhoods (Su and Quan, 2004) (Figure 2.7). This neighbourhood regeneration has achieved great success in China in terms of incorporating traditional forms with new technologies. However, the new architectural form was from superficial image-imitation and collage of traditional elements due to a lack of the awareness of a dynamic typological process of traditional houses and necessary analysis of the surrounding urban forms at larger scales.

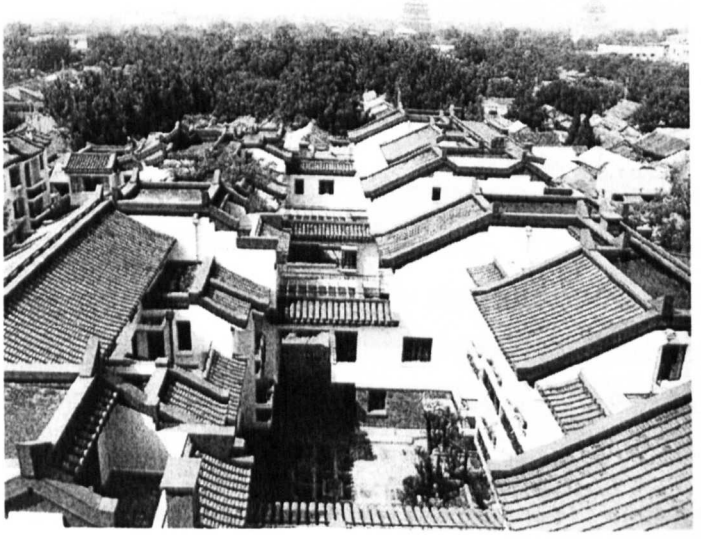

Figure 2.7 The building cluster and one of the courtyards in the Ju'er Hutong project (resource is from www.qvinfo.cn/st/ztzl/jz/juer.htm)

Another example is the 'Xin Tian Di' project in Shanghai in the 2000s, which has transformed a traditional neighbourhood into a high-end commercial and entertainment region based on the preserved traditional houses. Even though the project maintained the traditional features of that area and has gained enormous commercial success, it retained several problems. The first one was the social disconnection between previous residents and the place; the 'community' had been removed from its previous location, and the previous inhabitants had to sell the place

for commercial development. The second one was that, as concluded by Qian (2006, p852), tradition was 'de-linked from the history and culture it originated from, and is subject to selection and modification'. Similar development projects can be also found in Nanjing--'Nanjing 1912' (Yang, 1993, Qi and Yang, 2006), in which the traditional 'Min Guo' architectural style was employed to produce traditional image for modern commercial shops. In sum, in-depth understanding and sufficient applications of the typology theory are absent in China, and thus it makes this study necessary.

Conzenian urban morphology was introduced into China in the recent decade also by overseas Chinese scholars, such as Ke Jiangmin(1994) and Kai Gu (2008). Ke analysed three traditional dwellings in Suzhou using the approach of urban morphology. His research was merely a morphological analysis without further benefit to either urban design or landscape management. Gu introduced urban morphology into the Chinese academia (Gu, 2001) and applied the theory to the Chinese city Hainan in his doctoral study (Gu, 2002). He recently worked with Whitehand on urban conservation issues and morphological analyses of important traditional Chinese cities (Whitehand and Gu, 2003, Whitehand and Gu, 2006a, Whitehand and Gu, 2006b). Their most recent morphological analysis of Chinese cities was the study of the historical city–Pingyao (Whitehand and Gu, 2007). They applied Conzenian methodology to the urban form analysis of Pingyao, and defined morphological regions according to street-plan types, plot types and housing types. The work was essentially an investigation in plan analysis of the Chinese city, and was declared by Gu and Whitehand that it would benefit urban landscape management, although this would need further work. Their studies implied a great potential of the western theories of typology and morphology in the Chinese context.

The integrated typomorphology is completely absent in China; hence the potential of it needs this research project. Even though typomorphology derives from the European continent, it deliberately focuses on local contexts, and provides the theoretical foundation and methodological support for localised design. The attitude towards urban artefacts and the methods of analysing urban form in typomorphology

are what the Chinese scholars can learn from their western counterparts. Besides, since type is deeply rooted in people's unconsciousness, typological thinking that is embodied Chinese culture is already in people's mind. As mentioned in Chapter 1, traditional Chinese architectural and urban language received strong influences from ancient cosmology, philosophy, Fengshui and Li Zhi, which were maintained by the long-lasting feudal dynasties for seven thousand years. There was an ideal form of Chinese cities embedded in the traditional cosmology. Once the ideal form was achieved, it was reluctant on the part of the subsequent chroniclers of the city 'to allow the realities of actual urban growth and change to intrude upon the representation of the city in its ideal state'(Gaubatz, 1998, p148). As a result, the ancient Chinese urban architecture was extremely stable. This existing ideal not only of urban form but also of building form acted as morphological type or formal language in designers' spontaneous consciousness, which also spontaneously involves in their design practices.

In sum, Chinese tradition provides abundant cultural soil for Chinese typomorphological research. And typological thinking is deeply rooted in Chinese people's spontaneous consciousness. Meanwhile, western typomorphology offers theoretical and methodological framework for the Chinese research. These three conditions make the typomorphological research possible in China.

2.7 Conclusion

The concept of type in the western world derived from the early holy mysterious description of buildings and effort of searching for the relation of man-made objects with nature. It has been developing in the realm of architecture and urban study from a composition mechanism, low-level classification technique to a comprehensive theory of architectural and urban design over the past two hundred years. The meaningful word 'type' implies the characteristics, essence, structural principles and cultural symbols of urban artefacts in a specific cultural background. Typology theory, morphology theory and their integration have also well developed by the three schools and other scholars in America. Even though it has been employed for creating European traditional urban spaces and resisting the Modern Movement

initially, it can never be regarded as a simple nostalgia and production of cultural images. The true rationale behind is the concern of the harmonious and comfortable relationship of the physical world and human being, and the right attitude towards human's own culture at an immaterial level. These two issues are the timeless goals which designers and human society should pursue.

Chinese cities are facing the crisis of becoming placeless and losing its splendid cultural identity in the strong wave of urbanisation and globalisation. So far, there is no sufficient theoretic and methodological support founded in China to solve the problem. The typomorphology theory, which is completely absent in China, is able to benefit urban study and design in terms of cultural representation, morphological reference and effective communication as elucidated before. Typological thinking has been already embedded in Chinese people's unconsciousness. Therefore, its potential on the Chinese context is necessary to explore.

In response to the two questions asked at the beginning of this chapter, typomorphology is a possible solution for Chinese urban design, conservation and urban regeneration, which will be tested in Section 2 of the thesis. However, there is no model of analysis and design that can be borrowed directly, and it needs modification according to the Chinese reality. The particular methodology established for the Chinese analysis is explored in the next chapter.

CHAPTER 3 METHODOLOGY

In this research project, specific methods and terms for analysing Chinese urban forms are closely related to the typomorphological approach implemented in the western urban study and design. However, because of the specificity of the Chinese context, definitions and methods are modified accordingly. It is necessary to clarify such definitions and methods of analysis, thus this chapter explains in detail the selection of the case study city; the use of the typomorphological method; and the seven elements as components of the synthesis of a Chinese city.

3.1 The selection of the case study city

3.1.1 Aim of case study

During the recent three decades, Chinese cities have been experiencing transformations in different degrees. The loss of cultural identity is evident throughout the country and is part of the process of urbanisation and globalisation. To explore the potential of the theory of typomorphology as a way to solve the identity crisis in the Chinese context requires an appropriate application of the theory to Chinese cities. The rationale behind the 'case study' method is to conduct detailed contextual analysis of a limited number of objects or events, in order to understand a complex issue or object and offer grounds for establishing reliability of findings (Yu, 2007).

China is a broad country with hundreds of cities and towns, which have different urban forms following geographic conditions and social customs developed over history. For instance, generally speaking, the urban forms of traditional northern Chinese cities were more regular than that of southern Chinese cities due to the less rigid topographic limitations in history (Wu, 1985); and timber structures were more popular in the eastern cities than that in the western cities due to different climates and availability of resources. Therefore, it is impossible to investigate all Chinese cities in details in this thesis.

The 'case study' method provides a solution: if a case was selected among a group of objects which have similar quality, the way of analysing the case can be used for analysing other objects in the group. In this thesis, the qualitative and quantitative examination of one Chinese city provides a vision of how the typomorphological examination is conducted and what the merits of the theory are. The methodology established and tested for one city can be generalised for other cities with similar qualities. Therefore, the case study in this thesis offers a possibility of carrying such examination on other Chinese cities for the purpose of sustaining cultural identities by other researchers in the future.

3.1.2 The criteria of case selection

The criteria of case selection are critical for the success of the research. The case city should be typical among a group of cities which are necessary for typomorphological analyses. The following explains two main criteria and one extra criterion for case selection.

3.1.2.1 The first criterion

The first criterion for case selection is that the case city should have a strong presence of traditional urban fabric, because the inherent identity of a city is largely embodied in its traditional urban artefacts (refer to Chapter 1). This criterion has excluded hundreds of newly built modern cities and towns in China, of which identities do not come from their tradition but from other means such as contemporary landmark architectures.

Cities fulfilling the first criterion can be found in the government's three lists of 99[1] 'Cultural and Historical cities' (Lishi wenhua mingcheng). The government started to realise that both historical artefacts in cities and their built environments needed to be protected in the 1980s. The concept was inspired by several western conservation

[1] The number of Cultural and Historical cities increased to 114 by 2009, since the government added another 15 cities in 2008.

laws and projects [2] during the 1960s and 1970s. Consequently, the central government has launched the first list of historically important cities in 1982, which included 24 cities over the country. The second list of additional cultural and historical cities (1986) covered 38 cities, while the third list (1994) included another 37 cities in China (Ruan, 2000) (Figure 3.1). For the central government, firstly, cultural and historical cities should have abundant historical remains with profound cultural meanings or commemorative meanings of the Liberation of China[3]; secondly, there should be large existence of traditional layouts and historical appearances in those listed cities. The criteria for the government's selection of cultural and historical cities in China are greatly similar to the first criterion of selecting case city in this thesis.

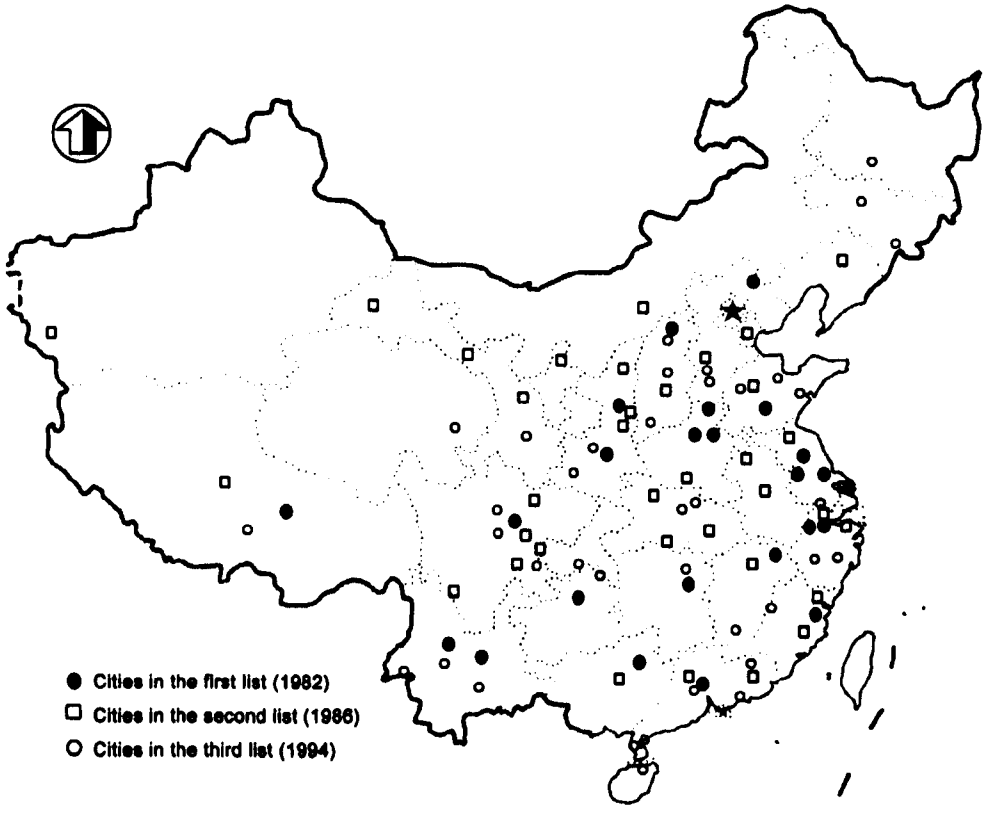

Figure 3.1 Locations of the total 99 Cultural and Historical cities listed by the government in 1982, 1986 and 1994 respectively (by the author)

[2] For example, the Venice Chapter for the conservation and restoration of monuments and sites in 1964; conservation projects in the UK which focused on the entities of cities such as Bath, York, Chester and etc in the 1960s.

[3] The Liberation of China refers to the establishment of the P.R. China in 1949.

The purpose of listing the cultural and historical cities is to 'sustain and preserve the traditional characteristics of those cities while gradually modernise[4] them' as indicated in the 'Zhonghua renmin gonghe guo wenwu baohu fa' (The law of the preservation of the cultural relics in P.R. China, 1982). Since the law allows conservation and modernisation of cultural and historical cities at the same time, historical remains in many of them are not sufficiently protected (Ruan and Liu, 2005). Most of the cultural and historical cities are located in the east part, because cities in the east had longer history of development than cities in the west (Figure 3.1).

In order to narrow down the range of selection for the case study in this thesis, it is necessary to compare the characteristics of the 99 cultural and historical cities. According to Li and Bao (1996), 99 cultural and historical cities can be categorised into six categories according to the properties and configurations of their historical characteristics (Table 3.1). The first category includes 37 cities which have scattered cultural heritage sites and important monuments. The second category contains 26 cities which have comparatively coherent historical urban fabrics and usually are considered as 'historical cities' (Gucheng). The third one has 13 cities which have neither large amount of historical sites or monuments nor coherent historical appearances, but are cultural centres of their regions over history. The fourth category covers 10 cities, which were important for military and transportation purposes in history. The fifth one includes 8 cities, which have distinctive natural landscape and historical gardens. The final one contains 5 cities, which are the

[4] According to the government's intention of listing those historical and cultural cities, the modernisation of cultural and historical cities needs to achieve five balances in development: the balance between historical layouts and the economic structures of such cities; the balance between multi-functional development and specified development; the balance between protection and renovation; the balance between old city cores and new areas; and the balance between tourism and other industries CHEN, K. (1992) Towards A User-Oriented Urban Housing Process in China: A Study of Traditional and Contemporary Housing in Nanjing City. *Faculty of Environmental and Social Science.* Newcastle upon Tyne, University of Newcastle upon Tyne. P11. The principles are too abstract to follow.

commemorative cities of the Liberation of China. The classification is based on Li and Bao's evaluation of the different degrees of importance of the six sorts of characteristics of those cultural and historical cities. For example, a city could have both coherent traditional urban fabric and distinctive natural landscape, such as Suzhou. But the natural landscape is valued by them as more important than coherent traditional urban fabrics in the city. Therefore, Suzhou is in the fifth category. Beijing has large amount of historical monuments while been the cultural centre of the region. But the former characteristic is more vital than the latter for Beijing, therefore, it belongs to the first category.

A			B		C		D	E	F
37			26		13		10	8	5
Dunhuang	Datong	Shenyang	Beijing	Nanjing	Chongqing	Fuzhou	Wuwei	Suzhou	Zunyi
Shexian	Ningbo	Zhenyuan	Qufu	Luoyang	Jinan	Guangzhou	Zhangye	Hangzhou	Yan'an
Zigong	Liangzhou	Shaoxing	Kaifeng	Xi'an	Ha'erbing	Tianjin	Keshi	Zhenjiang	Nanchang
Zhengding	Xinjiang	Daixian	Anyang	Jiangling	Shanghai	Zhenzhou	Quanzhou	Changshu	Qixian
Jiling	Ji'an	Quzhou	Shouxian	Nanyang	Wuhan	Kunming	Xuzhou	Chengde	Changting
Ganzhou	Liaocheng	Zoucheng	Shangqiu	Chaozhou	Huhe Haote		Langzhong	Zaoqing	
Linzhi	Junxian	Suizhou	Hancheng	Yinchuan	Changsha	Qingdao	Yibing	Guilin	
Zhongxiang	Meizhou	Haikang	Handan	Yueyang			Yulin	Yangzhou	
Qionghan	Liuzhou	Lesha n	Foshan	Xianyang			Baoding		
Dujiangyan	Luzhou	Jianshui	Hanzhong	Jingdezhen			Haozhou		
Weishan	Jiangzi	Tianshui	Pingyao	Huai'an					
Tongren	Rikeze	Linghai	Xiangfan	Chengdu					
Lijiang			Lasa	Dali					

Table 3.1 The classification of the 99 Chinese cultural and historical cities. Categories A: cities which have scattered historical remains; B: cities which have coherent historical appearances; C: cities which are the cultural centres of their regions; D: cities which were historically important for military and transport purposes; E: cities which have rich natural landscape or gardens; F: cities which are the commemorative places for the liberation of China (adapted according to (Xu and Zhang, 1996, p101)

Li and Bao's classification of 99 cultural and historical cities helps to target possible cities for the typomorphological examination in this thesis. Cities in the second (B) and the fifth (E) categories are more appropriate as case study cities for typomorphology than those of the other categories, because these cities have comparatively coherent traditional urban fabrics, which enable the typomorphological examination to be conducted at multiple scales [5] and systematically. Cities in the categories A and C can also be analysed through the typomorphological approach, but at limited scales, such as within certain historical districts or a specific urban block, since other districts or urban blocks are full of modern constructions. Cities in the categories D and F have special meanings for the country. However, they have few historical physical urban forms.

Hence, according to the first criteria of the selection of case study city, there are 34 cities in China suitable for a comprehensive typomorphological examination.

3.1.2.2 The second criterion

The second criterion for case selection for this research is that the case study city should be under great pressure of urbanisation, globalisation and serious crisis of losing its cultural identity, in order to explore the potential of typomorphology as a solution to the crisis.

Since the 1980s, economical globalisation and urban internationalisation are the two major trends at a national scale in China, which have caused dramatic transformation of urban forms. The transformations are driven by the international division of labour, the increasing foreign enterprises, investments and internationalised tourism.

The rapid development is greatly uneven among cities in China. Cities near the east coast of China are the most developed and fast transforming ones. According to the figures of GDP per capita in Chinese cities in 2006 (Figure 3.2), eight provinces and two cities of Beijing and Shanghai gain the highest GDP per capita, which is three to

[5] Those scales are the building scale, plot scale, block scale, district scale and city scale, which will be addressed in 3.2.1 of this chapter.

eight times of that of the cities in the west of the country. This uneven development is due to complex reasons, for example, the long history of development in eastern cities, the convenient transportation and high frequency of international trading in eastern cities, policies and etc. Therefore, cities on the east coast of China are under greater pressure of urban transformation than other cities in the rest of China.

Furthermore, according to Zhou's (2004) research on the most internationalised cities in China, 14 cities appeared in the top sixes of rankings among all Chinese cities based on the various indicators of internationalisation (Table 3.2). These 14 cities are most influenced by globalisation and modernisation. According to Zhou (2004), the degree of internationalisation of cities depends on the number of foreign-funded enterprises, import and export values, foreign capital used, the number of international flights, foreign travellers in that city and etc (Table 3.2).

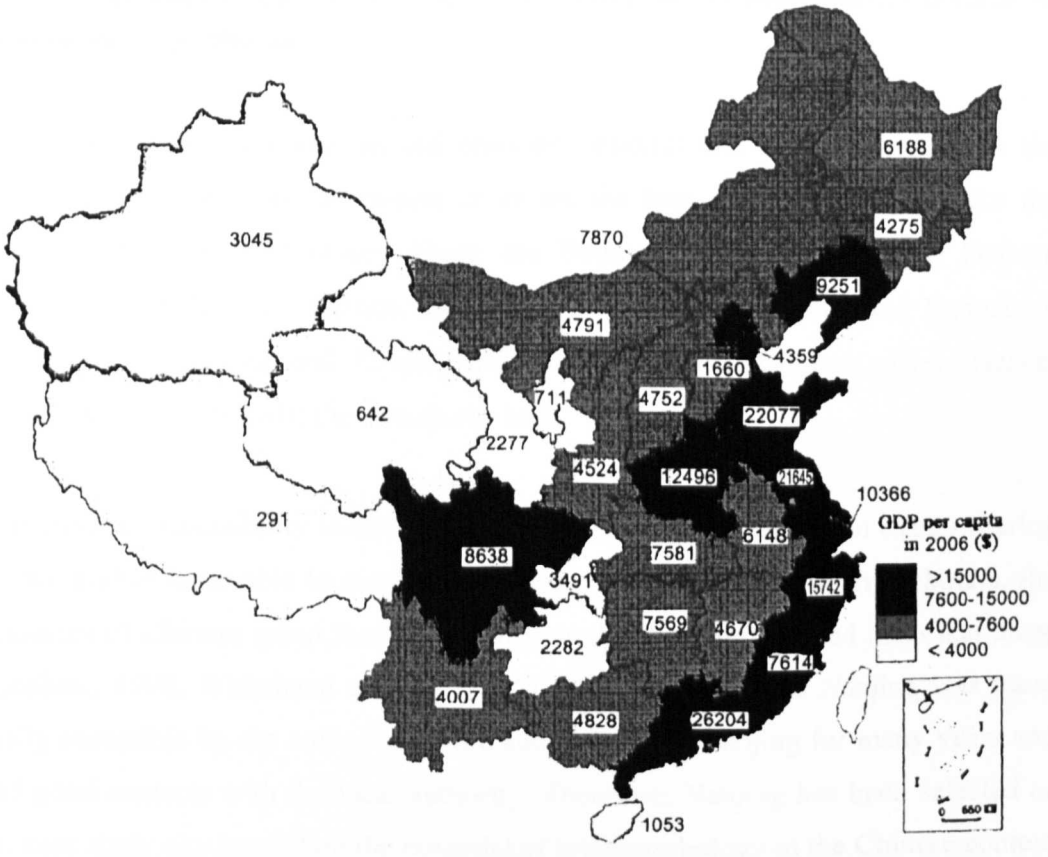

Figure 3.2 The GDP per capita of each province in China, 2006 (produced by the author according to the Section 3-12 'Gross Regional Product and Indices', China Statistical Yearbook 2007)

Dimension	Ranking of the top six cities
Foreign-funded industrial enterprises	1 Shanghai; 2 Tianjin, 3 Guangzhou; 4 Beijing; 5 Shenzhen; 6 Zhuhai
Enterprises with largest import and export value	1 Beijing; 2 Shanghai; 3 Guangzhou; 4 Qingdao; 5 Nanjing; 6 Hangzhou
Offices of foreign-funded telecom enterprises	1 Beijing; 2 Shanghai; 3 Guangzhou; 4 Nanjing
Offices of foreign-funded computer enterprises	1 Beijing; 2 Shanghai; 3 Guangzhou; 4 Chengdu; 5 Shenzhen
Foreign-funded financial institutions	1 Beijing; 2 Shanghai; 3 Guangzhou; 4 Shenzhen; 5 Dalian; 6 Tianjin
Foreign capital actually used	1 Shanghai; 2 Shenzhen; 3 Tianjin; 4 Beijing; 5 Guangzhou; 6 Qingdao
Imports and exports through custom	1 Shanghai; 2Shenzhen; 3 Guangzhou; 4 Tianjin; 5 Qingdao; 6 Dalian
International flights	1 Beijing; 2 Shanghai; 3 Guangzhou; 4 Dalian; 5 Qingdao; 6 Xiamen
Foreign travellers	1 Beijing; 2 Shanghai; 3 Guangzhou; 4 Xi'an; 5 Shenzhen; 6 Kunming

Table 3.2 Rankings of Chinese cities on various indexes of internationalisation (Suzhou shi fangchan guanli ju, 2004, p69)

According to the first and second criterion, cultural and historical cities in the categories B, E and on the eastern coast are the best suitable case cities for the typomorphological exploration. These are Beijing, Nanjing, Chaozhou, Foshan, Hangzhou, Jingde Zhen, Suzhou, Hangzhou, Zhenjiang, Changshu, and Yangzhou, among which Beijing and Nanjing are internationalised Chinese cities. Hence, Beijing and Nanjing fulfil the criteria the best.

Furthermore, accessibility to data on urban forms of those cities is an extra criterion for the author to be able to conduct the research. As noticed by many scholars, the resources of Chinese urban form are very limited, especially detailed historical maps (Gaubatz, 1998, Whitehand and Gu, 2007). The information of Nanjing was more easily accessible by the author since the author lived in Nanjing for many years and had good contacts with the local authority. Therefore, Nanjing has been selected as the case study city to explore the potential of typomorphology in the Chinese context.

Nanjing is a famous historical city with its urban history dating back to more than 2500 years. It has been the capital of ten dynasties, has splendid historical remains

such as the city wall and gates of the Ming Dynasty, feudal palaces and temples and historical houses in the southern city, all of which will be analysed in later chapters. Additionally, the typomorphological approach has also been partly conducted by the author in another cultural and historical city—Suzhou, which is also facing the challenge of globalisation and modernisation (Appendix 2). The typomorphological examination of Suzhou is an additional attempt to test the applicability of the theory. It is not as comprehensive as the study of Nanjing due to the length limitation of this thesis.

3.1.3 The applicability of the theory in other cities

The merits of typomorphology, as reviewed in Chapter 2, mainly lay on its conceptual methods of analysing urban forms and guiding designs to fit into contexts, and therefore maintaining the continuity of urban forms during developments. In order to explore its potential in the Chinese context, all the Chinese cities which have historical urban forms can be examined. The case study city Nanjing is only a typical example, which shows how to conduct similar typomorphological analysis in other cities in the future.

The first possible cities for the application of typomorphology in the future are those called cultural and historical city, which more or less have historical urban fabrics. These cities are all undergoing modernisation and globalisation, although the speed in the western cities is slower then that of cities on the eastern coast. As introduced in Chapter 2, morphological analyses already started to be conducted in another Chinese city—Pingyao by Whitehand and Gu Kai (2007). Pingyao is one of the cultural and historical cities in Category B. Despite their research merely focused on the analysis of Pingyao's urban form, it showed that typomorphological researches had potentials in Chinese urban study (although lack of exploration in Chinese urban design) (refer to Chapter 2).

Cities which are not listed as cultural and historical cities but have certain amounts of historical remains are also possible for typomorphological exanimations, in case new designs are needed in historical areas or near specific historical buildings. The typomorphological approach is able to help designers create context-related designs.

3.2 Typomorphological approaches for Chinese Cities

To conduct typomorphological analyses, a series of actions are required: setting scales for the study of urban forms in a continuous hierarchy; dividing time phases of the development of the case city over time; selecting appropriate morphological regions within the case city; doing plan analysis; defining types and typological processes, and accordingly, generating design suggestions for the case city. The purpose of defining types and typological processes is for generating design suggestions, and types and typological processes can only be addressed through plan analysis. These actions are explained in detail in the following paragraphs.

3.2.1 Hierarchical scales and time phases

Typomorphology suggests that the study of scales is the first aspect in the analytic framework set up for the examination of a city. As reviewed in Chapter 2, both of the Italian Typological School and the British Morphological School have specified a hierarchical relation between different scales of subdividing certain urban artefacts.

Despite Muratori and Caniggia believe that urban fabrics are entities or organisms in which their components have inseparable relation, they have conducted their research at a consistent hierarchy of scales, which always involves the relations of part-to-whole and part-to-part. A hierarchy of scales is based on different levels of specificity (Kropf, 1993), which implies progressive examination ranges used to investigate the characteristics of objects. For instance, if the first level of specificity is the spatial relation among several buildings in an area (their arrangement, orientation and relation to access), the second level of specificity is the dimensional properties of each building (volumes, heights, widths, lengths and densities); the third level of specificity is the structural characteristics of building layouts, which indicate the spatial relation among rooms of one building; the fourth level of specificity is the dimensional distinctions of each room; and further scaling down along with the increase of levels of specificity.

Within the Italian School, scholars have proposed different scales from small to large for the study of urban forms, which are 'building materials', 'buildings organism',

'urban tissue', 'urban organism' and 'territorial organism' (Caniggia and Maffei, 1979). Building materials form structure, and structures form rooms, and rooms form a building, the latter of which is regarded as an organism. The formation process from building materials to building organism reveals the relation of part-to-whole. The relation of part-to-part also exists. For instance, at the level of building materials, manmade materials such as steel, plastic and the natural materials such as timber, stone are arranged in a certain order; similarly, at the level of rooms, the mutual-position of one room to another also follows certain orders. The organisms—a building, an urban tissue and a whole city are formed by these two relations (Figure 3.3). If a type was defined at a certain level, it only presented either the order of part-to-part or the order of part-to-whole of that level. For example, a plot type refers the part-to-part relationship between the building inside and its surrounding open space, while a type of plot pattern refers to the part-to-whole relationship between adjacent plots. The works of Muratori and Caniggia mainly focused on the building level and the urban tissue level (Muratori, 1959, Cataldi, 1995).

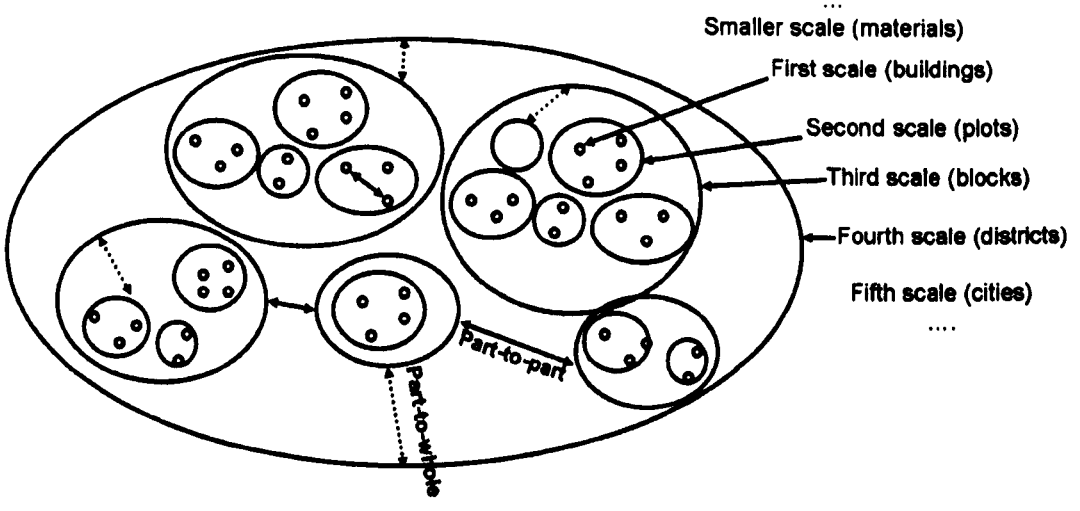

Figure 3.3 A conceptual diagram of the hierarchy of scales and the two relations of part-to-part and part-to-whole in the formation of organisms (by the author)

Conzen (1969, 1988) also employed the idea of a hierarchical system of scales. Conzen's principle of relation was characterised by the specific spatial relation of containment. 'The hierarchy is constituted by the fact that one complex contains the second which in turn contains the third' (Kropf, 1993, p66). Any building is located within the closed figure of the outline of a plot, while any plot is posited within the

outline of a block. The building pattern, plot pattern and block pattern are the relations of arrangement between buildings at the plot level, plots at the block level and blocks at the district level respectively (Figure 3.3). The above two relations are also the relations of part-to-whole and part-to-part. Conzen and his followers emphasised their research mainly at those mentioned scales, which are bigger than the scales of the study of the Italian School.

The scales for the study of urban forms employed by the two schools are continuous. For instance, a district contains urban blocks, which contain plots, which further contain buildings, and the rest can be deduced by analogy. In a study at the urban level, the sequence would go from districts to blocks, plots and then buildings, rather than jumped directly from districts to buildings. The continuous hierarchy of scales ensures that all relationships of part-to-part and part-to-whole are clarified at the required level and easy to understand.

Therefore, the establishment of the hierarchy of scales and the relations of part-to-whole and part-to-part should be the first step to analyse Chinese cities, because it frames urban forms in a logic way and makes the identification of relationships between different objects easy. Because the thesis focuses on urban design, the scales selected are the building scale, plot scale, block scale, district scale and the city scale. These levels form a consistent and continuous hierarchy to study urban forms. However, the other levels such as the building material level, the structural level and the territory level are also feasible for typomorphological studies for other purposes such as building design or city design.

Urban forms exist not only in space, but also in time; their transformation is a temporal process, during which their social identity is evident and transforming. Hence any typomorphological research of the transformation of urban forms should be studied in appropriate time phases. Time phases for a city are determined by some turning points when dramatic changes taking place in its urban forms.

In Chinese history, the main general turning points of urban forms were primarily driven by political forces. In the feudal China, cities were usually walled and serving for symbolic representation of the traditional cosmology and social hierarchy. During the late 19th century, most Chinese cities, especially the ones on the eastern coast were affected by the outer world along with the Opium War (1840) and various national campaigns[6]. Many traditional Chinese cities contained some colonial settlements, where urban planning and design directly followed western models. Examples were cities like Dalian and Harbin in the late 19th century and early 20th century. Meanwhile, modern industries were established in Chinese cities to replace the feudal autarkic handcraft industry. The infrastructures of cities started to be improved, and urban forms started to change during the reign of the nationalist government. Until 1949, when P.R. China was founded, the new central government implemented socialist planned economy and the Danwei system. The dramatic urban transformation taking place in Chinese cities began since 1978: the post-reform period. Today, large urbanisation, globalisation and modernisation are under going, which is fundamentally changing Chinese urban forms and other aspects of the society (Wu and Ma, 2004, Wu and He, 2005, Wu and Ma, 2007).

Therefore, the time phases for the general developments of Chinese cities are: from the feudal period to the late 19th century; the late 19th century to 1949; 1949 to 1978 and thereafter. However, there are variations for different cities, and it is possible to subdivide the four phases or integrate some of the phases according to specific situations. For instance, for real estate study of China, scholars may focus on the period of pre-1949, 1949-1978 and the post-reform era. For the typomorphological study of Nanjing in this thesis, the crucial time phases are three: the historical period (feudal era to the middle 19th century); the modern period (the middle 19th century to 1949); and the contemporary period (post-1949). This division is paralleled to the

[6] For example, the so called 'Yangwu Yundong' (the campaign of learning from the foreigners) was one of the campaigns initiated by Li Hongzhang, a high-ranking government officer, in 1861-95. The campaign asserted to learn from the foreigners in terms of industrial and military technologies to maintain the power of the government of the Qing Dynasty.

development of its urban forms, which will be examined in Section 2 of the thesis (Chapter 4 to 10).

3.2.2 Plan analysis and morphological regions

'Town plan' is the most focused element by researchers of urban morphology, out of the other two elements—'land use' and 'building form' (Whitehand, 1981, Whitehand and Gu, 2007), because the two-dimensional plan of a city contains essential information of how the urban elements at different scales combine together and form a complex urban system. Typologists start their study with the analysis of city plans or urban tissue plans. Therefore, the plans of Nanjing have been the starting point of this study. Plans of Nanjing come from published books of the city history and gazetteers, published works and records from the local planning authority. Land use patterns of the case study city are not studied in detail, but used generally to explain the reasons of urban form changes, while the analysis of building forms is also based on the study of building plans. Furthermore, city photos collected from various publications and the author's site-visits, and literal records of the city are also used to provide additional information of the city.

According to Conzen, a morphological region is an area of homogenous urban form in terms of plan types, building types and land use patterns (Larkham and Jones, 1991). Nanjing has an urban area of about 6500 square kilometres, and it is under constant expansion. Since it is difficult to analyse the city fabric in the same high degree of details, the concept of morphological region has been adopted, because the concept of morphological region allows the in-depth analysis of limited numbers of small areas in each morphological region to represent the characteristics of the entire region. The concept refers to 'case studies' for each morphological region in a city, which is useful for the analysis of Chinese urban forms as well.

The old city core is more appropriate for the typomorphological study than the newly built areas of the case city, due to the first criterion of the case selection mentioned before. According to Wang (1994), the definition of Cultural and Historical cities merely refers to the traditional city cores rather than the administrative territory of cities at present, for instance, Beijing as a cultural and historical city refers to the

originally walled area rather than the current prefecture area of Beijing, the latter of which is much bigger than the former.

The old city core of Nanjing is divided into several morphological regions which contain a number of urban blocks through a general examination of the urban plan of different city elements (refer to 3.3 of this chapter). For instance, for the analysis of urban blocks, the identification of morphological regions is based on different block pattern types and block types. For the analysis of street networks, the identification of morphological regions is related to the street pattern types. Moreover, one or two examples of each city element from each morphological region are examined in detail to represent the characteristics of the relevant element in that morphological region.

3.2.3 Defining 'types' and 'typological process'

Type and typological process are the most essential terms in this study since they have direct impact on the cultural identity of specific urban forms. The definitions of types and typological processes slightly vary for different scholars as shown in Chapter 2. In this thesis, a type of certain objects at a specific scale or level of specificity is defined according to the physical properties of the objects and their spatial relationships. For instance, an urban tissue type refers to the spatial arrangement of blocks, which in turn are defined as their physical dimensions—the width, length, density and ratio, and the spatial arrangement of plots inside them. Similarly, the definition of a plot type takes account of the physical dimensions of plots and the arrangement of buildings inside the plots, while the building type is defined according to the dimensions and volumes of buildings, the structural configuration of plans, and composition of elevations.

The typological process is also defined at a specific scale. It is the progressive relation of a series of types, which gradually and consistently change over time. Since particular urban forms are usually built in a specific time period, types of urban forms are closely related to time. A type only represents the social value, economic and technological conditions of that place at that time. Therefore, a type can also be called 'synchronic type'. There are certainly many synchronic types at different

places in one period, and many synchronic types at the same place in different periods.

A typological process represents a continuous transformation of all the synchronic types in one place over a long period of time. A typological process can not always be observed throughout time: when a dramatic mutation happens to the last synchronic type in one particular place, the typological process stops. It is possible that the typological process starts again to have relations with previous synchronic types, or a new typological process begins. Examples are Modernist architectural types that have no relation with traditional architectural types. There may be no typological process in the transformation of urban forms in one place if a sudden mutation changed the last type so dramatically that there was no relation between the last type and its precedents (Figure 3.4). On the contrary, if a typological process was observed, it would prove the robustness of the series of types for one place.

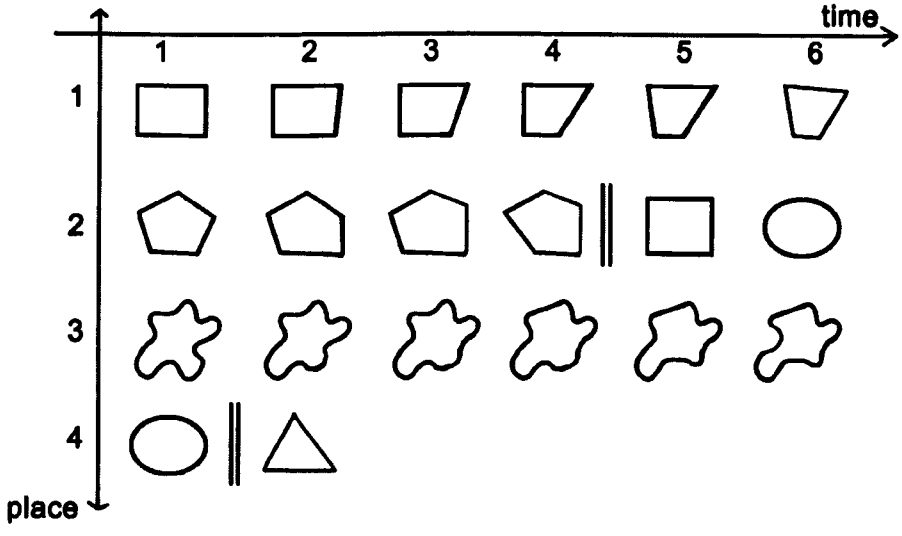

Figure 3.4 A conceptual diagram indicating synchronic types in different places and time, typological processes and mutations; '||' indicates the stop of a typological process because of a mutation (by the author)

In sum, the study of Nanjing intends to identify the synchronic types and the possible typological process of urban forms in different morphological regions of the city at a specific scale. The types in a typological process therefore can be used to generate design suggestions in that place because of their robustness.

3.2.4 Generating design suggestions

The design suggestions for specific elements of the case city are closely related to the typological evolution of urban forms in the city. As reviewed before, the purpose of typological design is to apply previous types to new forms in order to fit the new with the old. Design suggestions therefore are the instructions of how to apply the types that have survived the transformation process of urban forms, to new design projects in the future. By following the instructions, the traditional local characteristics can be translated into new urban forms, and still making sure these meet contemporary functional requirements.

Similar to the definition of a type, design suggestions are given in relation to sizes, proportions, heights, densities, volumes and spatial relationships of particular urban elements (refer to 3.3 of this chapter). For instance, an urban block type indicates the physical dimensions and spatial configuration of their plots so that design suggestions for new urban blocks in that area are to follow these physical properties and the arrangement pattern. Furthermore, design suggestions are specific to each morphological region since characteristics of those morphological regions vary. The current urban polices of the city, functional and economic restrictions in the case city are taken into account in order to make design suggestions feasible. Additionally, design suggestions are associated to a literature review of key urban design texts, especially for the design of urban public space.

3.3 Seven elements as the components of Chinese urban forms

In the typomorphological analysis of the case city, the synthesis of urban forms have been broken down into seven elements by the author to allow the study be focused and manageable, which are the general city plan, silhouettes, streets & street-system, urban blocks, urban public spaces, public buildings and houses. It is because the seven elements are the most popularly studied urban objects in both the western and Chinese literatures, which are explained in 3.3.2.

3.3.1 The seven elements at scales

The city scale, district scale, block scale and building scale of urban forms are selected for the purpose of this study. The seven elements of urban forms fit into

these scales: the general plan and silhouettes are described at the city scale; streets & street system are studied at the district scale; urban blocks and public spaces are examined at the block scale; and public buildings and houses are focused at the building scale (Figure 3.5). The seven urban elements together with the study scales provide a continuous and comprehensive hierarchy of urban form analysis for the typomorphological study of Chinese cities.

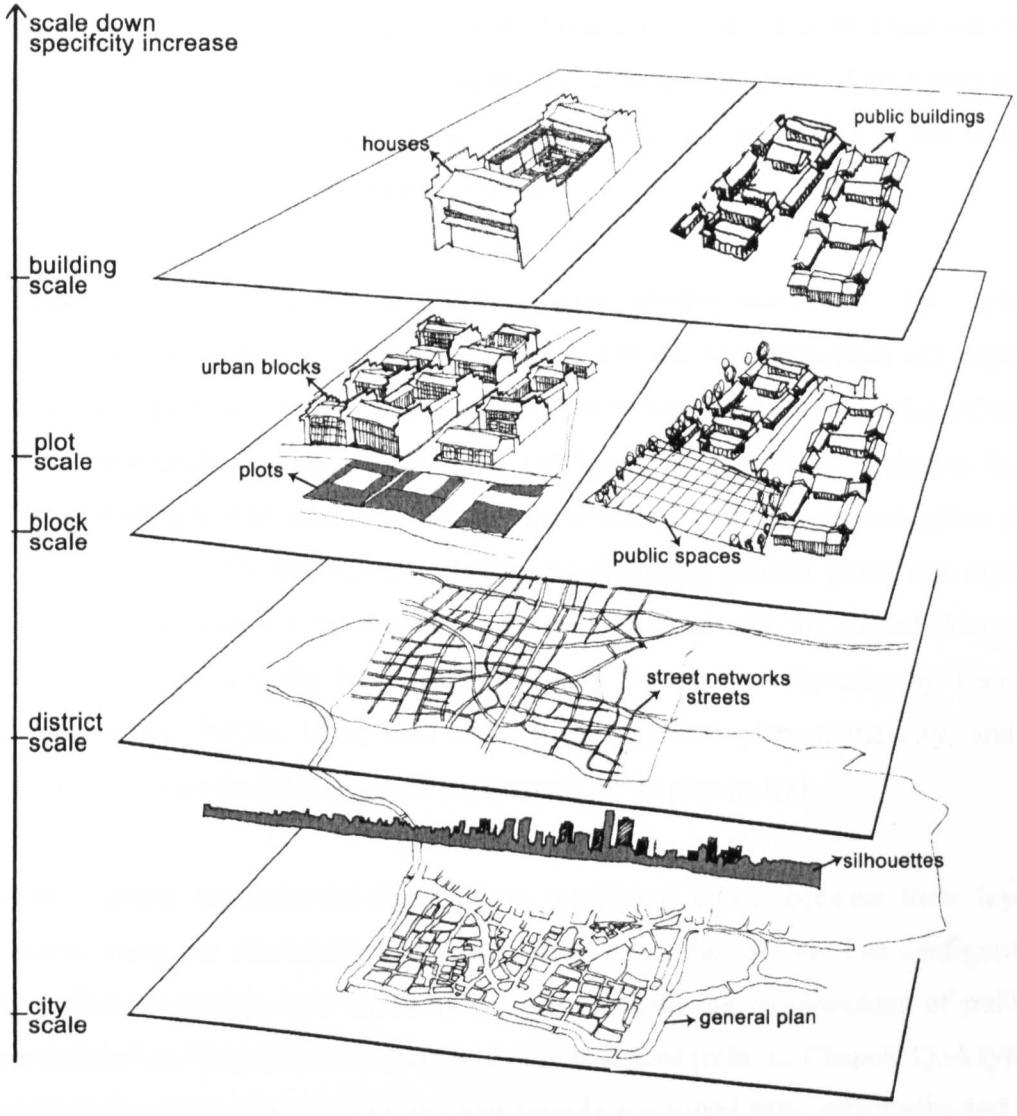

Figure 3.5 The seven elements at the hierarchy of scales for the typomorphological analysis (by the author)

3.3.2 The study of seven elements in literature

3.3.2.1 General plans

The general plans of a city are not simply a figure-ground plan of the city, but contain more information. The general plans of a city refer to two-dimensional maps that record the basic structure of the city such as location, topography, size, shape, axes, built-up fabrics, and boundaries of blocks, plots, buildings, as well as the arrangement of different urban functions. An overview of the transformation of the city fabric can be obtained by comparing the general city plans of each period and reveal the basic characteristics of the city at the city scale, which is the basis of detailed examinations of other city elements.

Morphological examinations in European cities always started with their general plans. Conzen asserted that town plan analysis was the most important technique for morphological study, which was demonstrated in his studies of Alnwick (Conzen, 1969), Newcastle (Conzen, 1981) and Ludlow (Conzen, 1988). Scholars in the British morphological school proved the fruitiness of analysing general plans (refer to Chapter 2). Furthermore, the technique of analysing general plans was also the most important one for the Italian Typological School and the French Versailles School, for instance, the typological study of Venice and Florence by Caniggia (Caniggia and Maffei, 1979) was based on the general plan of the city, and the reading of Versailles by Castex (1979) focused on its plan as well.

General plans are essential for Chinese traditional cities, because their layouts directly imply the cosmology and social hierarchy of the society. The configuration of traditional layouts were carefully planned to fulfil the requirements of political representation, Fengshui, Lizhi, and practical functions (refer to Chapter 1). A typical traditional general plan of Chinese cities usually contained axes, city walls, and was rectangular and symmetrical, which were vital characteristics of cities. The study of general plans is able to explore these characteristics and the symbolic meanings behind them. Such characteristics define a plan type for particular Chinese cities, which is worth preserving in developments.

Studies on traditional general plans of Chinese cities are fairly rich in the Chinese literature. The first book on Chinese planning is *History of Chinese city construction*, prepared by Dong and Li in 1961, and published in 1982 (Dong, 1982). The first book on the study of traditional general plans of cities in English is *A brief history of ancient Chinese city planning* by Wu Liangyong (1985). City plans are the major research objects in the two important books. Later works on Chinese urban study have widely adopted general plans of cities to gain morphological information (For example, Boyd, 1962, Yang, 1993, Hu, 1995, Zhuang and Zhang, 2002).

3.3.2.2 Silhouettes

Urban silhouette or skyline is a well-studied element over history, and is portrayed in numerous historical paintings as icons of cities both in the West and China. According to Kostof,

'Skylines are urban signatures. They are the shorthand of urban identity, and the chance for urban flourish. Cities of all descriptions and periods rise aloft distinctive landmarks, to celebrate faith and power and special achievement. These landmarks focus city forms and highlight city portraits. ... Radical transformations—the thrust of factory smokestacks or corporate towers—signify cultural upheavals. When the towered railway terminal and its hotel lift up its silhouette in emulation of the urban cathedral, we know that the old values are reduced or overtopped. When the city centre ends up as aggregate of tall office buildings, we recognize that the city image has succumbed to the advertising urges of private enterprise. The skyline, in the end, is a negotiated symbol. What stands out as the city's official silhouette was given license to do so.' (Kostof, 1991, p296)

Skylines express the social value of a place to outside audiences. Urban silhouettes are visible landmarks contributing to the imagineability of a city (Attoe, 1981). The iconic meaning of urban silhouettes can be used as advertisements serving the purpose of real estate. Urban skylines are very important components of the western urban form. They are also important in China, where building roofs have always been one of the main elements of urban artefacts (Zhong, 1986). It is widely acknowledged among Chinese scholars that roofs of traditional Chinese architecture

are the fifth elevation of buildings, as important as the other elevations. The images of silhouettes give a first impression of a city, and are essential to its identity.

3.3.2.3 Street networks and streets

The street networks and streets are so influential for the development of urban forms that they have received considerable attentions in the literature of urban design. As early as the period of Vitruvius, in his *Ten books of Architecture,* he proposed that the direction of a street should be 'properly laid out if foresight is employed to exclude the winds from the alleys' (Vitruvius, 1960, p24). Later on, in the morphological study of European cities, street networks and streets were critical urban elements as urban public spaces. Sitte (1889) classified the western street-systems into three categories—rectangular, radial and triangular. In urban morphology, streets were directly referred to as elements constituting the urban plan (Conzen, 1969). In relation to typology, Rossi suggested that a city was divided to three principal functions—housing, fixed activities[7] and circulations, which imply three principal urban elements—houses, public buildings and streets. These three elements participated 'in the evolution of the city over time in a permanent way' (Rossi, 1984, p86). The Krier brothers (1979b), DPZ (Duany and Plater-Zyberk, 1992) and Moudon (1995) concluded and classified the geometrical configuration of different types of street-networks. Cullen (1971), McCluskey (1979) and Ashihara (1983) gave detailed explanation on the design of street networks from a perceptual point of view. More recent work was conducted by Marshall (2005), who proposed the ABCD typology of the street systems according to different patterns formed at different stages of the growth of towns and cities (Figure 3.6).

Apart from morphological studies of streets and streets networks, many scholars emphasised the important role of them in cities. For instance, the spatial quality of streets for social life was emphasised by Rudofsky (1982) in his book *Streets for people: A primer for Americans*, although it has no practical guidance on street design. Jacobs (1993) advocated that great streets could help make community,

[7] Fixed activities, for Rossi, include stores, public and commercial buildings, universities, hospitals, and schools. ROSSI, A. (1984) *The Architecture of the City* New york, The MIT Press. P86

facilitate people acting and interacting, encourage participation and physically comfortable. Fyfe said that 'streets are the terrain of social encounters and political protest, sites of domination and resistance, places of pleasure and anxiety' (Fyfe, 1998, p1). Jan Gehl (2001) asserted that good street quality could increase the frequency of public activities. Therefore, streets and street networks are not only popularly studied in western literature, but also play an essential role in society.

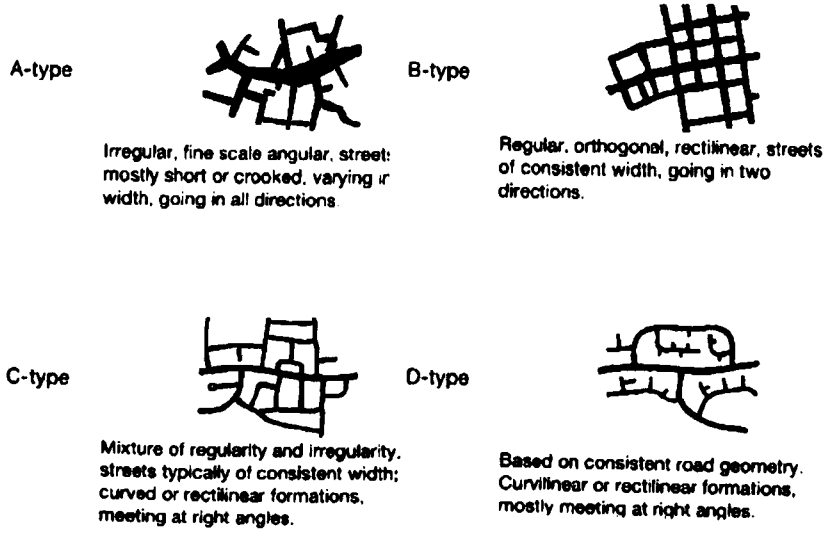

Figure 3.6 ABCD typology of Street systems (Marshall, 2005, p89)

For Chinese scholars, street networks and streets are skeletons of a city (Qi, 1982). The ritual layout of street networks and streets in the design of traditional Chinese capital cities was clearly indicated in the *Kaogong Ji* (*Artificers' record*, Zhou Dynasty) (Chapter 1). Traditional Chinese street networks were greatly influenced by Li Zhi, so that they were usually in a chessboard pattern and streets were intersecting in right angles. The widths of streets depended on the social status of where the street was located. Detailed explanations of the Chinese context of streets and street networks are in Chapter 6.

3.3.2.4 Urban blocks

Urban blocks, including urban plots, were widely regarded as a fundamental spatial organisation or a module of urban aggregation of a typical European city (Caniggia and Maffei, 2001, Paneral et al., 2004, Sonne, 2005). More important work on urban blocks dated back to the second half of 20th century: Jacobs (1961) proposed that the

sizes of urban blocks were essential for the liveability of a city, and should be kept small. The Krier brothers (Krier, 1979a, Krier, 2003) also paid attention to the size of urban blocks in their design projects. Sonne (2005) examined urban residential blocks in London, Milan and Paris to search for the appropriate form of urban dwellings.

In urban morphology and typology, blocks and plots are a key focus. Conzen gave a precise definition of urban blocks and plots, which was 'within the town plan unoccupied by street and bounded wholly or in partly by street-line', and a plot was 'the built-up area occupied by a building plus the non-built-up area which has close relationship with the building' (Conzen, 1969, p5). He and his followers focused on this element in all their plan analysis of numerous cities and towns. Furthermore, scholars in the French School examined urban blocks as the primary elements in several European cities to understand the development of urban forms (Paneral et al., 2004). Urban blocks perfectly bridge the gap between city forms and buildings forms at a medium scale.

Urban blocks in traditional Chinese cities were identical with Lifangs, which were the common way of organising urban residences (Chapter 1). The influence of Lifangs still exists in Chinese cities at present. The way of organising urban lands has long tradition in China, which is explained in detail in Chapter 7.

3.3.2.5 Public spaces

Public spaces have played an essential role in European urban history, and have consequently been well studied. Several movements in literature were closely related to public spaces, for instance, the Garden City Movement (1898) in England proposed that public parks should be emphasised in city planning to separate the residential zone from the industry zone. Furthermore, the City Beautiful Movement (1920s) in America advocated monumentality, eternity and uniformity as important aesthetic qualities for urban public spaces (Plattus, 1988). The planning of public spaces was 'a strategist's art of distributing human activities in space' (Meuser, 2003, p256).

In the western literature, Vitruvius (1960) suggested the proportion of a public square, and Alberti developed his idea. The well-known Nolli Map (1748) analysed the spatial configuration of Rome and the distribution of public spaces in the city. As mentioned in Chapter 2, Sitte (1889) established his five principles of making public plazas. Influenced by Sitte, Hegemann and Peets aimed to 'group buildings into harmonious ensembles', 'create a larger, more monumental unity, a unity comprising at least a group of buildings with their surroundings' in entire districts or cities (Hegemann and Peets, 1988, p1). Cullen's (1971) empirical study focused on the visual impacts of urban public spaces on observers. Rob Krier (1979b) illustrated basic types of urban plazas and their variations in his book *Urban space*. In the book *Finding lost space*, Trancik (1986) discovered the absence of good public spaces in modern cities, where spaces were open-ended voids and buildings were figures. He indicated those space are negative for the urban life and should be improved with reference to traditional examples. Moughtin (1992) studied a number of famous plazas in European cities and explored their most important morphological principle--enclosure. He asserted that the public square is the primary element in city deign and the 'chief method by which a town or city is both decorated and given distinction' (Moughtin, 1992, p123). These works prove that the studies of urban public spaces are prevalent and the qualities of public spaces are important.

Substantial work links urban public space to human behaviour research. For example, Whyte (1984) investigated people's social behaviours in public plazas in America and developed the strategies of how to attract and support their activities through appropriate space design. More detailed and comprehensive study on the interrelation of people and the use of urban public spaces were carried on by Macus and Francis, who generated guidelines for public space design (Marcus and Francis, 1998). These researches are used in Chapter 11 as additional references for the design of urban public spaces in Nanjing, since design suggestions generated from the typomorphological examination do not solve all problems in urban design.

In China, the tradition of urban public space (except market places) was not emphasised in the official concept of urban planning, since public awareness was entirely absent in history. However, public plazas and parks sometimes were formed spontaneously for the demand of public activities in traditional Chinese cities, and largely emerged in the 20th century in China. The Chinese context of public space design and the traditional morphological characteristics of public spaces are addressed in Chapter 8.

3.3.2.6 Public buildings

Public buildings were regarded as important city elements in the whole architectural theory and history in the Western world (Rapoport, 1969, p1, Mallgrave, 2005). Architectural history was almost written and represented by public buildings such as palaces, religious buildings and city halls. Public buildings participated in the operation of a state in the way of representation (Sonne, 2003). The study of the forms of public buildings can be traced back to the early architectural theories developed by Vitruvius and Albert, who proposed some fundamental principles of architectural forms such as order, eurhythmy, symmetry, propriety and economy. Architectural history and theory examined various types and styles of public buildings in different periods (Moffett et al., 2003). As mentioned in Chapter 2, Durand, Rossi and other rationalists' typological studies emphasised public buildings as well. Various examples can be found in the works of the Italian School, which would not be repeated here (refer to Chapter 2).

Public buildings were well-developed in traditional China, serving for religionary and commercial purposes. In Chinese literature, traditional Chinese architecture was almost equal to public buildings, because only important public buildings or palaces were recorded and emphasised by feudal governments. The first academic organisation on Chinese architecture research, SRCA, 'yingzhao xueshe' (1930), contained two departments: the Department of Ancient Building Techniques that focused on techniques and methods of traditional building construction; and the Department of Ancient Literature. The first study of Chinese architecture was the *History of Chinese architecture* by Yao in 1933 (Whitehand and Gu, 2006). The first publication on Chinese architecture in English was Liang Sicheng's *A pictorial*

history of Chinese architecture (Liang, 1985), in which the author illustrated the evolution of various elements of traditional buildings, such as Dougongs. Public buildings were the major research objects in these two studies. Moreover, another important book on Chinese traditional architecture in English by Liu also paid great attention to public buildings such as temples, palaces, imperial temples and etc (Liu, 1989). Therefore, public buildings indispensably constitute the urban form of a Chinese city.

3.3.2.7 Housing

The house is one of the most essential urban components with the largest quantity among all other urban artefacts in almost any city; studies on houses are probably the most popular ones in architecture. A house is a shelter which 'possesses a set of appropriate affordances in the terrestrial, animate and cultural spectrum to support and fit human activities and life-styles' (Chen, 1992, p15). Houses were unconscious products of common people, a reflection of their natural environment, climate, culture and practical needs in traditional time. Laugier said the primitive hut was the origin of houses without influences from technologies. Scholars believed that the cave and the nest were the origin of Chinese houses 10,000 years ago (Pan, 2001).

The study of vernacular architecture was promoted by scholars only since the second half of 20th century in the west, before which, architectural theory and history merely focused on public buildings. One of the earliest works on houses was given by Downing (1850) in his book: *The architecture of country house*. Holl (1982) classified American urban and rural houses according to different types. Rapoport (1969) examined the important relation between houses and local culture in his book *House form and culture*. As reviewed in Chapter 2, typologists' works were greatly related to houses. For instance, Rossi suggested that there were only three house types: 'central court type, gallery type and separate dwelling type' (Bandini, 1981, p110). Caniggia (Caniggia and Maffei, 1979) asserted that houses were basic architecture based on collective, therefore, important for a cultural tradition.

There is copious literature on housing in China as well, for example, Liu Dunzhen's (1957) *Zhongguo zhuzhai gaishuo (A general introduction of Chinese residential*

buildings) and Liu Zhiping's (2000) *Zhongguo juzhu jianzhu jianshi (A brief history of Chinese residential architecture*[8]*)* in the 1940s-50s. Wang and Zhang (1994) edited *Zhongguo chuantong minju jianzhu (The traditional residential buildings of China)* in 1994. Blaser (1995) conducted research on Chinese courtyard houses, and Knapp (2000) published an important book—*China's old dwellings* in 2000.

These seven elements commonly exist in every city and have been studied in both western and Chinese literature. Therefore, a synthesis of Chinese urban form can be organised according to these elements. The characteristics of Chinese urban forms can be outlined through the examination of the transformation of each urban element over time. The typomorphological examination of the case study city therefore is to analyse the seven elements of the city, which is in Chapter 4 to 10.

3.4 Conclusion

The case study of Nanjing is employed to show the shape and transformation of its urban forms over time. In this chapter, the criteria of selecting cases for interpreting typomorphology in the Chinese context have been explained. Firstly, Nanjing has distinctive historical characteristics and comparatively coherent historical urban fabric. Secondly, it is under the great pressure of transformation. Some important terms such as type, typological process, plan analysis and morphological regions have also been elucidated. Moreover, the typomorphological approach implies a hierarchy of scales, and seven elements, as components of urban forms at each scale, allow the analysis be focused and achievable.

In the next seven chapters, each urban element of Nanjing is examined in detail using the typomorphological methods. Morphological regions are addressed through plan analysis, and representative examples are selected to illustrate the characteristics of each morphological region. Synchronic types and typological processes of each element are revealed, and the results can be used to offer design suggestions for urban design practices in Nanjing.

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[8] This book was prepared in the 1940s and 1950s, but only published in 2000.

SECTION 2

THE CASE STUDY OF NANJING

INTRODUCTION OF NANJING

1, Geographic status

Nanjing is located in the lower reach of Yangtze River, at the tip of the river delta, which is at latitude 32.3N and longitudes 118.47E (Figure II.1). Yangtze River flows from the south-west and enters the city in a north-east direction, dividing the contemporary city of Nanjing into southern and northern sections. The traditional part of Nanjing is located in the southern section. Qinghuai River on the south which has many tributaries within the city was very important in history because it provided transportation and filled the moats around the city wall. The alluvial plain where the city is located has two lakes: Xuanwu Lake in the north with a surface area of 3,500 square meters and Mochou Lake in the west. There are series of mountains on the three sides of the alluvial plain, which provide natural defences for the city. Paralleling to Yangtze River, small knolls and rolling hills are lying from north-east to south-west direction of the alluvial plain. The biggest mountain in the region—Zhong Mountain, together with Baihua Mountain, and Longwang Mountain situates on the north-east side of the old city. Jubao Mountain is on the south of the old city. Nanjing is affected by the monsoon climate, which is usually cold and dry in the winter, and hot and rainy in the summer. During the winter, the air pressure is high which causes strong wind and diffusion of industrial pollutions unless properly controlled. The geographic variety of the city results in diverse sceneries and various types of constructions.

2, A brief history of urban development

Since the first city named 'Ye' or 'Yue' in the Chun Qiu era in 472 BC built in the region of Nanjing, the city was the feudal capital of ten dynasties (Shen and Yao, 1985, p128). The history of city construction in Nanjing has been 2480 years long. The ten dynasties were the Wu Dynasty (222-280 AD) during which 'Jianye[1]' was

[1] 'Jianye', 'Jiankang', 'Jingning' and 'Yingtian' were the names of traditional cities within the area of contemporary Nanjing, which were not identical with the current territory of the old city core of Nanjing, but smaller. However, these cities were the origins of Nanjing. The detailed location and territories of these cities will be addressed in Chapter 4.

built, the Eastern Jin Dynasty (317-420 AD) during which 'Jiankang' was founded, the South Dynasties (420-589 AD) including Song, Qi, Liang and Chen Dynasties, the Southern Tang Dynasty (937-975 AD), during which 'Jiangning' was constructed, the Ming Dynasty (1368-1420 AD), during which 'Yingtian' was built, and the Tianping tianguo kingdom (1853-1864 AD) (Yang et al., 1989, Yao, 2002, p101). Since empires of those dynasties had built splendid palaces, temples, pagodas and facilitated the development of the city in history, Nanjing is one of China's most important historical capitals, and it is selected as a Cultural and Historic City by the central government in 1982 (refer to Chapter 3).

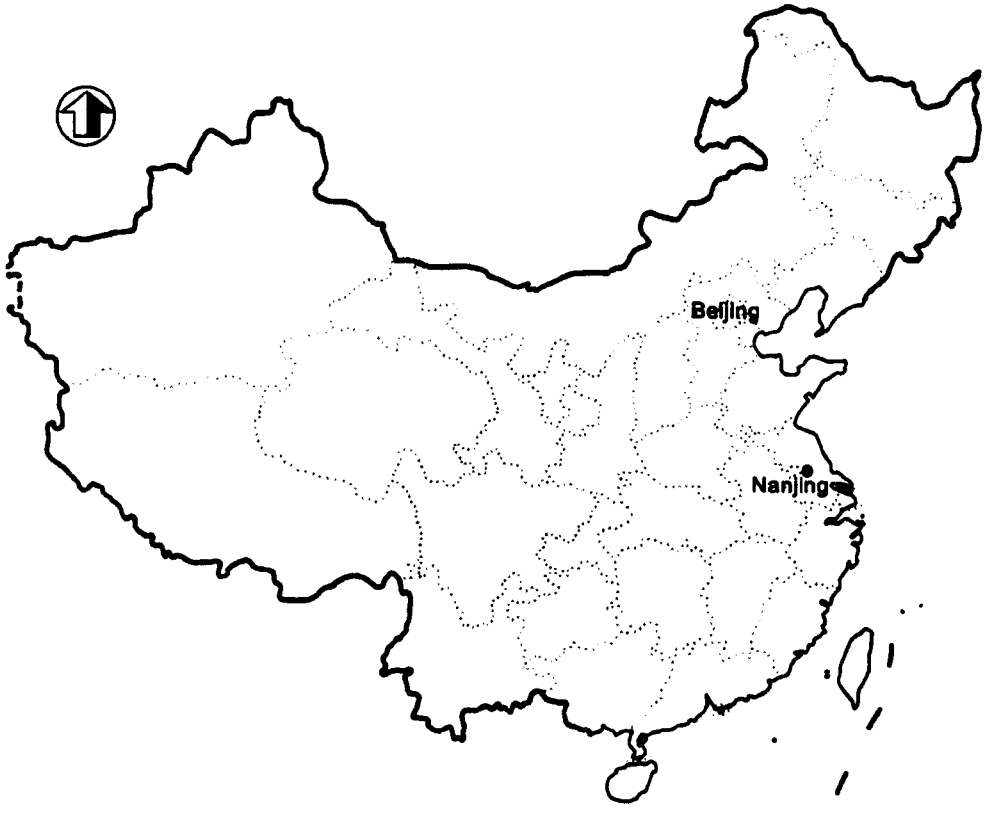

Figure II.1 The location of Nanjing in China (by the author)

After the feudal system had been abolished, the nationalist government founded its capital in Nanjing in 1927, which was 15 years later since the Republic of China was founded. The nationalist government launched a comprehensive city planning--'Shoudu Jihua' in 1929, which dramatically influenced the urban form that was built in the Ming Dynasty. In 1949, the government of the People's Republic of China (PRC) instated Nanjing as the capital of Jiangsu Province. The city construction was

restricted within the city wall until the 1950s, which was built by the emperor of Ming in 1368. The walled area—the old city of Nanjing is about 42 square kilometres. Nowadays, the metropolitan Nanjing covers the old city, new areas of Pukou, Xianlin, Dongshan and suburbs, which is 167 square kilometres in total (Figure II.2). During the last three decades, the city has been experiencing transformation in terms of land use pattern, infrastructure, and urban forms, which are discussed in Chapter 4.

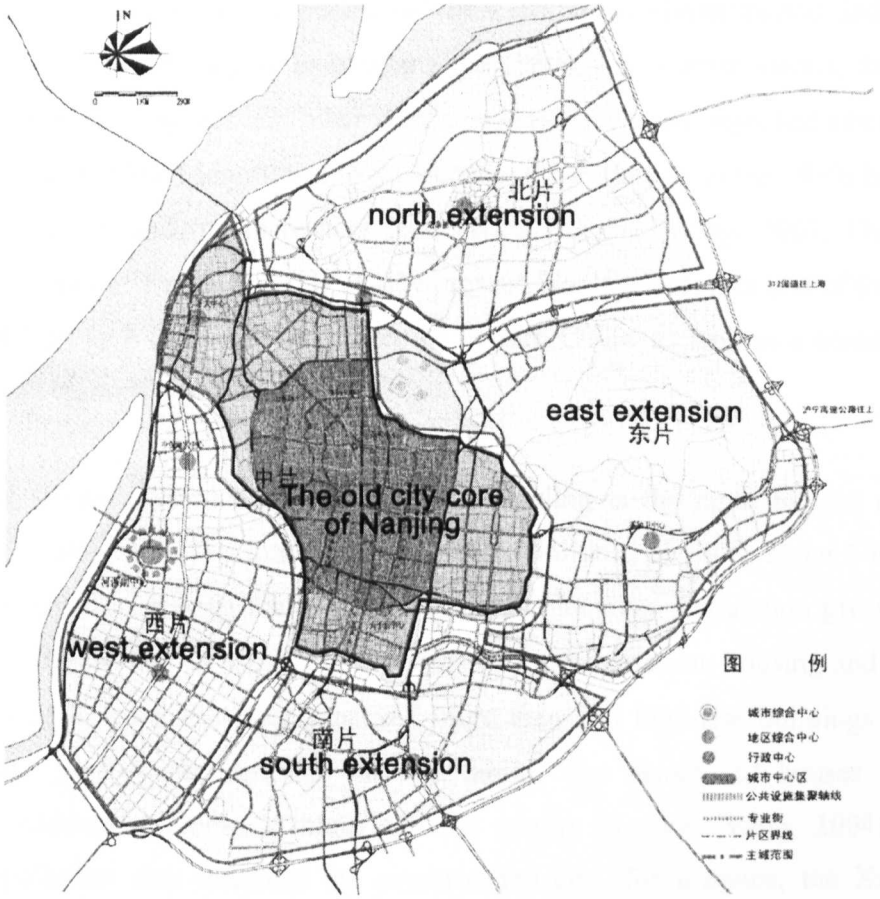

Figure II.2 The study area—old city core of Nanjing, and new developments (adapted based on the resource from the City Planning Bureau of Nanjing)

What remains from the long construction history of Nanjing are the distinctive city form and multi-style architectural heritages, which consist of the historical water network, the city wall, the imperial ceremonial buildings, such as the palace dated back to the Southern Tang Dynasty, the cemetery and the Drum tower, the mixed use urban blocks formed in the Ming and Qing Dynasties, the neoteric residential

buildings and the public building complexes of the Republic of China (Guo, 2005). The municipal government has been making efforts on the conservation and planning of the city during recent decades.

3, Social and economical development and challenges

Nanjing has been mainly playing political and commercial roles during the past. Because of the wars and changes of dynasties in history, Nanjing has not been steadily developing until 1949, even though there are a few retrogressive periods such as the Great Leap Forward period and the Cultural Revolution period. Industries and housing have been largely built during the 1980s, while urban streets, drainage systems, urban open spaces and other infrastructures have been improved since then. Heavy industries have been moved to the outside of the old city in the 1990s because of their pollution and the increasing land prices (Li and Xiong, 2003, The City Planning Bureau of Nanjing, 2003). At the present, Nanjing becomes one of the most important high-tech industrial centres in the eastern China, as well as a commercial centre in the region (Wu, 2005).

According to the government's statistic data, Nanjing is the ninth biggest city in China at the present, with a total population of 7.4 million, of which about 3 million live in the old city, making the old city the densest location. Population gives great pressure to the old city in aspects of environment, transportation, housing and social services. Furthermore, the closely packed more than 500 high-rise buildings in the city centre[2] greatly interrupt the old city fabric. The density of houses in the historical residential blocks is high, and the quality is poor (Yang, 2004). The industry pollution also threatens the overcrowded city, for instance, the Xuanwu Lake and Qinghuai River, the main water system in Nanjing, overload 259,000 ton and 213,400 ton sewerage respectively everyday (Yin, 2005). There is a drastic contradiction between historical remains and the rapid development. Like many other big Chinese cities, Nanjing is facing the challenge of losing its historical identity.

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[2] The city centre mainly refers to the Xinjie Kou area located in the geometric centre of the old city core of Nanjing.

4, The typomorphological analysis

In this section, the typomorphological analysis of Nanjing focuses on the old city area, which is inside the city wall and built during the Ming Dynasty, because this area has the longest history of development among the metropolitan region of Nanjing, as introduced before. The urban form of Nanjing will be analysed as seven urban elements: the general plan, urban silhouette, street-system and streets, urban blocks, urban public spaces, public buildings and houses. Each chapter addresses the transformation (morphology and typological process) and characteristics (types) of one of the elements from the general plan at the city scale to buildings at the building scale.

According to the construction history of Nanjing, there are two turning points in history when the urban form of Nanjing changed dramatically. The first one was the 1860s when the feudal system has been ceased. Before this point, the urban form was constructed and developed by feudal powers. Thereafter, the city started to be modernised due to the implementation of several modern planning ideas and architectural types, which was promoted by the nationalist government. The second turning point was 1949 when the PRC starts, when the city was experiencing further urbanisation and globalisation, and the historical and neoteric urban forms have been changed once again.

Therefore, the analysis in Section 2 (Chapter 4 to 10) of this thesis has been conducted in three periods in a chronological order: the historical period (--1860s), the modern period (1860s-1949) and the contemporary period (1949—present).

CHAPTER 4 THE GENERAL PLAN OF NANJING

4.1 Introduction

In this chapter, the general plan of Nanjing is examined through three aspects: the site changes of historical cities in the area of contemporary Nanjing, basic city configuration and the transformation of built-up city fabrics in order to gain an overview of the development of the city. In the area of contemporary Nanjing, cities as the capitals of ten feudal dynasties in history (refer to the introduction of Nanjing) were 'Yue', 'Jinling', 'Jianye', 'Jiankang', 'Jiangning', 'Yingtian' and 'Tianjing' named by those dynasties in a chronological order, which were the basis of the present Nanjing. Theses city sites had changed and cities had been rebuilt many times during the 2480 years. The configuration of cities refers to areas, city boundaries, axes and functional distribution. The built-up area is under constant transformation over time. The three stages of the development of Nanjing proposed by the author before clearly indicate the transformation process of the general plan. The three stages are the historical period (-1860s), the modern period (1860s-1949) and the contemporary period of the People's Republic of China (RPC) (1949—present).

4.2 General plan in the historical period (--1860s)

4.2.1 City sites

As reviewed in the first chapter, traditional Chinese urban and architectural form was largely influenced by the traditional Chinese cosmology, philosophies (e.g. Confucianism and Daoism), Li Zhi and Fengshui as rationales of site selection and form creation. The influence was fairly strong on big Chinese cities or capitals, where the feudal power was dominative. The geographic condition of the area of Nanjing was ideal for city construction according to those rationales. For instance, the alluvial plain of Yangtze River with mountains surrounding its three sides benefited the city in military terms, which was so important in ancient eras. Furthermore, according to the Fengshui theory, a good city site was against mountains on the north and facing rivers on the south. The northern mountains and

Qinghuai River on the south of Nanjing therefore fulfilled the criteria of site selection for Nanjing.

The first city in the area of Nanjing was 'Yue', which was built by the Yue Emperor for military purpose in 472 BC. The site of 'Yue' was near Jubao Mountain to the south of today's old city, where Qinghuai River meets Yangtze River. The city was rectangular, small and with the perimeter of 2 *Li* 8 *Bu* (about 820.8 meters) (Figure 4.1) (Wang, 1988). 139 years later, Chu conquered Yue, and built 'Jinling' on the feet of the eastern hills, which was also for military use. The early settlements in Nanjing area had not been developed as multi-functional cities but were military stations. The situation had changed along with the emperor of the Wu Kingdom founded 'Jianye' (229 BC) as its capital in the area of Nanjing, which had multiple functions. The city site was moved to the centre of the contemporary old city, which was against Xuanwu Lake on the north and north-south oriented. Since the emperor of the Eastern Jin Dynasty founded 'Jiankang' (300s AD), the city had been the capital for the entire Southern Dynasties (420-589 AD) which included Song, Qi, Liang and Chen Dynasties. The city site remained the same as 'Jianye'.

The entire city was almost completely demolished due to the unified war between the Sui and other small kingdoms in China in 589 AD. Palaces, previous city walls, imperial gardens and local people's houses were destroyed, and the urban land was converted to agricultural land (Yin, 2005). Until 'Jiangning' was founded in the area during the Southern Tang Dynasty (937 AD), the city was gradually restored, and the city site was moved towards south to Qinghuai River.

The next capital city in Nanjing was 'Yingtian', which was built by the emperor of the Ming Dynasty in the 1360s. The most important part of the city where the palace was located was moved to the east of 'Jiangning' on the filled site of Yanque Lake, against the Zhong Mountain on the north, and north-south oriented. The reasons for building the palace in the east rather than in the centre were that, firstly, it would not destroy the previous city fabric that was built in the Southern Tang Dynasty, since the government of Ming was facing financial shortage at that time; secondly, the site

was more appropriate according to the Fengshui theory, which was believed by the emperor to be essential for the prosperity of the entire country (Zhang, 1984). Figure 4.1 illustrates the changes of city sites over those dynasties.

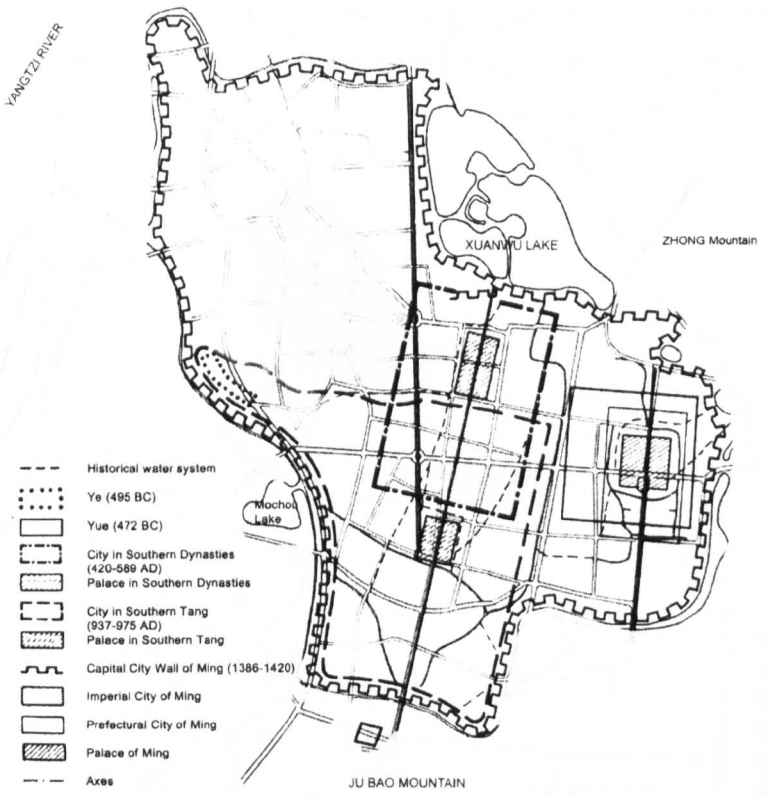

Figure 4.1 Changes of city sites and axes (adapted based on the resource from the City Planning Bureau of Nanjing)

4.2.2 City configurations

The first two cities 'Yue' and 'Jinling' (Figure 4.1) were military stations, where residential and commercial buildings were distributed irregularly outside the walled sites. The influences of the 'ideal city planning' dating to the Zhou Dynasty (refer to Chapter 1) could be seen apparently in the layout of 'Jianye' and the layouts of subsequent cities. 'Jianye' was rectangular, north-south oriented and about 2000 meters long in each side, and the palace that was 400 meters long in each side was located in the centre. The two-fold city had an axial street starting from the south gate of the palace to the south. The concept of functional zoning had been applied to the city planning. The walled area was for the palace, administrational and military uses, while the residential and commercial uses were located to the south of

Qinghuai River (Wang, 1988). Furthermore, several canals connecting Qinghuai River and Xuanwu Lake crossing the entire city had been built for transportation purpose (Yin, 2005). 'Jiankang' city had similar configuration, but were with three-fold palace walls and more splendid imperial gardens. Population had reached more than one million in the area near Qinghuai River (Wang, 1988) (Figure 4.2).

Figure 4.2 The configuration of the palace of Jiankang and the water system in the Southern Dynasties (Zhuang and Zhang, 2002, p272)

'Jiangning' of the Southern Tang Dynasty moved towards south to Qinghuai River and was close to the previous residential and commercial centre. The perimeter of the city was expanded to be 25 Li (about 14 kilometres). The rectangular shape slightly changed at the northwest corner and included the series of low hills inside the city wall. The north-south oriented axial street still connected the south gate of the palace to the south gate of the outer city wall, which divided the city fabric and Qinghuai River symmetrically (Figure 4.3). Important official buildings were located alongside the axial street, while some ancestral temples were distributed in the residential area. The axis was 14 degree to the west. Even though 'Jiangning' was not the capital of

the Song and Yuan Dynasties, it was one of the most flourishing cities in the eastern China.

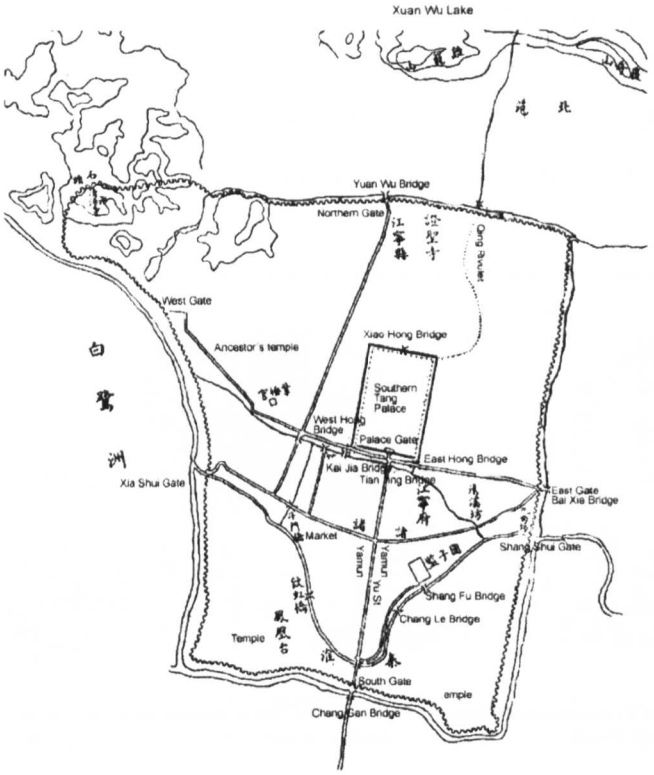

Figure 4.3 The city configuration in the Southern Tang Dynasty (Zhuang and Zhang, 2002, p273)

The period of Ming Dynasty was the most important period for Nanjing in terms of historical development, because parts of the urban form built in this period still exist today. Compared to the previous city configurations, there were two differences in the Ming Dynasty. First of all, as mentioned before, the palace was built in the east rather than in the centre of the city, even though the detailed configuration of the palace city followed the traditional ideology to be rectangular and north-south oriented. The palace had two-fold walls and an axial street on the south, along which important official buildings such as 'yamen' and temples were located (Figure 4.4). The axis was 5 degree to the west. The palace layout of Ming was the model for the Forbidden City of Beijing built in the 1420s, when the emperor decided to move the capital to Beijing. Since then, 'Yingtian' (Nanjing) played the role of secondary capital or south capital in the country, which was why the city was named 'Nanjing' (south capital). Secondly, the main city wall of 'Yingtian' was in irregular shape rather than rectangular, because it was built by connecting the previous city walls,

and based on the topography. The main city wall was made of special bricks of 40x20x10 cm, about 37 kilometres long, 14-60 meters high and 10-25 meters wide (Huang, 2003, Zhang, 2006). The urban area inside the main city wall was 42 square kilometres, which was three times of the size of 'Jiangkang' and two and half times of the size of 'Jiangning'. An outer wall, which was much lower and harsher than the main wall, had been built later on to include more land outside the main city wall (Figure 4.4).

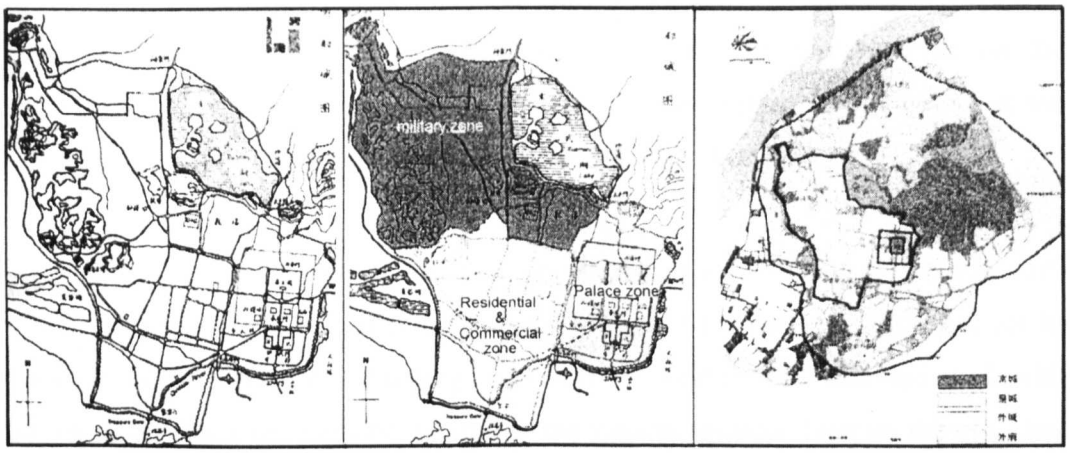

Figure 4.4 City configuration, functional zones and fourfold city walls in the Ming Dynasty (adapted from the resource (Yin, 2005, p42)

In the Ming Dynasty, the city was divided into different functional zones, which followed the concept of Li Zhi that social classes of the emperor, noble, and humble should not mix together, as well as people with different occupations. The east of the city was the administrative zone and for the palace, and the northwest of the city was the military zone. The residential zone and commercial zone were in the central south of the city, and the recreational zone was at the south corners of the city. The north military zone benefited defence and was against possible attacks since it was close to Yangtze River which was the main transport route at that time. In order to promote the capital, the emperor compelled about 59,300 skilled and rich people to move to Nanjing from other provinces nearby. As a result, the population increased to about 80,000 plus 20,000 warriors (Zhang, 1984). These people were placed in different Lifangs according to their occupations.

The city's territory defined by city walls, its orientation, area, axes and functional zones remained until the second period of the development of Nanjing.

4.2.3 Built-up fabric of the city

The city fabric built before the Southern Tang Dynasty was almost demolished in the unified war of the Sui, and the built-up area was in the Valley of Qinghuai River in the Southern Tang Dynasty because of the convenient water transportation. During the Ming Dynasty, the south part and east part of the city was developed very well (Tang, 2003). There was very little built-up area in the military zone on the northwest. The city fabric extended towards the centre and north of Nanjing in the Qing Dynasty (1644-1911) and was within the city wall (Figure 4.5).

During the long feudal period, the city developed in a relatively closed and self-sufficient environment, in which the political force was the most powerful one for its transformation. Traditional Nanjing was walled, north-south oriented and with distinct axes which were always related to the natural settings. Despite the city sites had changed, the basic shapes of the early cities were following the concept of the 'ideal city planning' (refer to Chapter 1) to be rectangular, and the emperor as the son of the god was at the centre. The shape changed with the expansion of the city which was constrained by the topography. However, the palace city, which was the most important part of the traditional city, remained rectangular. Functional zoning was a basic concept in Nanjing, which influenced the urban form fundamentally. The built-up city fabric did not coincide with the city shape defined by the city wall.

4.3 General plan in the modern period (1860s-1949)

The development of the city had been interrupted by wars during the 1860s to 1912 when the Republic of China was founded. The wars in the late Qing Dynasty, both against the Taiping Tianguo Kingdom and invaders of the Opium War, greatly destroyed the traditional built-up fabric of Nanjing. However, the transition of the city from a historical city to an industrialised one occurred at that time. According to Xiong (2003, p11), the industrialisation of Nanjing started with the establishment of the military factory--'Jinling Zhizao Ju' by Li Hongzhang, a high-ranking governmental officer of Qing in 1868, which caused a large scaled transformation of

the society. Li also carried out other construction projects in the city such as widening the streets of Chengchang and Shuixi Men, improving the water system and building bridges. The construction of 'Jiangning Road' according to a modern standard in the city in 1894 was 'a milestone for the modernisation of Nanjing' (Xiong, 2003, p12) (refer to Chapter 6).

Because of the Opium War (1840), 'Xiaguan', which was in the northwest of the city near Yangtze River, became a trade port in 1899. As a result, many migrants came to the city, and the northwest part of the city was under developing in the early 20th century (Figure 4.5). The total population was about 360,000 before 1927 when the city became the capital of the Republic of China (Wang, 2003). The detailed urban fabric of the city including building grouping, plots and blocks is addressed in Chapter 7.

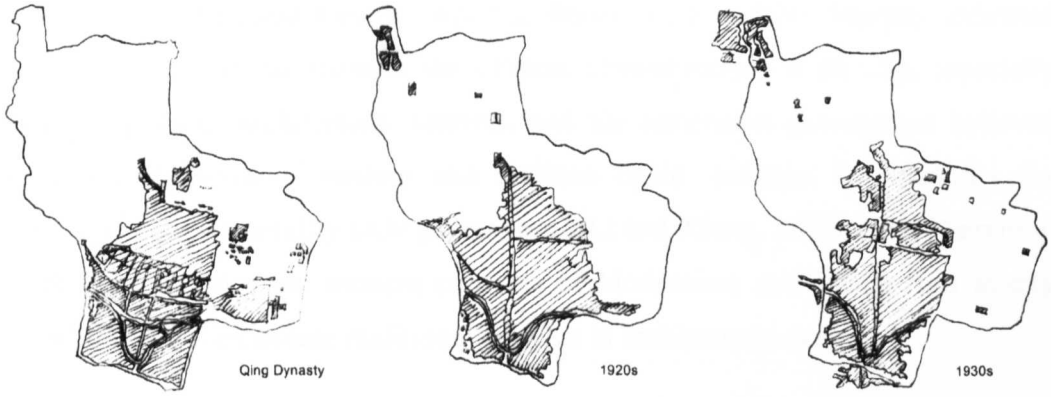

Figure 4.5 The transformation and expansion of built-up fabric in Nanjing (by the author)

From 1912 to 1926, Nanjing was the temporary capital of the Republic of China. The first president Sun Zhongshan of the nationalist government intended to recover the city from previous breakage and build a modern image of new China. Therefore, several schemes were launched, such as 'Shiye Jihua' (1919), 'Bei Chengqu Fazhan Jihua' (1920) and 'Nanjing Shizheng Jihua Shu'(1926), which covered broad issues of city development such as industrial development, commercial development, education, building public green spaces and residential buildings. One of the schemes also planned to develop Pukou area which was opposite to Xiaguan on the other side of Yangtze River (Li and Xiong, 2003). However, these schemes were not sufficient

for a comprehensive change of the city to represent the government's good wishes of building a democratic, modern and developed China. Therefore, 'Shoudu Jihua' (Capital City Planning) was launched in 1929 by 'Guodu Jihua Chu' (Capital Planning Bureau), which included high-ranking governmental officers, professional urban planners and designers. This scheme was one of the first modern city plans in China, which drastically changed the urban form of Nanjing.

Western theories of urban planning were introduced into 'Shoudu Jihua', firstly because the chief officer Sun Ke, the son of the first president, liked the monumentality and splendour of Paris and Vienna, and regarded them as the 'representatives of wealth and health' (Wang, 2003, p82); secondly, the main planner Henry K. Murphy, an American architect who was trained with Beaux Arts tradition, considered that the axial arrangement of city space was a perfect joint point of Chinese architecture and western planning theory (Cody, 1989). Murphy indicated that it was important to maintain the Chinese characteristics in the city, especially Chinese traditional architectural features, and the nationalist government believed that the combination of modern and tradition could 'enhance its reliability for common people and solidify their governance' (Li and Xiong, 2003, p52). Therefore, the scheme promoted the western concepts of Modernism and Beaux Arts in city planning, as well as Chinese traditional features in architectural design.

The Capital City Planning included a new street system (refer to Chapter 6) and a functional division. The new street system changed the axes of the traditional city by building a straight and broad boulevard system cutting through the city (refer to Chapter 6, Figure 6.8, 6.9). There were three residential zones in the city: the first zone was for high-ranking governmental officers; the second zone was for normal officers; and the third one was for common workers. The city also had an administrative zone containing official buildings in the traditional Chinese style, a commercial zone, several industrial zones and green spaces (Guodu Jihua chu (The planning bureau of the government of Republic of China), 1929). Furthermore, the requirements of building heights, set back distances and densities for each zone were

stated in the scheme. Detailed plans of the administrative zone, the first residential zone, the street network and green spaces were proposed.

Figure 4.6 The new axes of Nanjing in the second period (by the author)

However, not all the plans of the Capital City Planning had been implemented because of the disruptions from high-ranking governmental officers, lack of finances (Wang, 2003), and the Japanese invasion in 1937. Apart from the boulevards, only some residential buildings and public buildings had been built along the new streets (Yang, 1993). Some of the original built-up area gave way for the street construction, which slightly destroyed the city fabric. The total built-up fabric was in the southern part and the area alongside the boulevards.

4.4 General plan in the contemporary period (from 1949)

The city of Nanjing has been developing and expanding steadily since 1949 on its original site, axes and built-up fabric, even though there were several setbacks on both the economic and cultural fronts during the ten years of Cultural Revolution (1966-76).

According to Sit (1985), the state plays a decisive role in the process of urbanisation through central planning in socialist countries, which affects the growth, nature and performance of cities, and the rise and fall of the urban population. From 1949 to

1957, Nanjing was developed as a centre of higher education in China's eastern region (Shen and Yao, 1985, Huang, 2004). The built-up area concentrated inside the city wall. Pre-liberated Nanjing almost totally lacked of basic industries and had poorly developed manufacturing industries (Shen and Yao, 1985). From 1958 to 1966, the 'Great Leap forward' campaign promoted by the central government in the whole country, considered the industrial development was the most important. The population of Nanjing increased because of the increasing of manufacturing industries, which were located to the north and east of the old city outside the city wall. During the three years, the industrial investment was 70% of the total investment for the development of the city. Industrial lands were increasing dramatically, and residential lands were declining (He, 2000). The development of the city was stagnant and retrogressive from 1966 to 1976. However, the city nevertheless had successfully converted from a traditional-style consumptive city into a productive city at that time.

A comprehensive economic revolution or the Open Door Policy launched in 1978 has transformed the previous planned economy to the current market economy, which brought great economic opportunities for Chinese cities. The central government of PRC did not pay attention to city planning throughout the country till the 1980s, hence Nanjing had the first two city planning schemes—the Master Plan of Nanjing 1981-2000 and the Master Plan of Nanjing 1991-2010 since then (Zhou, 2002). From 1979 to the 1990s, the municipal government of Nanjing made efforts to the regeneration of the old city and built houses for the increasing population (1.3 million by 1990) through those city planning. The city was expanded towards the west to Yangtze River outside the old city (Huang, 2004) (Figure 4.7). In the latest decade, there were several satellite towns in the region under developing, such as Dongshan and Xianlin (Figure 4.8). The population reached 1.5 million in the old city by 2000, and about 3 million in the old city by 2007 (statistic data from the planning bureau of the government). As mentioned before, the old city area is the densest place in metropolitan Nanjing.

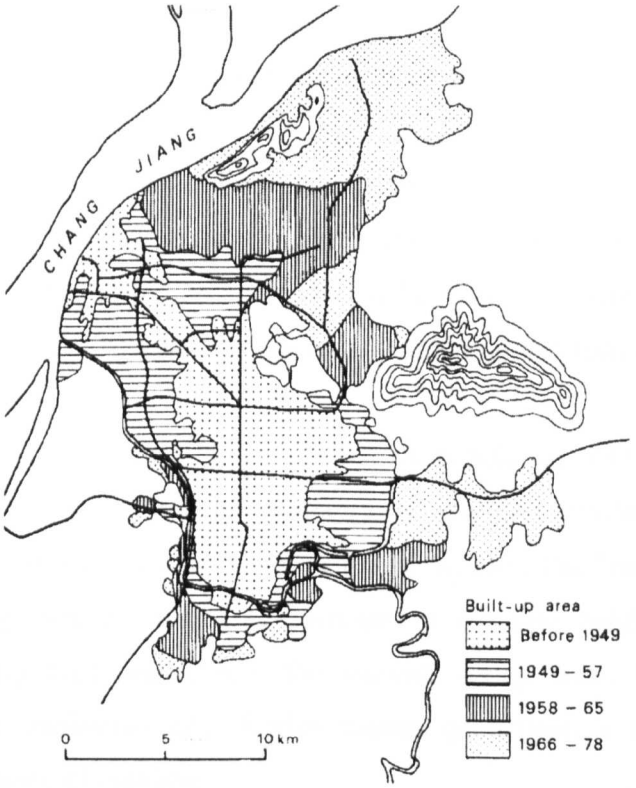

Figure 4.7 The development of built-up areas of Nanjing from 1949 to 1978 (Shen and Yao, 1985, p135)

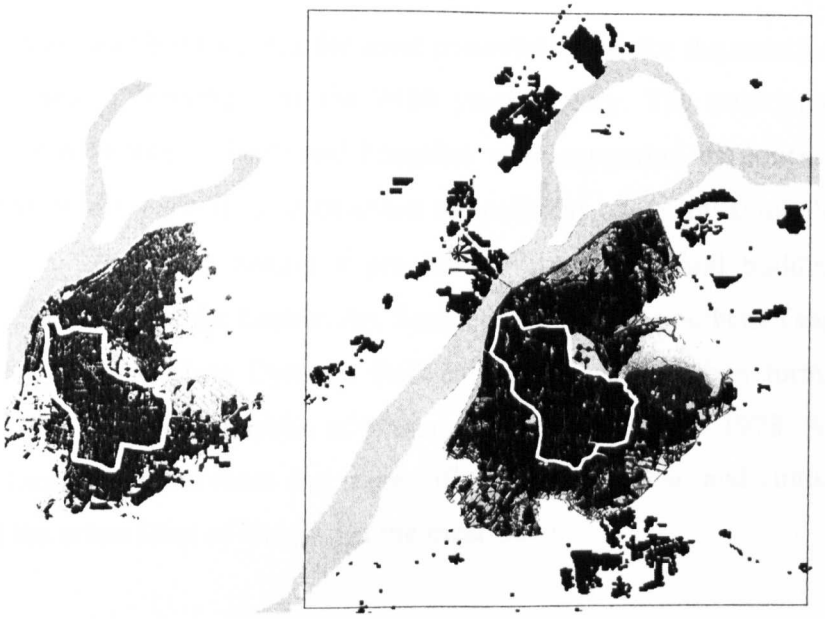

Figure 4.8 The development of built-up areas of Nanjing in the 1990s and 2000s (by the author)

The spatial expansion of Nanjing is a clear process at the contemporary period. Firstly, scattered built-up areas emerged based on natural resources, which were

connected with the old city by several transport links. Secondly, linear built-up areas were developed alongside those transportation linkages. Finally, those built-up area amalgamated together to form an integrated urban region (He and Shao, 2006). Nanjing and its satellite towns are developed towards Shanghai to form a group of developed cities in the Yangtze delta region according to the government's strategic plan (Hao and Li, 2005). The previous functional division has been overthrown. The old city is now almost mixed with commercial, residential and recreational uses.

The rapid growth of the city in terms of both population and built-up density negatively affects the historical urban structure and building remains. As a result, the precious historical axes can hardly be perceived in the city. The land value of the old city is increasing, which causes the increase of building heights, destroys the traditional built-up area and blocks the natural setting from being seen. The demolishment of traditional city fabrics causes gentrification and changes the traditional appearance of Nanjing.

4.5 Conclusion

Political forces have been always the most powerful factor for the transformation of the urban form of Nanjing over the 2480 years history. The traditional Chinese cosmology, philosiphies, Li Zhi and Fengshui were supported by political powers. When a plan was produced, it represented the political power by symbolism in the feudal period. There was always a process of 'destroying and building' in the changing of dynasties of the Eastern Jin, Southern Dynasties, Southern Tang Dynasty, Sui Dynasty, and the Ming Dynasty. Political influences on urban forms are also obvious in the period of Republic of China and the PRC before 1978. After 1978, economic factors become more and more influential, and social and cultural factors also affect the urban form of Nanjing at the mean time.

The morphological characteristics of the general plan of Nanjing (general plan type) can be perceived clearly during the transformation process. (1) The shape of the city plan has been defined by the city wall and moats and maintained over history. Since parts of the city wall have been demolished, the definition of the shape of the general

plan needs to be improved (refer to Chapter 11). (2) The general plan of Nanjing has strong links with the natural environment, as shown by the axial relation between mountains, water system and important zones and buildings. (3) Axes are vital elements in the general plan, which remain from each period of time even though the built-up fabrics from that period have been wiped out. (4) The texture of urban forms in the old city, which refers to the orientation, proportion and pattern of urban blocks, is also one of the characteristics of the plan type. The city is north-south oriented. The built-up fabric grows gradually over time. The city always contained a rectangular administrative centre in the first and second periods, which changed only in the third period. The rectangular shape and central administration represented the highest social position of the ruling class. The general plan of the old city of Nanjing is undergoing a fairly slow typological process. The characteristics of the general plan are embodied on its shape, orientation, relationship with the natural environment, axes and the general urban fabric, which benefit the identity of the city. These characteristics of the general plan should be strictly preserved in the future development of the city, which is explained as design suggestions in Chapter 11.

CHAPTER 5 URBAN SILHOUETTES OF NANJING

5.1 Introduction

Urban silhouette or skyline traditionally refers to the meet point of the land horizon and the sky. In the Oxford English Dictionary, it is defined as 'the outline of a building or a number of buildings or other objects seen against the sky'. Silhouettes as a description of the relationship between buildings and the sky has not been mentioned until 1876, and commonly used in the 1890s (Attoe, 1981, Kostof, 1991).

Urban skylines or silhouettes are essential elements of urban forms because of two reasons: their symbolic meanings and their role as urban landmarks which contribute to the imageability of the urban form. As a result of building activities, a skyline of building-collection in a city tells the story of the vicissitude of the city, as well as the value of the society. A skyline is a chief symbol of religion, political force, capitalism, or social collectives. A European medieval city usually had a church dominating the skyline, which expressed the power of religion and the solidarity of people. Tall or voluminous buildings in the central core of a city were designed to be perceived with respect and sense of authority in the middle of nineteenth century, which represented monarchy against democracy. For instance, the planning of American capital city shows strong strength on the bureaucratic representation (Sonne, 2003). After the Industrial Revolution, industrial chimneys and steel towers were the main components of the silhouettes of European cities, which radically changed the images of cities. Furthermore, alone with the growth and expanding of private enterprises in the modern time, skyscrapers emerged to celebrate the capitalism of private economic power both in Europe and North America. In order to show the collective value of a society, Krier has advocated that only civic buildings, such as town halls, theatres, stadiums, basilicas, schools, libraries and others, should be shown in skylines to emphasise the civic order (Porphyrios, 1984). Since urban silhouettes have symbolic meanings, they have been used as advertisements serving certain purposes. For example, socialists employed the bright sunlight with a skyline of their city to represent the splendid future of the society. Estate developers use

ecological skylines of a natural town to fulfil buyers' dream of healthy living. Also, city monuments shown in skylines can commemorate heroism, freedom, localism and so forth, for instance, the Victor Emmanuel Monument in Piazza Venezia, and the monument in Tian'an Men square.

A silhouette can act as a landmark to provide a sense of place and orientations, which contributes to the imageability and identity of a city. The image of a silhouette usually gives the first impression of the city to observers from a distance. It constitutes a cityscape in various settings such as day, night, sunrise and sunsets. The skylines of some cities become memorable so that, no matter from the outside or the inside of a city, observers can recognise where they want to go and what a place is. For instance, the skylines of Chicago and Seattle are made of iconic buildings and dramatic architecture; while the skylines of Hong Kong and Tokyo consist of mega-concentrations of building mass with powerful natural backdrops; the skyline of Sydney is outstanding due to the iconic Opera House on the waterfront (City of Portland. Oregon, 2007).

According to Wayne Attoe (1981), a large scaled skyline is usually made of repeatable features of similar forms to pursue the qualities of rhythm and punctuation. The visual beauty of a skyline lies on the harmonious fit of it with the natural topography. The man-made landscape interacts, reinforces or contrasts nature, for instance, the castle of Edinburgh interacts with the rocks. Attoe also emphasised the quality of 'netting the sky', which refers to the zipper-like relationship between buildings and the sky. 'As the building soars up into the blue vault, it also captures it and brings it down to the building' (Cullen, 1971, p40). Furthermore, the abstract form of a skyline, which is transformed by lighting and atmospheric conditions, creates beautiful city images. For instance, the nightscape of a skyline presents a unique feature of beauty. The quality of layering of a skyline allows scenes become lighter and lighter with the distance increasing from the perceive point to the background (Figure 5.1). An ideal skyline, according to Attoe's six qualities mentioned above, should be rich enough to form esthetical and changeable images.

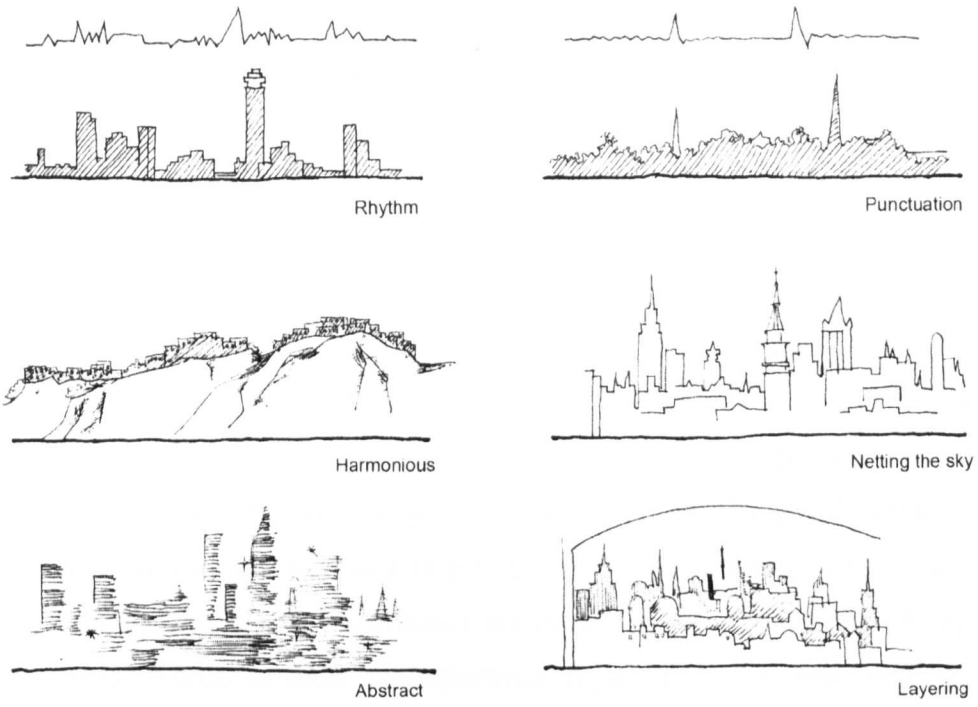

Figure 5.1Six qualities of a skyline that need to be achieved by design control (by the author)

In this chapter, the transformation of the silhouettes of Nanjing will be examined from the ancient time to the present. The characteristics of the main silhouettes which can be perceived from five major view points outside or in the city during the three periods—the historical period (--1860s), the modern period (1860s-1949) and the contemporary period (1949—present) will be illustrated. The Chinese context which indicates the driving forces of the common features of traditional silhouettes in Chinese cities has been given before the examination of the case study city.

5.2 The Chinese context

Generally speaking, Chinese traditional cities had a consistent height without many dominant features. This phenomenon was well presented in thousands of Chinese historical cities, which received direct influences from the traditional philosophy and city planning theory. The Chinese philosophy Daosim, as explained in Chapter 1, advocated harmony between artefacts and nature. Their philosophy required buildings to take every possible advantage of the natural beauty of their sites, of woods and hills, for instance, the design of Chinese private gardens (refer to Chapter 10). 'Chinese architecture, through its horizontal platforms was related to the earth

and fuses with the environment' (Zhong, 1986, p106). The feudal society advocated the severe order and control of urban forms so that the silhouettes of traditional cities were almost even and low. Topography was very important for traditional Chinese silhouettes. Natural settings such as mountains and rivers, which benefited a city according to Fengshui, were the major components of the silhouettes of the city.

It is widely acknowledged among Chinese scholars that building roofs are the fifth elevation of traditional Chinese architecture, to which is paid equal attention as the other four elevations. The reason was that it was very difficult to increase the number of floors and the volume of a single building due to the structural technique of timbers in the historical time. As a result, the shape and structure of wooden roofs became the only possible way to enhance the visual impact of a building (Wang and Zhang, 1994). In order to show the importance of palaces and official buildings, the roofs of 'official architecture' which represented the power of ruling class had plenty of details and additional constructions (refer to Chapter 9). They showed the beauty of agility, elegant, flexible and the trend of flying with overlapping roofs and walls, changing levels of brackets and iterating of plans. The roofs of vernacular buildings also represented the owners' personalities in a modest way. Chinese traditional silhouettes were made of those collective roofs as a whole.

According to Ashihara (1970), the main silhouette of an object is made from its basic outline, while its secondary silhouette is made from all kinds of fixtures or additional ornaments on it, for instance, the secondary silhouette of a building is consists of roof windows, ridges, pediments and etc. Main silhouettes can be perceived from far away, while secondary silhouettes are appreciated in close distance. For traditional Chinese cities, the main silhouettes were uniform and harmonious with nature, while the images of secondary silhouettes were very rich.

In addition, small architectural features sometimes could be shown in traditional silhouettes, such as pagodas, temples and towers. Pagodas as religious symbols were normally located on top of hills, half covered by forests, or located on the peripheral city as components of temples. Temples, referring to temples of the heaven, temples

of the earth, drum towers, and bell towers, were also recognisable from silhouettes of traditional cities, and were usually placed on the main axes of a city. Moreover, there were also some view towers built on certain view points of a city, which allowed people to appreciate the beauty of the city. However, all those storied buildings hardly influenced a city's silhouettes at a large scale due to their small volumes.

5.3 Major view points of Nanjing

The images of silhouettes are determined by where the silhouettes have been perceived. A good view point allows the silhouettes of a city to be perceived as a whole very well. Those view points are usually on seashores, top of mountains or edges of the city, for instance, the Sydney Bay from which the silhouette of Sydney can be well perceived. Furthermore, a good view point of a city is also a popular place drawing people to appreciate the beauty of the city. For Nanjing, five view points are selected by the author because they not only allow silhouettes of the city to be observed in a relatively complete sense, but also are popular places (Figure 5.2).

The first and most popular one is the water bank of Xuanwu Lake, which is in the north of the city. It provides a large open space for people to have outdoor pleasure, and the city becomes a backdrop of the lake. Moreover, since the main railway station of Nanjing is recently reconstructed near the lake, it draws a large amount of tourists and passengers everyday. Thus from the view point of Xuanwu Lake, people are able to gain the first impression of Nanjing and its silhouette can be perceived as an entity (Figure 5.3). Similarly, the Yangtze River bank is another ideal place for perceiving the silhouette on the west of the city. There are several public parks and watching towers near the river bank, which served for military purposes in history, and are tourism attractions nowadays. Thirdly, Zhong Mountain as the highest mountain in the region provides a natural view point for Nanjing. It is a popular place for many sorts of outdoor activities, such as picnic, camping, and climbing, because it accommodates the Botanic Garden, the astronomical observatory station, the Presidential Mausoleum and etc. The fourth one is the city wall and gates, especially the well-preserved Zhonghua Gate on the south of the city. Its location and height make it suitable for viewing the city from the edge.

The aforementioned view points are almost outside the old city, and for the appreciation of main silhouettes of the city. The Xin jiekou area as the current city centre is another view point within the city. At present, it has large number of high-rise buildings with entertainment places on their top, where people can perceive the silhouettes well. Also high-rise buildings themselves in this area have great impact on skylines. Apart from those five points, city streets allow changes of view points along with the movements of individuals, from which the detailed and continuous secondary silhouettes of the city can be appreciated.

Figure 5.2 Five view points around the old city of Nanjing (by the author)

Figure 5.3 Silhouette perceived from Point 1 (photography and composition by the author)

5.4 Silhouettes in the historical period (--1860s)

The silhouettes of Nanjing in the historical period were even and low, in which the most distinctive objects were the city wall, temples and pagodas, as well as the natural mountains on both the west and northeast sides of the city. From the view points outside the city, mountains and multi-story objects were the major

components (Figure 5.4), while the collective building roofs were perceived from the view point of the city wall and gates (Figure 5.5). There was a poem described that Nanjing had four hundred eighty temples during the Southern Dynasties (420-589). Even though the number of temples was an exaggeration, religious temples were commonly built in the city at that time because the emperors of the Southern Dynasties actively promoted Buddhism in the country (Zhu, 1936). Those temples did not have long-term impacts on the silhouettes because of the demolishment of them by the emperors of Sui later. Later on, the city wall which was constructed during the Ming Dynasty changed the silhouettes to be even and continuous lines. During the Qing Dynasty, the drum tower, national exam tower, Yuejiang Tower and other multi-story buildings have been built, which exist today. They punctuated the even lines formed by the city wall.

Figure 5.4 The pagoda of Jiming Temple is outstanding from the contemporary high-rises which is viewed from the city wall. (Photography by the author)

Figure 5.5 Collective roofs form the skylines as perceived from the Point 4 in the 19th century (Yang, 2001, p545)

In this period, shapes of building roofs were essential for the characteristics of silhouettes at small scales. There were four types of shapes of roofs in the historical Nanjing (Figure 5.6). The even and flat type was abstracted from the city wall, which was the most recognisable element in the skyline. The second type was multi-cone, which was distilled from pagodas, of which the influence on the silhouettes lasts till the present. Similar to the multi-cone type, the multi-trapezoid type was also found commonly in historical buildings' roofs, such as the Yuejiang Tower, the Drum Tower and etc. The fourth type—the stepped type existed in thousands of vernacular buildings such as houses, which formed the most ubiquitous image of detailed silhouettes of Nanjing in this period. The four types of shapes in the traditional silhouettes could be appreciated in great details, while they were interacting and overlapping harmoniously with each other to form a continuous city image and correspond to the nature settings.

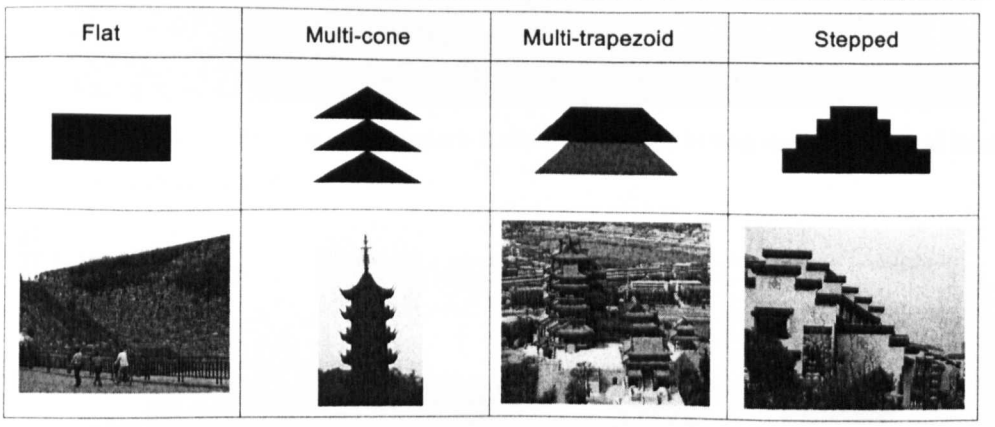

Figure 5.4 Four types of the shapes of building roofs in the historical period (by the author)

5.5 Silhouettes in the modern period (1860s-1949)

Silhouettes of Nanjing had not changed much in this period, because the height of buildings built in this period did not exceed the height of the city wall, which was from 20 to 60 meters. On the one hand, building design was under the rule of 'Xi Ti Zhong Yong' ('combining western and Chinese architecture'), thus building height was limited within the conventional height of Chinese architecture. On the other hand, the government of Republic of China was facing serious financial problems (Wang, 2003). The development and construction of the city had only undertaken for

less than ten years (1927-1937), interrupted by the war against Japanese army (1937). Therefore, the majority of buildings were maintained as before, and so were the main silhouettes, even though several boulevards and official buildings had been built. The natural features and the city wall were still the major components of skylines (Figure 5.7).

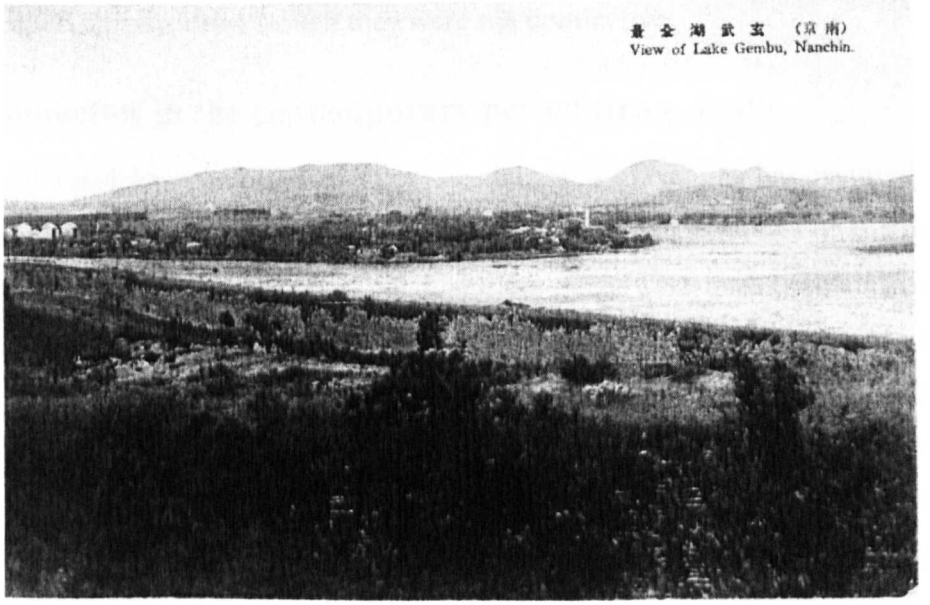

Figure 5.5 The silhouette from the Xuanwu Lake bank (Point 1) was made of natural landscape and the city wall (Liu, 1998)

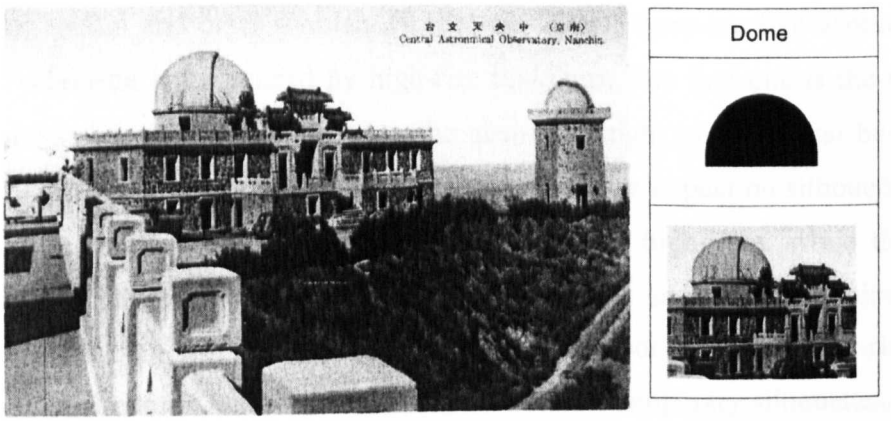

Figure 5.6 The dome of the Astronomical Observatory of the Purple Mountain (adapted by the author according to (Liu, 1998))

Since western architectural elements had been adopted in new buildings, the small scaled silhouettes of the city had few modifications. Apart from the historical types of building roofs, another type of the roof shape—the dome appeared. The example

was the Astronomical Observatory of the Purple Mountain, in which the dome perfectly matched the function of the building (Figure 5.8). The building can be well perceived because it is located on top of the mountain. Furthermore, the western triangle pediment and the Orders had been employed in some important buildings such as banks and official buildings (Chapter 9). Those new types had influenced the streetscapes slightly, even though they were not dominative.

5.6 Silhouettes in the contemporary period (from 1949)

The rapid transformation and growth of the silhouettes of Nanjing has occurred in the contemporary period, along with the emergence of high-rise buildings[1] in the process of urbanisation and modernisation. High-rise buildings were built up mainly in two periods in China: the 1920s-30s in Shanghai, and the late 1970s onwards in the whole country (Hua, 2005). Those buildings had iconic meanings. First of all, the high-rise building type is adopted to represent the growing economic power of private enterprises. Secondly, high-rise residential buildings 'associate with the Chinese modern ideology of social progressiveness which is embedded in national consciousness and urban daily life' (Lee, 1999, p5). They appeared because of the increases of urban population and urban land value.

According to Rui and other scholars (Rui et al., 2004), there are five aspects from which a silhouette is influenced by high-rise buildings. The first one is the relative height of high-rise clusters rather than the absolute height of individual buildings. The more differences among building clusters, the greater impact on silhouettes they have. The second aspect is the density and location of high-rises, while the third aspect is the cubage of high-rise buildings. The denser and more voluminous the building is, the bigger impact it has. Furthermore, the roof shapes of high-rises and the surrounding natural landscape also influence the contemporary silhouettes.

[1] High-rise buildings are defined as that the height of buildings exceeds 24 meters according to building regulations such as the 'Gaoceng minyong jianzhu sheji fang huo guifan GB 50045-95' ('Fireproof regulations of civic high-rise building GB 50045-95') in contemporary China.

The development of high-rise buildings in Nanjing can be classified into two sub-stages in this period: the initial development which is from 1977 to the 1990s, and the rapid development stage which is from the 1990s onwards. It is widely acknowledged that the first high-rise building in Nanjing was Dingshan Hotel (1977), which was 30 meters high and eight stories. It is located in the north of the city (Wang et al., 2005). From 1977 to 1982, seventeen high-rise buildings have been built in the city, which are distributed mainly near the boulevards in order to be easily accessed (Figure 5.9). The total built area is about 250,000 square meters, and average height of these buildings is less then 50 meters, 10 stories. Most of them are office buildings or for commercial uses, among which Jinling Hotel is worth being mentioned. The hotel is located in the centre of Xin Jiekou area, with 37 stories, 122 meters tall, and built in 1983. It had been the tallest building in the country for several years, and was also regarded as a symbol of modern Nanjing. It marked the threshold of high-rise buildings congregating in the city centre.

370 high-rise buildings had been built during 1983 to the 1990s, which were distributed mainly in the centre or along the main streets. The reason why there were so many high-rises built in this area was the relatively high land value, which was influenced by accessibility and locations. The total construction area of those buildings was 5,000,000 square meters, and the average number of stories of them is 30. The tallest building was Jinying Trading centre in Xin Jiekou, which was 191 meters tall and 58 stories. Furthermore, buildings in Xin Jiekou were not only for commercial use but also for residential use in this stage. Local people started to accept the new life-style of living in high capacity community, because high-rise apartments fulfilled Chinese people's fantasy of 'modern', 'luxury' and 'high social status' (Hua, 2005, p847). In addition, mixed-use within individual high-rise buildings became the major functional alternation in this stage. For instance, the lower stories of residential high-rise buildings were changed to commercial use.

During the second stage of rapid development of high-rise buildings, 415 new high-rise buildings have been built in 2002 to 2004 (Figure 5.10), and the total construction area is 6,000,000 square meters. Even though half of the high-rise

buildings are in the newly developed area outside the old city, the old city still accommodates 214 new high-rises, in which the tallest one is the Nanjing Trading Plaza (218 meters high, 56 stories). Moreover, 73% of the high-rise buildings are for residential uses. Until 2007[2], the number of high-rise buildings in Nanjing reached 1760.

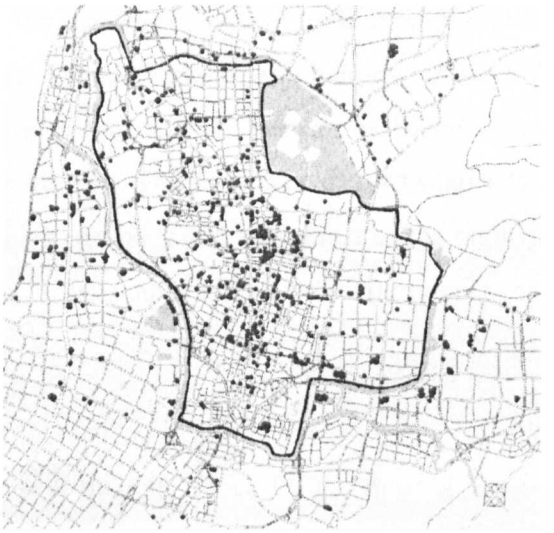

Figure 5.7 The locations and height of high-rise buildings in 1977-82 (left)(The research group of Nanjing's city characteristics of the Architectural Institute of the University of Nanjing, 2006, appendix 2)

Figure 5.8 The locations of high-rise buildings in 2004 (right) (ibid, p3.15)

As a result, the city image of silhouettes that can be perceived from the five major view points is changing dramatically over years. For instance, the Jinling Hotel used to be distinctive in the skyline, but was lost in the growing concrete forest in less than ten years. The comparison of the silhouettes observed from the Point 1 indicates the changes (Figure 5.11).

At the small scale, the types of roof-shapes of high-rise buildings in Nanjing are various (Figure 5.12). They usually consist of additional objects such as waster tanks, rotated restaurants, solar energy collectors and lightning rods on top of those roofs. The shapes can be classified into eight types. The tube type of shapes is abstracted

[2] Resources of the numbers of high-rise building built in 2002,2004 and 2007 are from the urban planning bureau of Nanjing.

from flat roof without any additional structures, for instance, the Jinling Hotel. The types of cone and slope are the variations of the tube type. The types of dome and stepped pyramid are generated from the western neo-classic idea, which emphasises right proportions, symmetry and steady of architecture. The neo-classic language is favourable for Chinese private enterprises because it delivers the symbolic meanings of durability and elegance. The hat type derives from Chinese traditional pitch roofs, which shows the attempt of employing Chinese traditional features in high-rise buildings. The curved conical type is rare in roof shapes, but can be found in some special artefacts such as the TV tower in the city. The final type of roof shapes is the tube shape with additional structures, which can be found with most of the high-rises in the city. The eight types constitute the streetscapes which orientate people inside the city (Figure 5.13, 5.14).

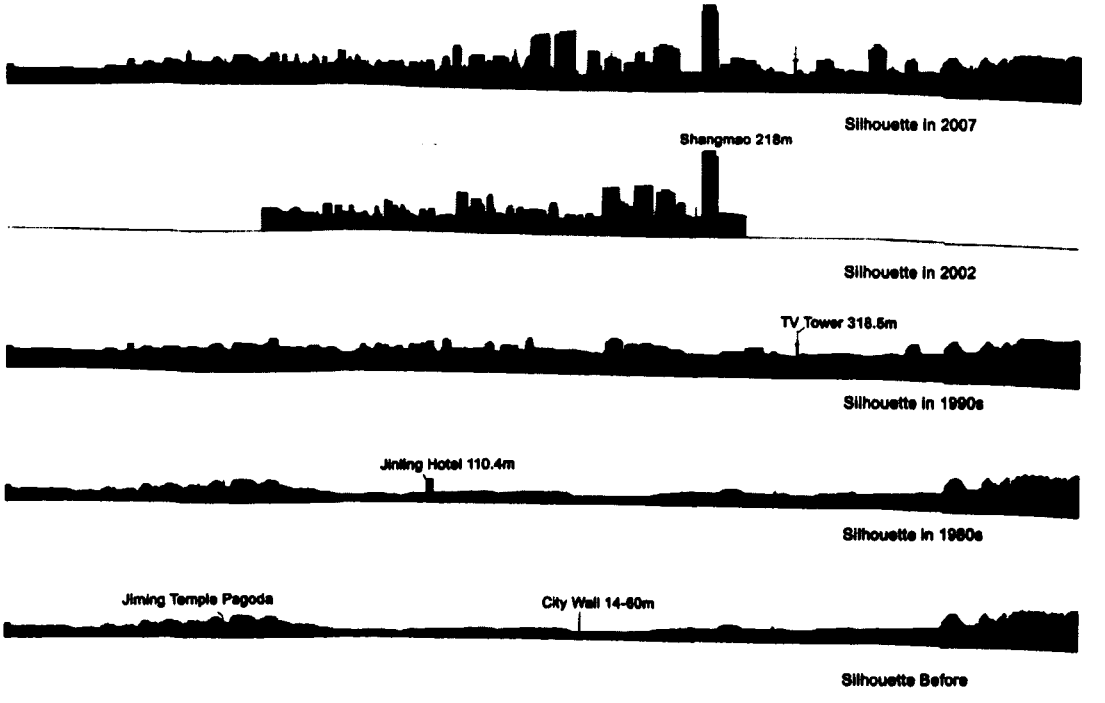

Figure 5.9 Comparison of skylines observed from Point 1 over time (by the author)

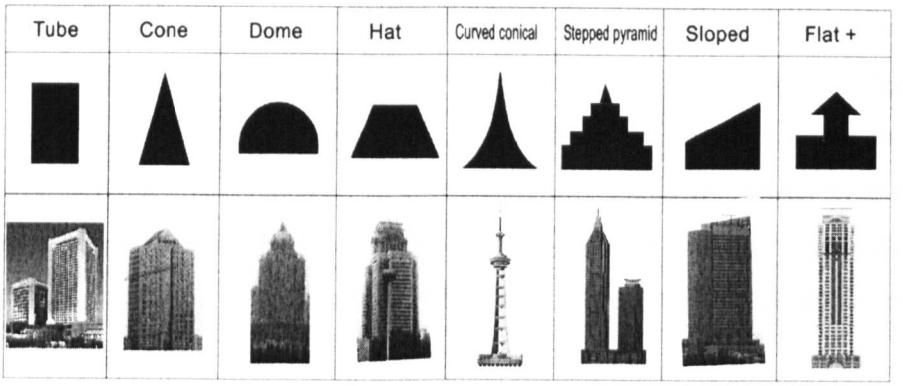

Figure 5.10 The types of roof shapes of high-rises in Nanjing (by the author)

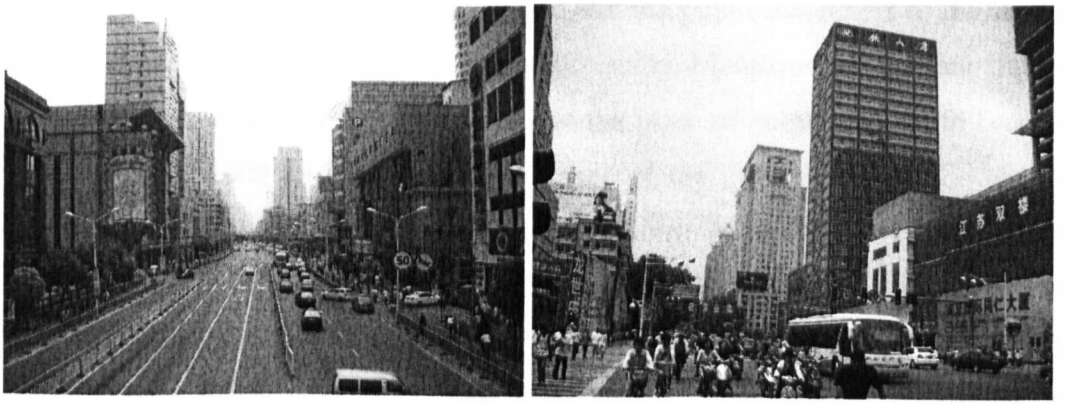

Figure 5.11 Streetscape of the Eastern Zhongshan Road (Photography by the author)

Figure 5.12 Streetscape of the Zhongshan Road (Photography by the author)

The dramatic flowering of high-rises in the city has brought several problems. Firstly, the types of roof shapes of high-rise buildings are completely unrelated to the traditional types. Many high-rise buildings obstruct the visual corridors of the city that are towards historical buildings and natural settings. For instance, the Heping Dasha on the Northern Taiping Road defilades the Zhong Mountain from a broad angle of viewing inside the city. The second problem is the poor quality of high-rises and the way that they are distributed in the city. Some scholars have addressed that there was no scientific strategy of planning and height-control of those high-rises in Nanjing until recent years (Wang et al., 2003). For example, the policy of 'Yi Di Bu Lu'[3] promoted by the municipal government before 2002 caused chaotic building

[3] The basic concept of 'Yi Di Bu Lu' policy was that certain developer gave financial assistant to the government by building public roads, for a return, the developer got some free urban land for his own profit. The policy has been abandoned by the government in 2002.

activities and sub-dividing plots blindly (Tao and Zhu, 2005). Such chaos has been intensified by frequent changes of the by-law on the issue of set-back distances of high-rises in recent years, for instance, one building was required to have three meters distance from its nearest street-line, while its neighbours which were built in later years, were required to have five meters distance from the street-line. As a result, buildings along streets are not able to create the sense of enclosure for people.

A recent campaign of 'the most beautiful high-rises in Nanjing'[4] promoted by the government and mass Medias has addressed that the public awareness of the skyline and the quality of high-rise architecture is increasing. Moreover, the government has funded some university researchers to study the issue of height control in order to preserve the cultural and historical appearance of the city, which can be used to revise the current planning policies and regulations. A recent survey about local people's opinion on high-rise buildings of Nanjing revealed that 68.2% interviewees thought it was necessary to control the height of buildings in the old city (Tang, 2003). Such research has also been conducted by the research groups of the Southeast University (Wang et al., 2003), which proposed a detailed classification of the city land for height control of buildings based on their evaluation of historical landscape, land value and land potential of the city (refer to Chapter 11, Figure 11.10).

In sum, the contemporary skylines of Nanjing are uneven and growing, and high-rises are the major components during this period. The secondary skyline of Nanjing made from the roof shapes is not repetitive and cacorhythmic.

5.7 Conclusion

Through the examination of the silhouettes of Nanjing at a big scale and at a small scale over time, the original type of the main silhouettes, which was even and low,

[4] In the campaign, Jinling Hotel won the prize of 'Harmony with the environment', while Jinying Trading Centre won the prize of the 'best technology and materials'. Hilton Hotel was titled as the 'best design', and the Railway Headquarter and the Sheraton Hotel won the 'highest tech' and the 'most creative design' respectively. (resource from http://house.jschina.com.cn , 2005)

had been maintained fairly stable until the 1970s. Thereafter, the type has been changed dramatically when high-rise buildings have emerged. Therefore, the typological process of the silhouettes at the big scale has last only until the 1970s. Similarly, at the small scale, as components of secondary silhouettes, the traditional types of roof shapes have not been inherited in the third period, during which new types of roof shapes have been invented along with the emergence of high-rises.

The transformation of the silhouettes of Nanjing from the traditional types to the contemporary type is irreversible. Thus (1) it is impossible and not necessary to follow the traditional type of even and low silhouettes at the present, because high-rise buildings are inevitable products of economic development of Nanjing, and the life-style of the inhabitants has gradually adapted to the high capacity living. However, it is important to manage the image of the silhouettes from the five major viewing points in order to achieve the visual qualities of rhythm, punctuation, harmonious, netting the sky, and etc, because they affect the imageability of the city and reproducing the identity. Furthermore, high-rise buildings have caused disordered streetscapes and obstruction of historical features and natural settings from being seen in Nanjing, which demands improvements through legislation and design. (2) The traditional types of roof shapes, which were repetitive in the historical buildings, are still useful for making streetscapes with strong local identity, which needs to be applied to new buildings. The three points can be achieved by following the design suggestions proposed in Chapter 11.

CHAPTER 6 STREET NETWORKS AND STREETS OF NANJING

6.1 Introduction

According to M. R.G Conzen's (1960) definition, a street refers to 'the open space (street-space) bounded by street-lines and reserved for the use of surface traffic', while a street-line is 'the line dividing street-space from adjoining blocks' (Larkham and Jones, 1991). A street network is the arrangement of streets in a ground plan or an urban area (Conzen, 1969). Streets structure city fabrics and townscapes to form contexts of urban settings (Tugnutt and Robertson, 1987). Street networks, together with urban blocks, constitute the ground plan of a city, which has 'morphogenetic priority' over the other complexes such as land use patterns and building forms in morphologists' conception of a city form (Whitehand and Gu, 2003, p3).

The desired qualities of a street are not only based on its function, but also on health, sensory perception and aesthetics. Vitruvius promoted healthy streets design in his doctrine: 'they should be properly laid out to exclude winds' (Vitruvius, 1960, p24). Sitte (1889) emphasised the importance of being enclosed and continuous for a street so that it protected the gaze from losing in infinity. Lynch (1960) suggested that a path, as one of the elements of a city's structure, should have clarity of direction, identity and rhythm of kinaesthetic sensation such as turning, rising and falling.

The study of street networks is a popular subject in the literature of urban morphology. According to New Urbanists' geometrical classification, the basic types of street networks are grid, radial, linear, continuous curvilinear and culs-de-sac (Duany et al., 2003). Those basic types combine to each other and form diverse patterns of street networks. Another example is Marshall's (2005) categories of A, B, C, D typology, which has been mentioned in Chapter 3. The complexity and diversity of streets and street networks contribute greatly to the distinctiveness of an urban form.

Similar to the aforementioned study, it is through geometrical analysis to classify types of street networks in this chapter[1]. The way of identifying street types is in relation to the plan, height-width ratio, and built frontage or vegetation arrangement of streets. In this chapter, the Chinese context of traditional street networks and streets is addressed first as the background of the street-forms of Nanjing. The typomorphological examination of the street networks and streets in Nanjing is conducted in three periods of the development of the city: the historical period (--1860s), the modern period (1860s-1949) and the contemporary period (1949—present). The process of formation and transformation of street networks and streets reveals their synchronic types and typological processes, which could further benefit street design in the future.

6.2 The Chinese context

The form of Chinese traditional streets in planned capitals or big cities was greatly influenced by the feudal social hierarchy—Li Zhi, as mentioned in Chapter 1, which was recorded in the *'Artificers' Record'* as an ideal city planning principle dating back to the Zhou Dynasty. A city should have nine north-south oriented streets and nine east-west oriented streets, which should divide the square city into equal parts symmetrically. The widths of streets in a city were set according to the governor's social status. For example, the streets in the city of the emperor of Qin, who was the first emperor uniting China, were 50 'Bu' (about 67 meters) in total. The streets were divided into three parts by pine trees, in which the central part was for the emperor's carriage, which was about 7 meters, while the rest of the streets were for common people (Xu and Zhang, 1996). There were normally two important and the widest streets in a grid network in a planned capital city in China: the one coinciding with the central north-south axis and the east-west oriented one on the south of a palace or a prefecture mansion. Other streets in common people's residential area were scaling down in width (Wu, 1985).

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[1] There are other methodology of analysing types of street networks, such as the theory of Space Syntax HILLIER, B. (1996) *Space is Machine*, Cambridge, Cambridge University Press. and the Fractal theory COOPER, J. (2005) Assessing Urban Character: the Use of Fractal Analysis of Street Edges. *Urban Morphology*, 9, p95-107., which will not be explained in detail here.

Even though the ideal principle was not accurately applied to cities, the grid pattern of street networks with clear orientation can be largely found in historical Chinese cities, especially those in the north of the country, where the topography has relatively less constraints. Street patterns were less regular in cities with strict topographical constraints, which were normally in the south of the country. Street networks and streets in small cities and towns that were formed without official city planning appeared diverse forms (refer to Chapter 1).

Compared to streets in western countries, Chinese traditional streets were treated with far less aesthetic consideration. In the western tradition since the Renaissance, external and internal spaces of architecture were equally treated and were beautiful, while in the Chinese tradition, external spaces such as street-spaces were much less important than internal spaces of the buildings. Before the Song Dynasty, streets were enclosed with external plain walls of buildings. Even though street-spaces have been opened for trading since the Song Dynasty, poor aesthetic treatments of street-spaces and the introversion of buildings have not changed much in the feudal period (Figure 6.1).

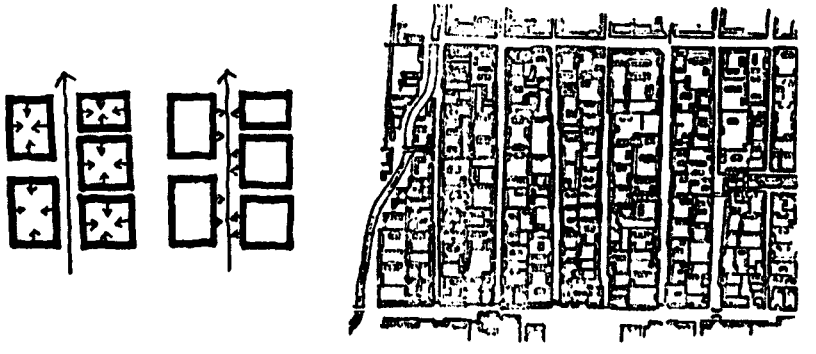


Figure 6.1Street-spaces were less important than internal spaces of buildings in traditional Chinese cities even though buildings were open to streets after the Song Dynasty (Zhuang and Zhang, 2002, p5)

Generally speaking, traditional Chinese street networks were normally in north-south oriented grid pattern, while the streets were at different degrees of importance and with limited aesthetic treatment. These characteristics of street networks and streets

have also affected the street networks and streets of Nanjing in the historical period, which has been analysed in the paragraphs below.

6.3 Streets & networks in the historical period (--1860s)

6.3.1 Street networks

Available city maps (Figure 4.1, 4.4, 4.5) from 472 B.C to the Ming Dynasty did not show complete street networks but several important streets. The essential ones were the axial streets, which started from palaces to the south and were north-south oriented. Zhonghua Road (present name) was the axial street of the city in the Eastern Jin, Southern Dynasties and the Southern Tang Dynasty, which divided the Qinghuai River and its valley into two equal parts. Yudao Street (present name) was the axial street of the city in the Ming Dynasty, which was also north-south oriented and started from the Ming Palace to the south. Besides, the east-west oriented streets for those dynasties were Sanshan St and Dazhong Qiao St (Shengzhou and Jiankang Road at present), and Dashi Street (Jianye and Baixia St at present) that connected the Ming Palace to the west part of the city (Figure 6.2). Those streets were so called Guan Jie (official streets) that accommodated the biggest flow of transportation in the city. Their layouts were also according to the official standard, which is addressed later.

There were other Guan Jies shown in ancient maps: the north-south oriented Wangfu Great St (present name) and Mingwa alley, and the east-west oriented Beixin St. Those streets were connecting important sites, for instance, the Wangfu Great St connected Sanshan St to the Beimen Qiao market, which was one of the biggest markets in the Ming Dynasty, while the Beixin St connected the Ming palace to the western city gate (Figure 6.2). The network formed by Guan Jies was imprecisely following the ideal city planning principle, so that it appeared as a loose cross pattern.

Street networks can be recognised from the map of the Qing Dynasty comprehensively (Figure 6.2). The street network in the south part of the city was the densest compared to the street networks in the east and the north, because the south

part was more developed than the rest as the residential and commercial aggregation area for thousands years.

Figure 6.2 Street networks in the historical period with Guan Jies highlighted (by the author based on the city map of the Qing Dynasty from (The editors committee of the gazetteers of Nanjing, 1986 and the Fig 4.1, 4.4 and 4.5)

In the south part, the type of street network was *network responding to the topography:* following the trend of Qinghuai River. The best example of the type

was the street network in the West Gate Area, which was radial and orthogonal to the river. Such type of street network was maintained from the Wu Kingdom (222-280), when the settlement was arranged to adapt the beautiful natural landscape (Tang, 2003) (Figure 6.3). This type of street network existed in the northwest of the city, because there were series of mountains, and the northwest area accommodated military stations. The majority of the street networks in the city, especially in the east part and central part, were the type of *north-south oriented grid*, because the palace and the noble class were located there, and the influence of feudal hierarchy was strong.

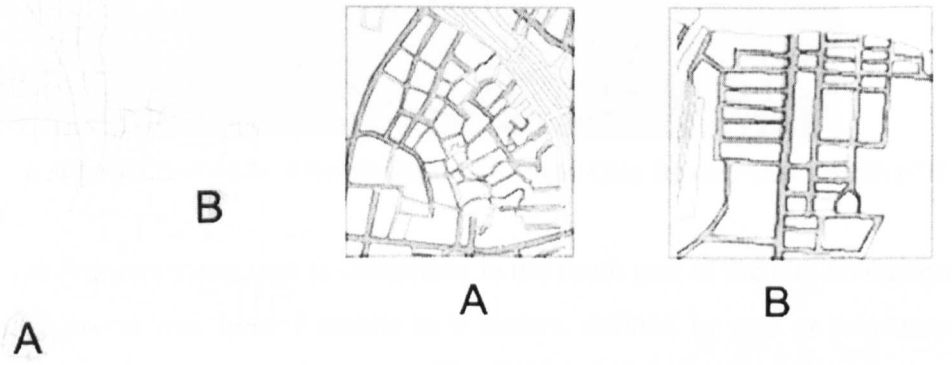


Figure 6.3 Locations and examples of type A of the street network: *network responding to the topography*; and type B of the street network: *north-south oriented grid* (by the author)

6.3.2 Streets

Two types of streets were common in the historical period: Guan Jies (type a) and ordinary traditional streets (type b). The width of Guan Jie was 9 'Gui' (about 16.6 meters), with porches along each side of them (Zhang, 1984), and paved with stones. Porches alongside Guan jies provided services for official postmen and merchants in ancient time. Later on, those streets were open for trading during the Song Dynasty. Since then, they became flourishing street markets surrounded by commercial buildings, with temporal structures on the streets (Figure 6.4). There were about 48 such streets in the city, while 13 streets connecting the city from the city gates to surrounding areas in the Ming Dynasty (Xu and Zhang, 1996).

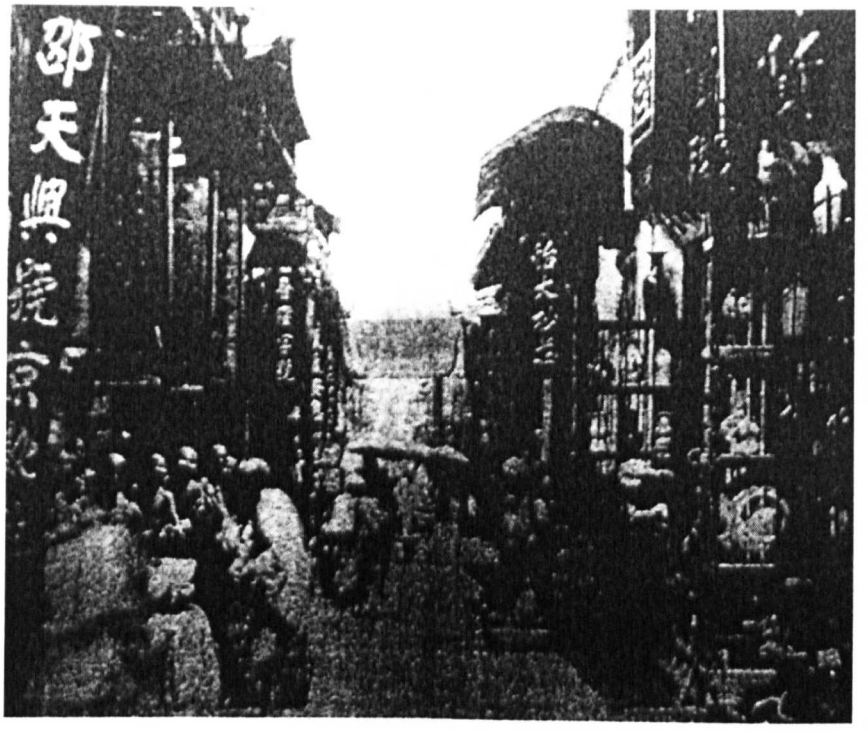
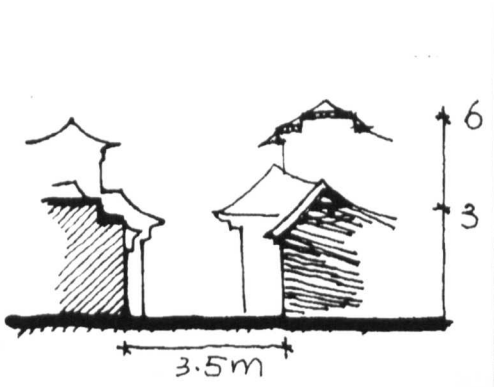


Figure 6.4 A street market: Pingshi Street during the Ming and Qing Dynasty (Yang, 1993, p71)

The historical ordinary street type is ubiquitous in the south part of the city nowadays. The width of streets was from 3 meters to 6 meters, defined by one or two-story buildings with doors opening to the streets. The W/H (width/Height) ratio was about 1 (Figure 6.5). The streetscape of those streets in Nanjing was rich because their street lines were slightly curving. Buildings were arranged to have slight angles with streets, thus the rotation of the gables and the chiaroscuro of shade and light made interesting streetscapes (Figure 6.6). A visitor could not see throughout a street, which kept privacy in parts of the street, where people could chat and children could play safely. The linear spaces were important for community activities.

In sum, there were two types of street networks and two types of streets in the historical period of Nanjing. The street networks of Nanjing during that time consisted of the *networks responding to the topography* and the *north-south oriented grid*, which were distributed in different areas. The Guan Jies and ordinary streets differed in terms of size and layout, but the width/height ratios were similar.



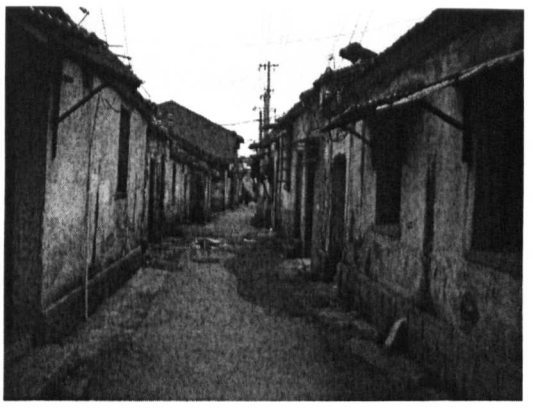


Figure 6.5 The section of a typical traditional ordinary street (by the author)

Figure 6.6 The streetscape of a traditional ordinary street (photography by the author)

6.4 Streets & networks in the modern period (1860s-1949)

6.4.1 Street networks

The milestone of the initial modernisation of transportation in Nanjing was the construction of the first modern road—'Jiangning Road' conducted by the governmental officer of Qing--Zhang Zhidong in 1895 (Xu and Zhang, 1996, Li and Xiong, 2003, Xiong, 2003). Jiangning Road started from the gubernatorial mansion[2], connected the Tongji Gate in the southeast and Xiaguan treaty port on the northwest, and went through the Drum Tower area. The road was built based on the previous route, and according to the standard of modern streets established in Shanghai by the western colonists and the Qing government—the width was 2 'Zhang' 5 'Chi' (about 8.33 meters), and it was for vehicular use[3] (Figure 6.7).

Since the establishment of the Republic of China by the Nationalist Party in 1912, the government attempted to make series of plans to rebuild Nanjing, and since 1927 when Nanjing was officially announced to be the capital, a more comprehensive planning scheme—Shoudu Jihua (Capital City Planning, 1929) was launched to build

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[2] The building complex was the palace of the Taiping Tianguo Kingdom during 1853 to 1864. It becomes the Presidential Palace in the Republic of China era and the Nanjing Historical Remains Museum of Chinese Modern History at present, which is located in 292 Changjiang Road (resource from its official website: www.njztf.cn) Related information also can be found in the chapter 9.

[3] The first motor vehicle was appeared in Nanjing in 1905.

Nanjing as a modern city, and to represent the nation's prosperity and democracy. For instance, some plans of street networks called 'Quanguo guodai xianwang' (Plan of the national street network, 1928) and 'Shi'er guodao zhuyao ganxian' (Plan of twelve national streets, 1929) were launched. However, they were not completely implemented because of the shortage of finance and labours. Only several national streets outside Nanjing have been built (Xu and Zhang, 1996).

Figure 6.7 Jiangning Road (Xu and Zhang, 1996, p69)

The Capital City Planning proposed a systematic street network in Nanjing, which consisted of several straight and broad boulevards; some geometric grids filling into the space between boulevards; several park-like streets paralleling to the water system and connecting the proposed public parks[4]; and circular streets outside the city wall (Figure 6.8). The boulevards were named after the president Su Zhongshan, while the other streets were named after cities and provinces of the country in order to obtain financial supports from those cities and provinces (Wang, 2003). The proposed street system had not been completed because of the anti-Japanese war in 1937. However, the boulevards and several grids in certain residential districts have been built before 1937.

[4] The proposed park-like streets paralleling with the water system and other public parks are explained in Chapter 8.

Figure 6.8 The proposed street system and names of the streets in the Capital City Planning, 1930 (Wang, 2003, p114)

Figure 6.9 Street networks in the 1940s with the boulevards and geometric grids highlighted (by the author)

There were two new types of street networks emerged along with the modern planning, which were the type C—*boulevards system* and the type D— *geometric grid network* (Figure 6.9). As mentioned in Chapter 4, the capital city planning received strong influence from the west planning theories by employing American planners and designers. The chief planner Murphy was educated with the Beaux-Art tradition, and he considered that the axial-like street pattern was a great integration of the western concept of Beaux-Art and the Chinese tradition. However, differing from the boulevards in Paris which were cutting through the original built-up city fabric, the boulevards in Nanjing were gently built, because firstly the urban land in the central and north parts of the city were not well built-up[5]; and secondly some boulevards (Northern Zhongshan Road and a part of the Zhongshan Road) were based on the previous Jiangning Road, despite small scaled demolishment of previous buildings was inevitable.

The type of *geometric grid network* was built in the residential district for the high-ranking governmental officers in the north of the city (Figure 6.9). The new street network had no reference to the previous one in that area, and not north-south oriented. The block patterns and house type were also borrowed from the west[6]. The residential district represented the government's desire of modern and luxury lives, which is explained in detail in Chapter 10.

6.4.2 Streets

In the modern period, the boulevards (type c) were built as a new type of streets. Boulevards were 40 meters wide and paved with asphalt, which were divided by vegetations into five parts: the middle one (10 meters) was for high-speed vehicles; the side ones (6 meters) next to the middle one were for low-speed vehicles such as jinrikisha; and the side ones (5 meters) near the edges were for pedestrians (Figure

[5] The evidence can be found in one of the policies of the government of the Republic of China called 'Nanjing shi Zhongshan Road liangpang kongdi xianqi jianzhu banfa' ('The strategy of constructions of the urban land along side the Zhongshan Road'), which was launched in 1947 (Resources from the Second Bureau of China Historical Archive in Nanjing, Volume 12(6), file no: 20815).

[6] Block patterns of the district are addressed in Chapter 7, while house types are addressed in Chapter 10.

6.10). The total length of the Northern Zhongshan Road, Zhongshan Road and the Eastern Zhongshan road was 12,002 meters, starting from Xiaguan area in the north, to the Zhongshan Gate in the east (Wang and Gao, 2002). Their layout initiated with the purpose of transporting the coffin of the president Sun Zhongshan to his mausoleum on Zhong Mountain. However, only the middle parts of the boulevards had been completed before the president's funeral in 1929 (Wang and Gao, 2002), which was 4 years later after his death.

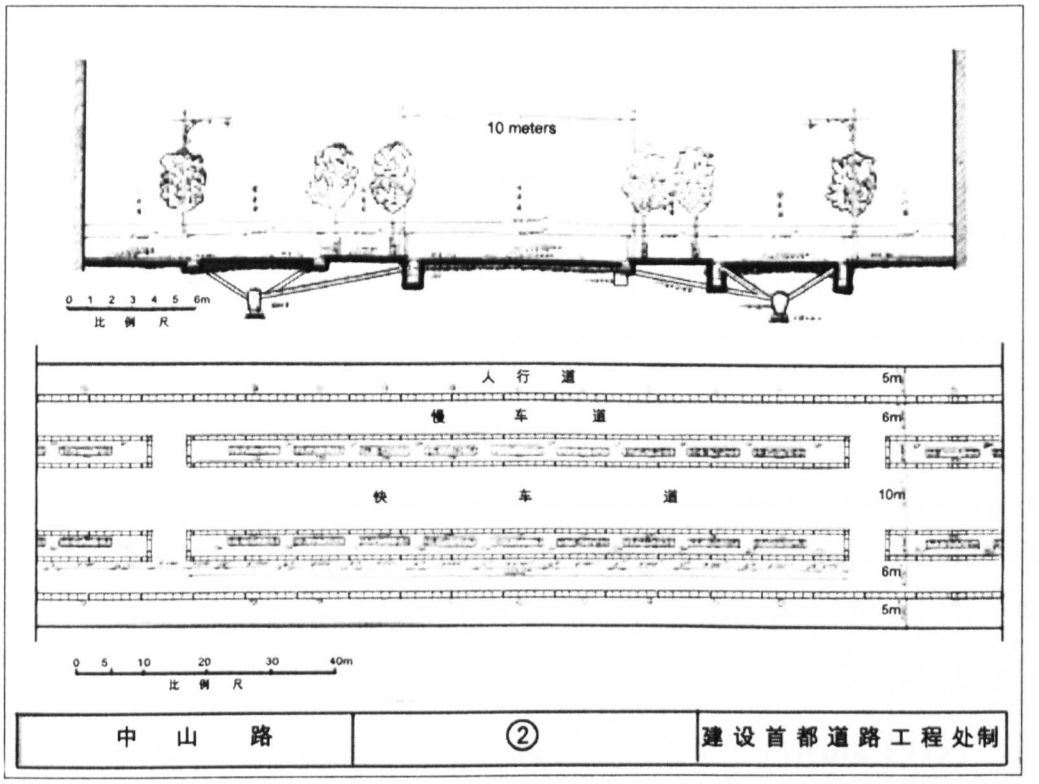


Figure 6.10 Proposed section and plan of the boulevards (Guodu Jihua chu 'The planning bureau of the government of Republic of China', 1929)

The three boulevards—Northern Zhongshan Road, Zhongshan Road and Eastern Zhongshan Road were built firstly in 1929, with two joint points: the Drum Tower square and the Xinjie Kou square. During the 1930s, the Southern Zhongshan Road was built as an extension of the Zhongshan Road and connecting the Zhonghua Road on the south. Other streets highlighted in Figure 6.9 were also widened and rebuilt based on previous streets.

Furthermore, according to the governmental regulation--'Nanjing shi Zhongshan Road liangpang kongdi xianqi jianzhu banfa, 1947' ('the strategy of constructions of the urban land along side the Zhongshan Road, 1947'), buildings alongside the boulevards were controlled. The regulation indicated that firstly all buildings should be parallel to the streets; secondly, buildings should be at least two stories high; thirdly, the height of the ground floor of all buildings should be the same, which was more than 4 meters, and the height of the first floor should be more than 3.6 meters; fourthly, the total height of buildings should not exceed the width of streets, otherwise they should be set back until the height equal to the width; fifthly, first floors should not overhang more than 1 meter to ground floors and etc (The Government of the Republic of China, 1947). It can be seen that the width/height ratio of the boulevards was deliberately controlled within 1, and the height of floors was identical. The strategy is doubtable to be sufficient to create a continuous or aesthetic streetscape, because building façades were unmentioned and the total height of buildings was flexible.

In sum, during this period, the new types of street networks and the new type of boulevards have changed the city image from the traditional appearance in the rest of the city apart from the south. The previous types of networks and streets were remained in the south.

6.5 Streets & networks in the contemporary period (from 1949)

6.5.1 Street networks

The streets of Nanjing have been renewing and constructing since 1949. The total length of streets in the city in 1949 was 241 kilometres, and the total area was 1,890,000 square meters. In the first five years after the RPC founded, 70% of those streets were renewed or maintained (The editors committee of the gazetteers of Nanjing, 1986). Newly built streets before 1960 were Changle Road (1957), Eastern Beijing Road, Northern Taiping Road, Western Beijing Road and etc (Figure 6.11). New streets called Northern and Southern Daqiao Road (Bridge Road) were built in 1967 when the Great Bridge of Yangtze River was finished. The street construction

was disturbed and progressing slowly because of the national-wide Cultural Revolution during 1968 to 1978.

Figure 6.11 The street networks in the 1960s with newly built streets highlighted (by the author based on the city map of 1960 from the City Planning Bureau of Nanjing)

The first comprehensive city planning scheme in this period was launched in 1980, which planned a main street network of Nanjing based on the exiting grid network (type B): three north-south oriented streets and eight east-west oriented streets. The middle one of the three north-south oriented streets was the Zhongshan Road and Southern Zhongshan Road; the one in the west was the newly built Southern Daqiao Road and its extension—Huju road; and the one in the east was not built at that time. The eight east-west oriented streets were 2 kilometres' distance from each other. The second comprehensive city planning scheme was implemented in 1992, which added

two north-south oriented streets in the grid. As a result, the whole grid network was in the distance of about 2 kilometres. During 1999, new planning schemes proposed a circular highway network surrounding the city (Figure 6.12) and six underground lines in the city. At the present, the highway network is working very well, while one underground line has been finished by 2008.

Figure 6.12 Street networks at the present including the highways (the map is from the City Planning Bureau of Nanjing, 2008)

Apart from the main street network, previous networks of the type A, C and D have been maintained and improved. An urban research group from the University of Nanjing suggests that the density of the grid network should be increased to release the current transportation pressure in the old city (The research group of Nanjing's city characteristics of the Architectural Institute of the University of Nanjing, 2006). Some other scholars such as Zhu (2002) recommended that public transportation and bicycles are sustainable transport means for the old city, and should be encouraged by the government. Their ideas are worth considering. The detailed ways of adopting these ideas in respect of the typomorphological characteristics of street networks of the city are addressed in Chapter 11.

6.5.2 Streets

The boulevards built in the modern period become the most important streets in the contemporary city because of their central locations and well-designed layout. The other main streets in the city built in this period are following the layout of boulevards, which consist of five parts. Some of the streets are also divided by trees. The boulevard type has not changed so much in the later renewal and maintenance, and the pine trees are conserved very well, which greatly contribute to the identity of the city (Tang, 2006). Since high-speed vehicles are greatly demanded nowadays, the width of the original lanes for low-speed vehicles is decreased and the lanes are used for bicycles and sometimes for buses in rush hours (Figure 6.13).

Buildings alongside the boulevards have changed dramatically, and high-rise buildings are the majority at present, because the value of the land is increasing rapidly. All those high-rise buildings are modern or high-tech-looking, which have changed the streetscape of the boulevards (Figure 6.14, 6.15). Nowadays, a number of land plots beside the boulevards such as the Eastern Zhongshan Road and the Zhongshan Road are under construction, and voluminous buildings are gradually replacing the original small buildings and obstructing buildings inside urban blocks from being seen (Figure 6.16, 6.17). Furthermore, new buildings are not maintained to be visually harmonious with the existing buildings. The phenomenon has negative impact on historical buildings inside blocks in the south part of the city.

Another type of contemporary streets has emerged, which appears in the rest of the streets apart from the boulevards. This type (type d) of streets is 18 to 40 meters, and has three parts, which are the central lane for vehicles and two side lanes for pedestrians. Streets of this type are divided by fences or trees. Heights and façades of buildings along the streets of this type are various (Figure 6.18, 6.19). Ten main streets[7] in the city are in this type, which are 34.1 kilometres long in total, while 28

[7] Main streets (40 meters wide) and Secondary streets (30 meters wide) are defined by widths in the government's urban planning policies, which is further explained in Chapter 11.

secondary streets are in this type, which are 40.58 kilometres long in total by 1985 (The editors committee of the gazetteers of Nanjing, 1986).

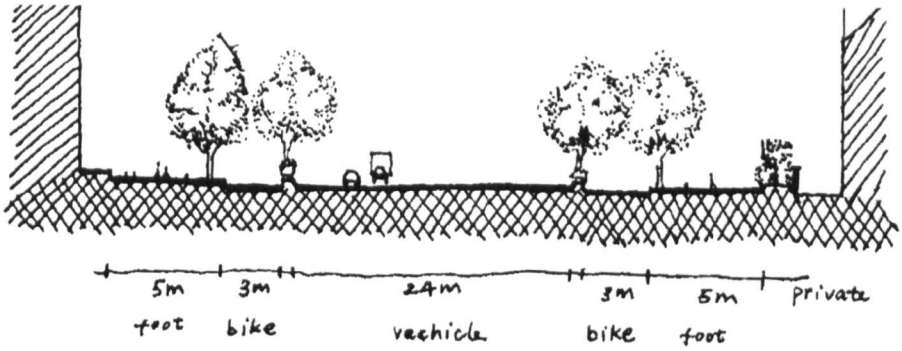


Figure 6.13 The layout of the boulevards in the contemporary period (by the author)

Figure 6.14 Streetscape of the Eastern Zhongshan Road (Photography by the author, left)
Figure 6.15 Street overview of the Zhongshan Road (photography by the author, right)

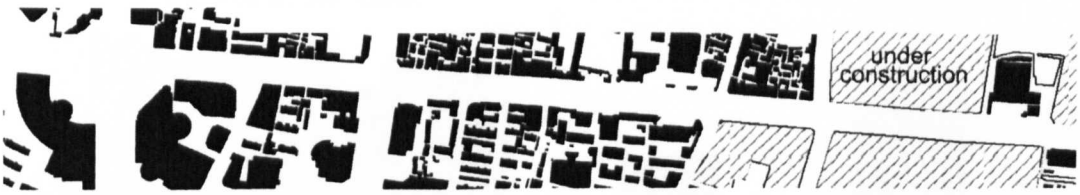


Figure 6.16 Building plans alongside the Eastern Zhongshan Road (by the author based on the city map (2007) from the City Planning Bureau of Nanjing)

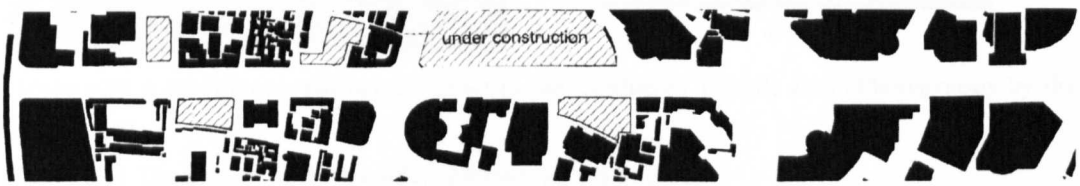


Figure 6.17 Building plans alongside the Zhongshan Road (by the author based on the city map (2007) from the City Planning Bureau of Nanjing)

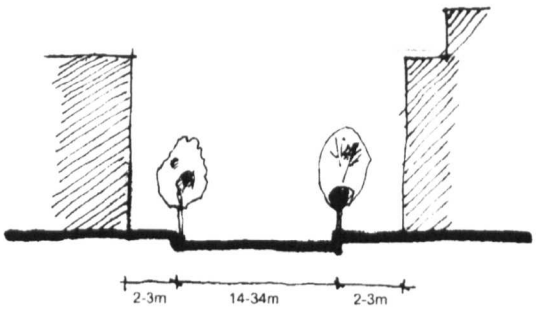


Figure 6.18 The section of the type d of streets (by the author, left)

Figure 6.19 The streetscape of Eastern Meiyuan Road which is in type d (Photography by the author, right)

The traditional type of streets in commercial areas in the south city still exists, even though buildings alongside those streets have been completely replaced, some of which use historical building types. For instance, the Confucian Temple area (Figure 6.20) is a typical traditional commercial district in the south of the city. The traditional type of Guan Jies can be found in those streets of the district, which is preserved as a pure pedestrian zone. The width of this type is about 10 to 18 meters, while the width/height ratio is 1. The first floors usually overhang the ground floor with balconies or temporal structures such as flags (Figure 6.21). The traditional type of streets in residential area has also been maintained because traditional buildings have been preserved in the south.

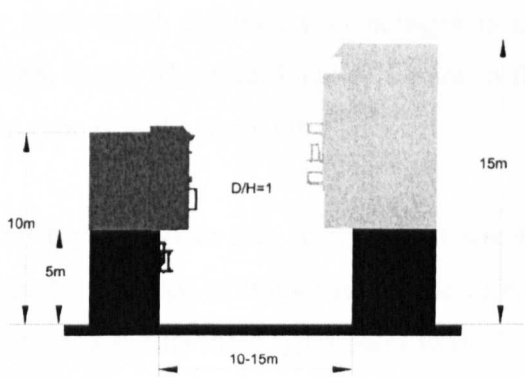


Figure 6.20 A traditional commercial street in the Confucian Temple area (Photography by the author, left)

Figure 6.21 The section of the traditional street (by the author)

In sum, the contemporary grid street network is based on the previous north-south oriented grid system, while other previous street networks have been improved and preserved in this period. The layout of the boulevard type of streets has slightly changed to adapt to the high demand of vehicles at present. A new type of streets which has three parts appears in a large number of contemporary streets. The traditional types of commercial streets and residential streets also exist and function well in the south of the city in this period.

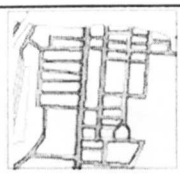
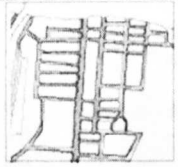
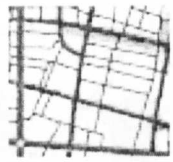
6.6 Conclusion

Through the examination of the transformation process of the street networks and streets in Nanjing in a chronological order, there are four types of street networks and four types of streets in the city at the present. (1) The four types of street networks are the *street network responding to the topography*, the *north-south oriented grid network*, the *boulevard system* and the *geometric grid network* (Table 6.1). The first two dates back to the historical period, and their typological processes are very slow. The second type has been inherited in the last period to form a comprehensive network in Nanjing. The third type dates to the modern period, and its layout and surrounding buildings have changed to adapt to new needs. The fourth type also dates to the modern period, and it has been preserved as a historical site at present. All the four types of street networks are continuous in the entire process of the transformation of the city. The current street system in Nanjing is a combination of the four types of networks, in which *the north-south oriented grid network* is the main one. Other three types exist in different areas. The traditional types are in the south and east of the city, while the modern type is in the north city.

(2) The four street types are the traditional type of Guan Jies (commercial streets, type a), the traditional residential type (type b), the type of boulevards (type c) and the new contemporary type (type d) (Table 6.2). The first three types dates to the first two periods, and they have been experiencing typological transformation. The typological processes of the three types are clearly observed, in which the process for boulevards is faster than the others. In such process, economic forces are the main driving power, and political forces help to resist the changes in order to keep the

distinctive city image made from the streetscape of the boulevards, for instance, trees have been preserved and replanted when the central part of the streets have been expended due to the increasing vehicular demanding. Furthermore, the changes of the first type lie in its surrounding buildings, while the traditional residential type is the most stable one. Different types of streets are in relevant types of street networks, and are also in different areas of the city.

The characteristics of the four types of street networks and streets should be reflected in new design since they co-exist in the city and in different areas. Traditional types greatly benefit the identity and image of the city. Their possible application in new street design is interpreted in Chapter 11.

Types of Street networks			
	First Period	**Second Period**	**Third Period**
Type A	Street networks responding to the topography; streets were dense; consists of street type b.	maintained	maintained
			
Type B	North-south oriented grid network; streets were dense; consists of street type a and d.	Maintained	North-south oriented grid network; imprecise; streets were in 2 kilometres distance; the main street network in Nanjing
			
Type	None	Boulevard system; the	maintained

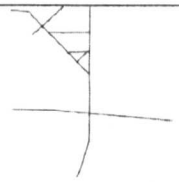
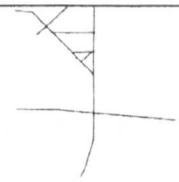
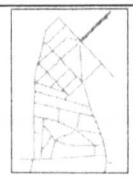
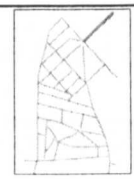
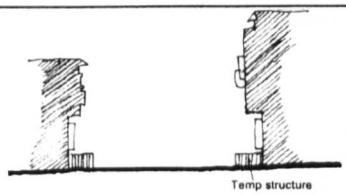
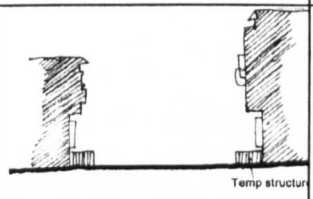
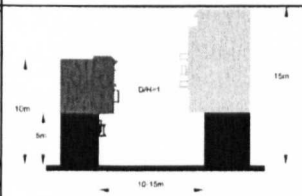
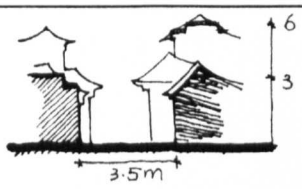
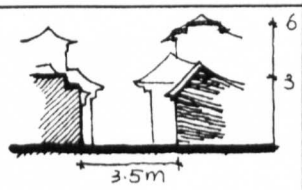
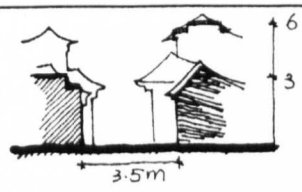
		axial streets; consists of street type c.	
C	None		
	None	Geometric grid network; consists of street type d.	maintained
Type D	None		

Table 6.1 Characteristics and typological processes of the types of street networks in the three periods (by the author)

	Types of Streets		
	First Period	**Second Period**	**Third Period**
Type a	The width was 16.6 meters; porches alongside; surrounded by commercial buildings with temporal structure; W/H• 1.	maintained	The width is 10 to 18 meters; surrounded by commercial two-story buildings; W/H• 1.
			
Type b	The width was 3 to 6 meters; surrounded by one or two stories buildings; street lines were not straight, W/H• 1.	Maintained	Maintained
			

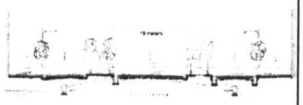
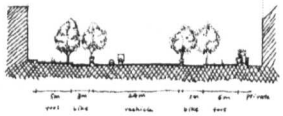
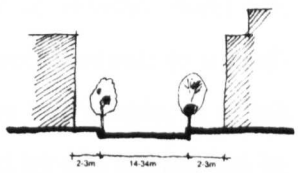
Type c	None	The width was 40 meters: it had five lanes, and the central one was 10 meters; divided by pine trees; surrounded by two-story buildings; 4>W/H>1	The width is 40 meters; five lanes; the central lane is 24 meters; divided by pine trees; surrounded by high-rises; W/H<1
			
Type d	None	None	The width is 20 to 40 meters; three lanes; the central one is 14-34 meters; W/H is various.
	None	None	

Table 6.2 Characteristics and typological processes of the types of streets in the three periods (by the author)

CHAPTER 7 URBAN BLOCKS AND PLOTS OF NANJING

7.1 Introduction

Urban blocks are the superior spatial organisation of a typical classic European city (Paneral et al., 2004). An urban block consists of 'exterior facades facing streets, solid buildings and interior courtyards' (Castex, 1979, p89). The definition of urban blocks in urban morphology is that it is 'within the town plan unoccupied by streets and bounded wholly or partly by street-lines'; it includes a plot series which is 'a row of plots, placed contiguously alone the same street-line, each with its own frontage'(Conzen, 1969, p5). The definition of 'plot' is 'a parcel of land representing a land-use unit defined by boundaries on the ground' (Conzen, 1969, p128). According to the definition, an urban block is bounded by a continuous street line and contains a group of plots. Conzen's definition of a plot which equals to a land-use unit is not clear, because one land-use unit can be owned by two people, in which case the unit should be separated. Similarly, a land unit owned by one person can be used for several functions. Caniggia's definition of a plot (lot) is more convincing that a plot includes the 'built-up area together with the non-built-up pertinent area'—the area annexed to the building (Caniggia and Maffei, 2001, p125). For Caniggia, urban blocks are a 'module of urban aggregate', and they are formed through progressive building activities along matrix routes (Caniggia and Maffei, 2001, p133-4). He claims that routes are the genesis of urban development, while urban blocks are the consequence.

The study of urban blocks was a long-ignored realm and in-between of architecture and city until the second half of the 20th century. Together with plots, urban blocks are targeted not only in urban form study, but also in other related urban study, for instance, Castex's (1979) read the city of Versailles through its blocks, the Krier brothers' (1979) emphasised the sizes and enclosure of urban blocks, Jacobs' (1961) proposed to control block size to activate the city (refer to Chapter 3).

The typomorphological study of urban blocks in this chapter focuses on the physical profile of them, such as the height, length, orientation, proportion and density, as well as the arrangement of them and their plots. Types of plots are defined similarly. The spatial structure of their arrangement can be shown in accessibility analysis. The land utilisation of urban blocks and plots is briefly mentioned to explain their formation and transformation process.

In this chapter, the Chinese context in relation to urban blocks is introduced firstly, because it is the cultural soil that Chinese urban blocks grounded. The urban blocks of Nanjing is illustrated in the same chronological sequences as the other city elements examined before: the historical period (--1860s), the modern period (1860s-1949) and the contemporary period (1949—present). In relation to the general examination of the development of city in Chapter 4, urban areas in Nanjing have been developed as different morphological regions in different periods of history, which allows several samples of urban blocks in their morphological regions to represent the characteristics of other urban blocks of the region in that period. A general examination of a morphological region is conducted, and examples of each type of urban blocks are analysed in detail. Type and typological processes of the urban blocks of Nanjing are summarised at the end in order to be used for design suggestions in Chapter 11.

7.2 The Chinese context

Two basic concepts or policies in the feudal Chinese society fundamentally influenced the form of urban blocks: one was the Lifang policy; the other was the zoning concept.

7.2.1 Lifang

The Lifang system was a way of organising urban residential quarters in feudal China, which derived from the conventional agrarian subdivision with military establishments in rural areas. The system embodied the Chinese cosmology that square was a basic shape for cities to reflect the shape of the earth. The Lifang system was officially formed in the Chunqiu era (770-476 BC) during the Zhou Dynasty. Except palaces of emperors in the centre of a city, the rest of urban areas

were divided into a number of wards called Fang[1], while Li was a unit to calculate the number of families. One Li of families was usually located in one Fang. Therefore Lifang[2] became the conventional name of the subdivided lands, which equalled urban blocks because they were also bounded by public streets.

'Zhou Li' ('Ritual of Zhou Dynasty') recorded that one Li contained five Bi, while one Bi contained five families. During the Zhanguo era (475-221 BC), one Li contained seven Gui, while one Gui contained five households. Thus a Lifang contained 25 or 35 households at that time. During the North Wei Dynasty (386-534), a Lifang in its capital city—Luo Yang was 300 Bu (about 434 meters) in each side no matter how many households it contained. The city had 320 Lifangs (Zhuang and Zhang, 2002). The system was well developed during the Tang Dynasty (618-907). Tang's capital city Chang'an was divided into 110 Lifangs of different sizes: big Lifangs were 600 meters by 1100 meters, while small Lifangs were 520 meters by 510 meters (Tao and Zhu, 2005)(Figure 7.1), which were further divided by alleys into the similar grid pattern. Those Lifangs were extremely big compared to Lifangs in other cities, because less number of Lifangs was easier to be managed by the government (Zhuang and Zhang, 2002). From the Zhou Dynasty to later dynasties, the sizes of Lifang were increasing.

A Lifang was either rectangular or square, which was walled with only one gate on each side open to streets. The gate was closed in nights and guarded by governmental officers, who were selected from the inhabitants of the Lifang. Ordinary people were restricted in specific Lifangs and the severe control was applied to them. Only houses of people of the noble class were directly accessed from alleys by establishing private gates on the walls of Lifangs. Such system was built to facilitate the

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[1] Fang was named since the Sui Dynasty (581—618 AD). The divided urban lands for residential use in Chinese cities were called Li before that time PAN, G. (2001) *Zhongguo jianzhu shi (The history of Chinese architecture),* Nanjing, Zhongguo Jianzhu Gongye Press (China Industry Construction Press).

[2] Lifang is also called Fangli in literature. Both of them mean this special residential organisation system in feudal China.

government's management of urban population for census count, recruiting people for state military and other labour services (Huo and Gu, 2005, Brill, 1994).

Since the North Song Dynasty (960-1127), the walls of Lifangs were broken down because of the rapid economic bloom. As a result, streets were used for trading, and symbolic gates of Lifangs replaced real gates. However, all the other characteristics such as the shape, size, density and arrangement were maintained in developed Lifangs (post-Lifangs) as a common residential organisation system in traditional China. The system more or less influenced urban blocks of almost all big Chinese cities, such as Luoyang, Datong, Pingyao, Nanjing, Beijing and etc.

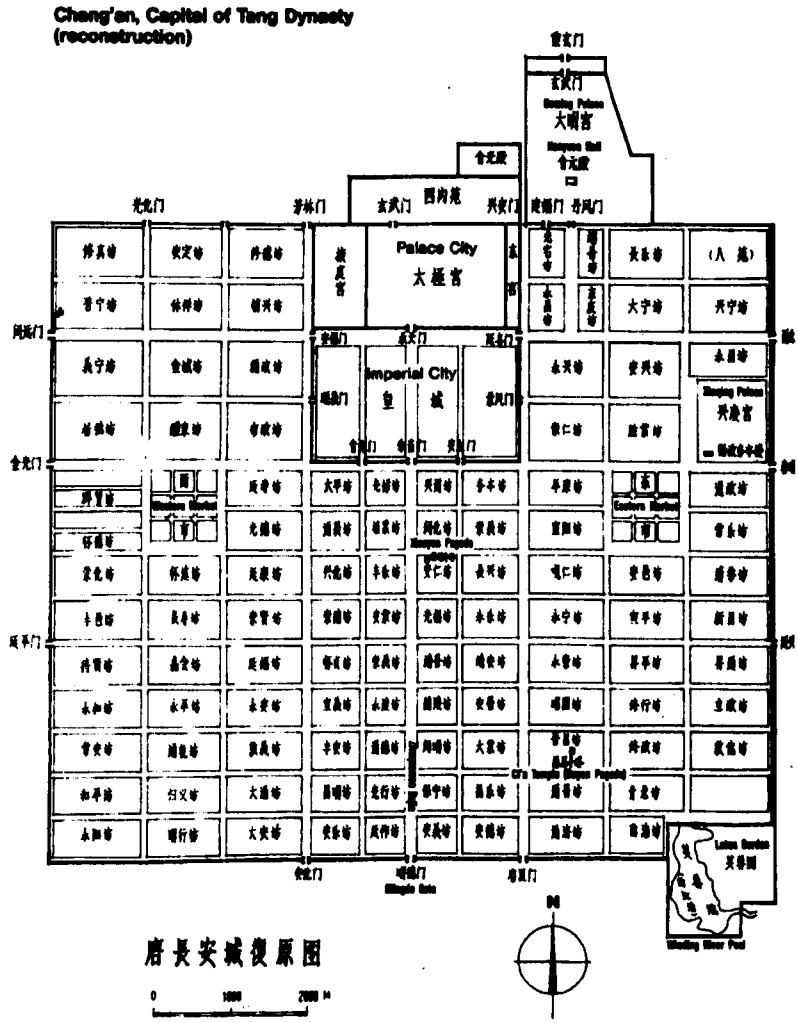

Figure 7.1 Lifangs in the capital city—Chang'an in the Tang Dynasty (Wu, 1985, p40)

7.2.2 Zoning

The segregation between noble and humble class, as well as between people with different occupations was another important concern in the feudal Chinese society. It was because the moral code (Confucianism and Li Zhi) promoted by the ruling class indicated that the separation between the social classes was essential for keeping good order in society. For instance, the aforementioned ideal city planning in ancient time showed that a city ought to be divided into a palace zone, common people's residential zone, noble's residential zone, market zone, and ceremonial zone. Furthermore, four kinds of people: warriors, farmers, workers and traders, could not mix together. Therefore, the concept of functional division existed in Chinese urban history for thousands of years.

The palace zone or administrative zone usually was the most important zone in a capital city or a provincial city. The zone was located in the centre or in the central north, and was rectangular, big, walled and symmetrical along a north-south oriented axis. The zone normally occupied several urban blocks, and consisted of sequences of buildings and imperial gardens. The market zone was located either on the north of the palace zone or on its south, but separated from Lifangs. The noble class's residential zone and ceremonial zone were normally near the palace zone, which also covered several urban blocks.

Despite the Lifang system and zoning concept were powerful in the traditional Chinese city planning, different Chinese cities appeared different forms because of other factors such as topography limitation, economic conditions and emperors' preferences. The complexity can be seen from the urban blocks of Nanjing.

7.3 Urban blocks in the historical period (--1860s)

7.3.1 General examination

The development of built-up areas in Nanjing during this period has been reviewed in Chapter 4. The built-up areas before the Ming Dynasty concentrated in the Qinghuai Rive valley on the south part of the city. Therefore, well developed and completed urban blocks and plots existed in the south part of the city which could be

considered as a morphological region representing the characteristics of urban blocks in the historical period.

Within the south region, an area bounded by the Jianye Road and Baixia Road on the north and Qinghuai River on the south (study area A) is selected by the author (Figure 7.2).This area was the residential and commercial mixed zone in the Ming Dynasty. Blocks were well defined by street-lines, and plot series were recognisable in the map dated from the Qing Dynasty. Furthermore, urban blocks in the Eastern Gate area[3] and the Chaotian Palace area[4] are further selected to be examples of different block types in this period, which are examined in detail.

By measuring the sizes, areas and proportions of these blocks in the study area A, the research showed that the most common size of blocks in the area was 25,000 square meters, which was of 42.3% of the total blocks. And the second largest percentage of the blocks of which sizes were around 36,000 square meters was 23.1%. The smallest block was 110 meters by 52 meters, and the biggest one was 720 meters by 460 meters, the area of which was 25 times of that of the smallest one. A common width/length ratio was one, but the ratio of some blocks near the river such as Block 15 was nearly 9. Hence various sizes and shapes of blocks mixed together in the area A.

The plot arrangements in Block 6, 10 and 52 as examples were shown in Figure 7.2. The arrangement showed the priority of accessibility. Plots inside the blocks were built later than plots along the sides. And the shapes of plots were adjustable according to the sites. Furthermore, the plot in Block 10, which presumably accommodated a big family house, is in the east of the block that was naturally divided by the river.

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[3] Location of the Eastern Gate area is marked in Figure 7.2. It is on the southeast of the Qinghuai River and bounded by the southern city wall.

[4] Location of the Chaotian Palace area is marker in Figure 7.2. It is on the northwest of the study area A.

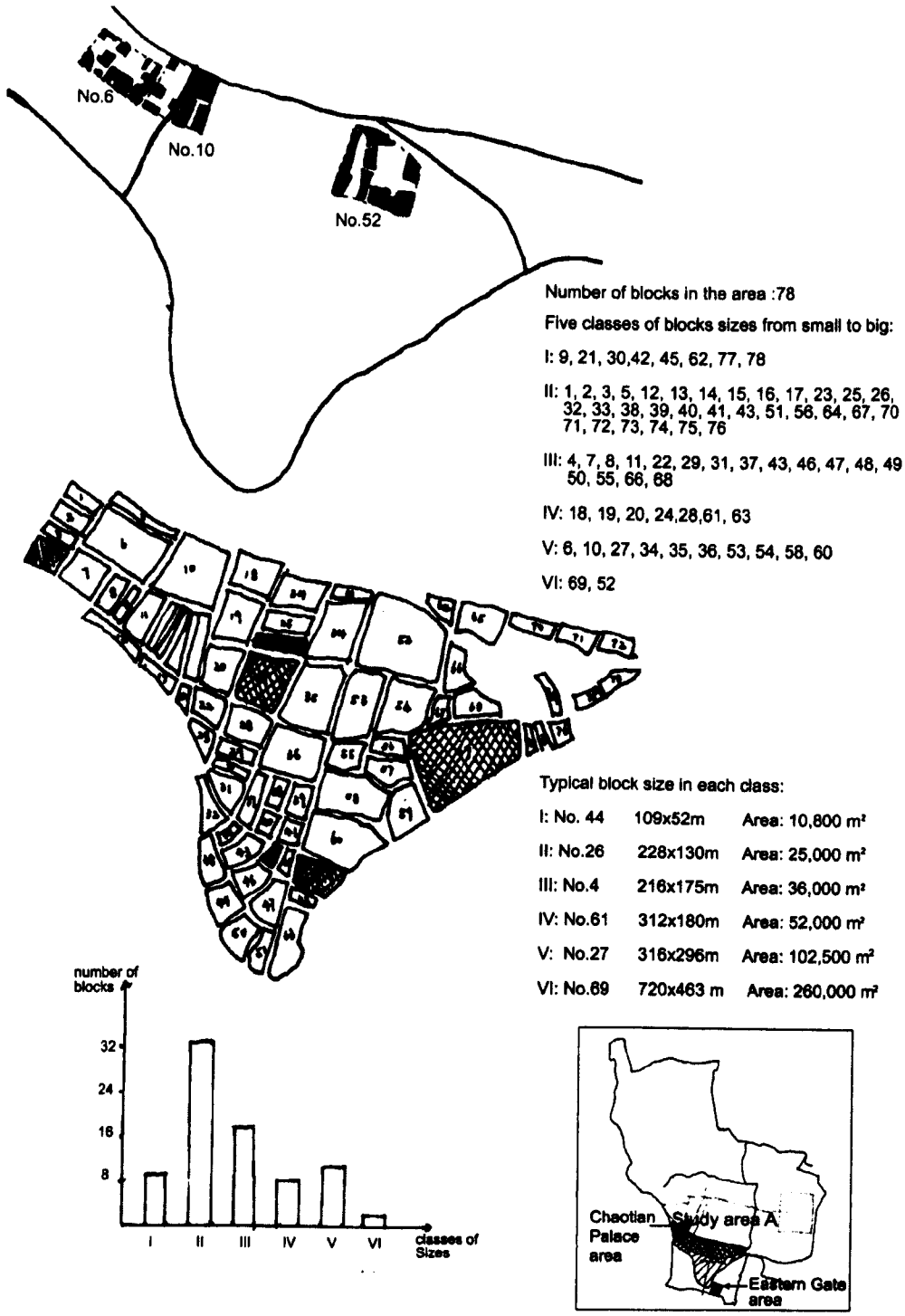

Figure 7.2 A general analysis of the area A and the locations of the selected examples (by the author)

The general examination indicated that although the Lifang system and the zoning concept largely influenced the block form of traditional Chinese cities, the situation

of Nanjing was special. There were three reasons. Firstly, the ruling class of the Ming Dynasty was tolerant about the city's arrangement and encouraged commercial activities rather than merely agriculture. Secondly the commercial germination appeared in Nanjing slightly earlier than the majority of other cities due to the convenient river transportation, which had facilitated the emergence of perimeter development in these blocks. Thirdly, the topographical force in Nanjing was prior to the conventional south-north orientation of blocks, thus urban blocks were not always regular, but suitable to the landform.

7.3.2 Examples

As the capital city of several dynasties, Nanjing has palaces such as the Chaotian Palace, Ming Palace and Presidential Palace in history, which can be regarded as a special block type due to their distinctive physical features. Despite the topographical limitation caused by Qinghuai River, the Lifang system has affected the residential blocks of Nanjing. Such impact can be observed in those residential blocks where the typographical limitation is unremarkable, for instance, the Eastern Gate area.

7.3.2.1 Chaotian Palace (the special block type)

Chaotian Palace was firstly built by the emperor Fu Chai in 586 BC (Zhuang and Zhang, 2002, Zhang, 1998), which was surrounded by Jianye Road on the south, Ye mountain on the north, Mochou Road on the west and Wangfu Great Street on the east. Since it was built along with the first city 'Ye' in Nanjing area, its names and functions have changed six times in later dynasties. It was used as a palace or a Taoist temple. During the Ming Dynasty, it was rebuilt as a ritual education and practice place serving for the ruling class (Zhang, 1998).

The existing palace is a reconstruction in the Qing Dynasty after wars. It originally consisted of sequences of grand buildings along three clear axes, in which the middle ones were the Confucian temple, the west ones were the temple and ceremonial hall of Bian[5], and the east ones were the Jiangning mansion, which were demolished in the 1940s (Figure 7.3). Buildings formed several large courtyards and were

[5] Bian was a famous general in the Eastern Jin Dynasty.

symmetrical along the axes. The northern mountain—Ye mountain gives those buildings a upward trend from the south to the north, which enhances their visual impact of stability and dignity. The palace occupies the entire urban block, and walled, which has no interacting with its surroundings. The block is large and low dense.

Figure 7.3 Chaotian Palace (Jiangsu sheng cehui ju (The mapping bureau of Jiangsu Province), 2005, p108)

7.3.2.2 Eastern Gate area (the post-Lifang block type)

The existing houses in the Eastern Gate area (Meng Dong) were mostly built in the Ming and Qing dynasties (Guo, 2005). The area was used for military purpose in the late Qing Dynasty due to its close location to the city wall. Because of Qinghuai River, the grey-marked block (Figure 7.4) is irregular, while the others were arranged in grid pattern that is similar to Lifangs. Traditional courtyard houses and small houses largely exist in the area, despite some contemporary buildings are constructed to renew some of the blocks (Figure 7.4).

The block sizes are various, among which the comparatively regular shape block is 158.7 meters by 89 meters (14124.3 square meters). And a typical plot size is 6 to 10 meters by 32.5 meters, narrow and long against the main streets. Plots are approximately north-south oriented. However, plots near the Qinghuai River of the grey-marked blocks orient according to the river. Plots are arranged one by one in the same orientation along streets with accesses from front and back alleys or streets.

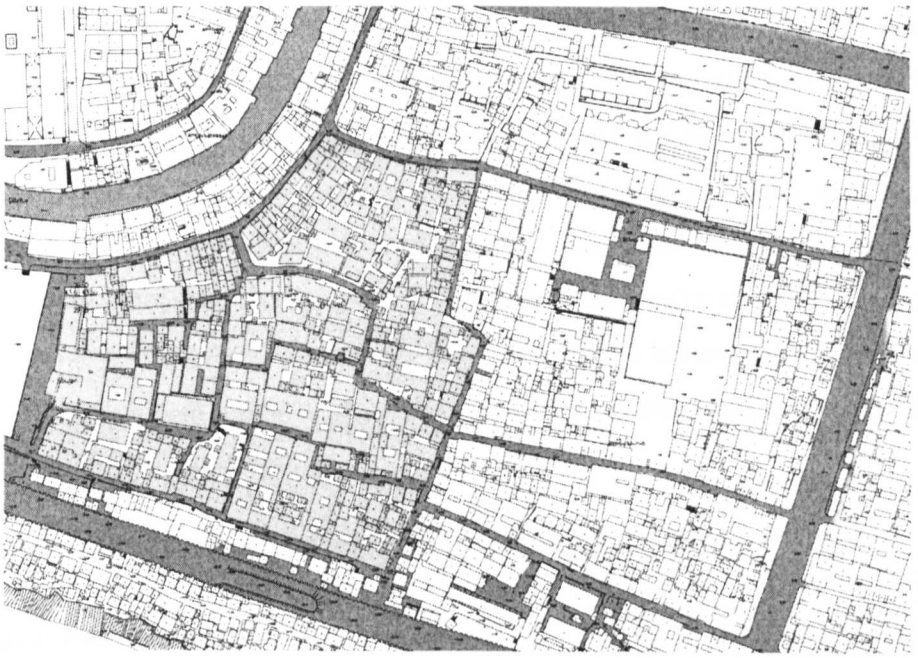

Figure 7.4 urban blocks in the Eastern Gate area in 2000 (resource from The City Planning Bureau of Nanjing, 2000)

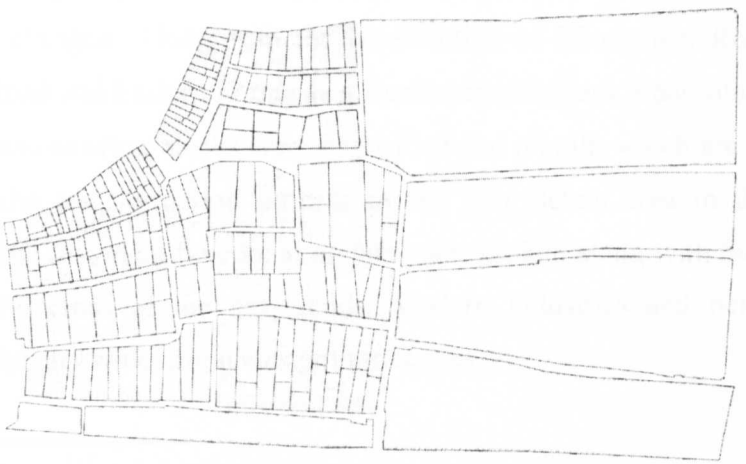

Figure 7.5 Simulated model of the block pattern with plot pattern in the grey-marked block of the Eastern Gate area in the historical period (by the author)

Figure 7.5 is a simulated model of the plot pattern in the historical period, which is based on the current plot pattern[6] in the grey-marked block. The government of Ming encouraged people to build their own houses using the courtyard house type[7] (Tang, 2003). Those houses, which are addressed in Chapter 10, determined the plot pattern in this period.

In sum, there were three types of urban blocks in this period: the special block type, residential block type and ordinary block type. The special block type was relatively independent, walled, symmetrical along north-south axes, big and low dense. It only had one plot, which coincided with the block boundaries. The residential block type and the ordinary block type were small, rectangular or square, mostly in grid pattern but adapted to the topography in certain area, and high dense. The differences between them were that, firstly, plots in the residential blocks were arranged one by one in the same orientation along street-lines, while plots in the ordinary blocks were arranged along the perimeters; secondly, residential plots were long and narrow, while ordinary plots were shorter.

7.4 Urban blocks in the modern period (1860s-1949)

7.4.1 General examination

As indicated in the previous chapters, the 'Capital City Planning Scheme' ('Shoudu Jihua') was partly implemented since 1929. Hence the urban form of Nanjing has dramatically changed. Along with the construction of Zhongshan Road, Northern Zhongshan Road and Eastern Zhongshan Road, some modern urban blocks emerged, and some of the existing blocks were intensified and rebuilt, which are shown in the example of the transformation process of the Xin Jiekou area in the following paragraphs. The historical functional division was broken along with the city's CBD moving to the cross of the new roads. Modern industries and neighbourhoods appeared in the city with strong western influences.

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[6] The transformation of the block and plot patterns in this area in the contemporary period is further mentioned in later paragraphs of this chapter.

[7] The detailed regulation of building houses in the Ming Dynasty is in Chapter 10.

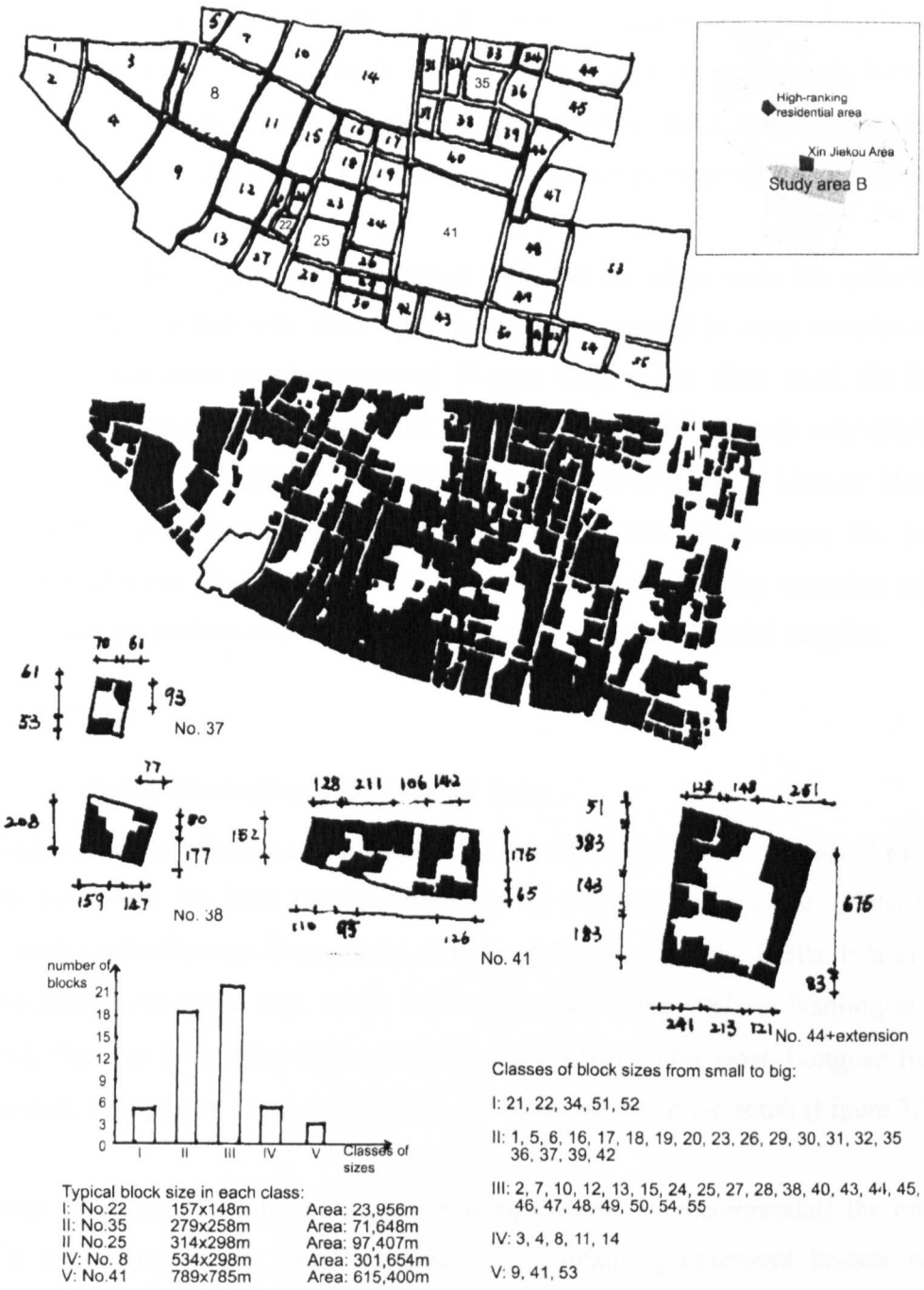

Figure 7.6 A general analysis of the area B and the locations of the selected examples in this period (by the author)

The same measurement and examination have been applied to newly built blocks between the Eastern Zhongshan Road on the north and the Jianye and Baixia Road on the south (study area B, Figure 7.6). The area is regarded as a morphological

region which represents the characteristics of urban blocks in this period. There were 54 blocks in the district, which were classified into five categories according to their sizes. The research indicated that the most common sizes were averagely between 71,000 square meters and 97,000 square meters, which were almost three times bigger than historic ones. Besides, the shapes of blocks were squarer than before.

The centres of the largest blocks were not built, but the edges were occupied with scattered plots. The perimeter development could be observed in some samples, and their dimensions were clearly measured (Figure 7.6). At the plots level, the back lines were extremely irregular. As a result, negative semi-public spaces were created. This characteristic was remarkably different from that of plots in historic blocks, which were regular and well defined. This was presumably because the basic component of those plots was no longer courtyard houses. The fully occupied edges and the sharp proportion of each plot were to enhance the commercial benefits.

7.4.2 Examples

7.4.2.1 Xin Jiekou blocks (the ordinary block type)

Xin Jiekou area is selected as an example of the urban blocks in this period by the author, because it has been mostly formed along with the construction of the two main boulevards--Eastern Zhong Road and Zhongshan Road in the 1930s. It is in the geometrical centre of the city, which is the most flourishing CBD in Nanjing at the present. The area is bounded by the Great Wangfu Street on the west, Longpan Road on the east, Changjiang Road on the north and Hubu Street on the south (Figure 7.7).

The area firstly had been built during the Ming Dynasty to accommodate the noble class's residences, where large scattered plots containing courtyard houses with gardens were distributed near streets. Well-defined urban blocks had not been completed. Later on, it had been rapidly developed as a commercial area from the Qing Dynasty, especially after the two boulevards had been constructed in the modern period. Functional changes within the area lead to the remarkable morphological change.

Figure 7.7 The chronological transformation of the urban blocks in Xin Jiekou area (by the author based on the chronological maps of Nanjing)

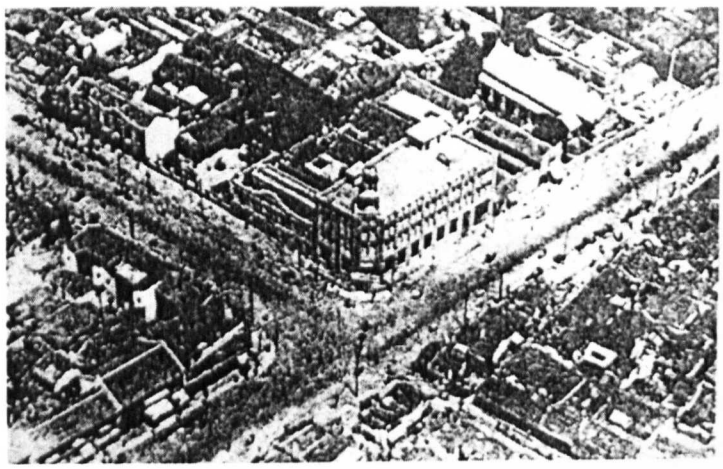

Figure 7.8 Xin Jiekou area in the period of the Republic of China (Yang, 1993, p17)

During this period, the growth of the area was almost horizontal. In Figure 7.7, demolished, newly built and reconstructed blocks are marked with different hatches

in a chronological order. Before the era of the Republic of China, streets were ill-defined by plots, which were arranged irregularly. During the 1920s, large amount of built-up plots emerged to fill the space in-between the previous plots. As a result, edges of blocks were defined by buildings and density of them was increasing in the 1930s. However, the inner spaces within big blocks were still left over. In order to give way to the new boulevards, the previous blocks and plots near the boulevards were largely demolished and reconstructed. New modern buildings occupying big plots emerged along the new street-lines. Figure 7.8 shows the image of the area in the 1930s. As mentioned before, the government of the Republic of China announced specific regulations for constructing new buildings alone the streets in a short period of time[8]. Therefore, those urban blocks have been developed along the perimeters first, and filled in later. Even though the height of the front buildings was controlled, their plot sizes were bigger than before and shapes were various.

7.4.2.2 High-ranking residential area (the residential block type)

In the 'Capital City Planning Scheme', there were three ranges of residential districts in Nanjing (refer to Chapter 10). The high-ranking residential area was built near the Xikang Road and Jiangsu Road. With the infiltration of western culture and planning concepts, the traditional courtyard house type was no longer the dominative house type in this stage. As an alternative, western house type decorated with Chinese details (for instance the pitch roof) emerged. The government's fantasy for advanced modern life facilitated the superficial imitation of European house models, and European neighbourhoods (Figure 7.9).

Figure 7.10 showed the block and plot patterns, which was divided extremely geometrically, and not north-south oriented. A typical plot size was 52 meters by 20 meters, and the plot boundaries were defined by fences or barriers. The shapes of both the blocks and plots were regular. The residential density was much lower than that in historical residential blocks. Streets within the neighbourhood were comparatively wide to accommodate motor vehicles.

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[8] The regulation for controlling the appearance of buildings along the new boulevards refers to Chapter 6.

Figure 7.9 The overview of the high-ranking residential area ((Jiangsu sheng cehui ju (The mapping bureau of Jiangsu Province), 2005, p79, left)

Figure 7.10 The block and plot patterns of the high-ranking residential area (by the author, right)

In sum, the general urban blocks in the modern period were much bigger than historical blocks, and the density was lower. There were two types of blocks which carried different characteristics. Based on the ordinary blocks in the historical period, the first one was perimeter development. It was diverse in shape and bigger than similar blocks in the previous period. The second one was the newly emerged modern high-ranking residential block type, of which the blocks were regular, low dense and arranged geometrically without north-south orientation.

7.5 Urban blocks in the contemporary period (from 1949)

7.5.1 General examination

After the Communist Party took over the country in 1949, Chinese cities have been developing more steadily than before. Urban blocks of the old city of Nanjing have been completely built in this period. Two new block types appeared along with the new socialistic political ideology and economic bloom—the Danwei block type and Juzhu Xiaoqu block type. Danwei blocks were 'the micro components of the morphological structure' of a city, which were the results of the socialistic planning in P.R. China in first three decades (Gu, 2002, p156). Juzhu Xiaoqu blocks emerged

as massive housing developments at large scales and in short period of time in order to fulfil the housing market during the contemporary period.

The term 'Danwei' means a company or a corporation of administration, education, or industry, which was generally owned by the state. Danwei blocks provided living/working environments under close Party supervision, by which, Mao hoped, 'a basic asceticism in living habits would be enforced and large-scale investments in urban infrastructure and housing would be avoided' (Friedmann, 2006, p443). Their physical form was usually walled and isolated, not only for security purpose of their inhabitants but also for creating a spirit of solidarity. Moreover, each Danwei had its own set of social services such as hospitals, schools, leisure centres and etc without sharing with even the neighbouring Danwei. Therefore, each Danwei block had mixed land use pattern, for instance, residential use, office use and recreational use. Furthermore, every Danwei was usually under the same socialist planning guidelines in the planning process which resulted in a standard layout. Being economic was pursued in building forms of Danwei blocks, thus their appearances were monotonous and crude (Gu, 2002).

The Danwei system had brought several social problems. Firstly, social services and facilities of each Danwei only served for the inhabitants of that one, as a result, those facilities were not only largely tatty and inefficient, but also a waste of resource. Secondly, Danwei blocks usually occupied large amount of urban land, and were isolated and independent, which caused lifeless urban spaces. Thirdly, the building and development of Danwei blocks had no concern about the urban environment but Danweis themselves, which brought unbalanced urban development and segregation. Finally, the development of Danweis completely ignored the existing city fabric including historical remains and cultural heritages (Wu, 1990).

After the Economic Reform in 1978, the ownership of most of the Danweis has gradually changed from state-owned to collective or individual-owned. Therefore, the morphology of Danweis has also been altered to be much smaller, open and marketilised, especially the individual-owned Danweis, which no longer keep their

previous forms. The way of housing provision also has changed from the state-provided housing to commodity housing (Porphyrios, 1984). However, some Danweis which accommodate government administration, military research and higher education still exist in the city of Nanjing at the present, which can be found in the morphological region C (Figure 7.11).

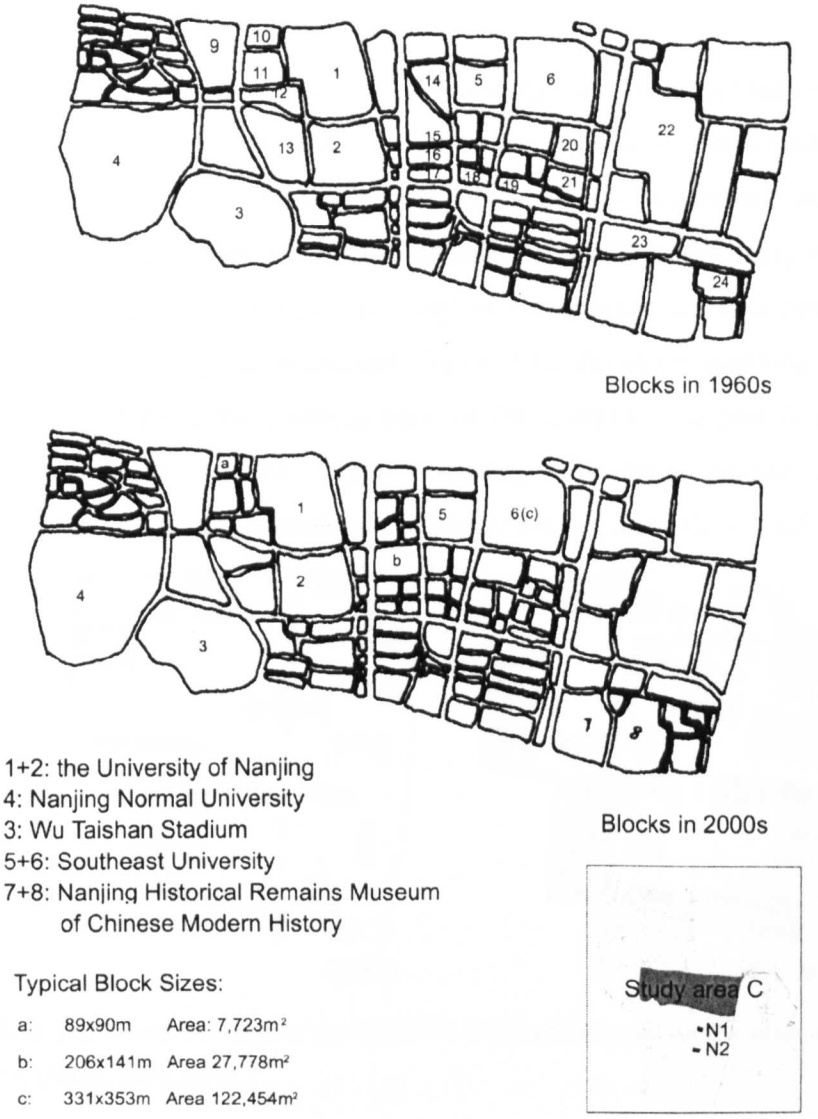


Figure 7.11 A General analysis of area C and the locations of the selected examples in this period (by the author)

The area C starts from the Drum Tower and the south bank of the Xuanwu Lake to the Eastern Zhongshan Road. The block sizes within the area clearly drop into two classes, of which the first one contains majority blocks which are even smaller (7,700

square meters) than the historical blocks, and the second one contains enormous blocks (122,000 square meters), which are Danweis, such as the block No. 1 to 8. The built-up density in those blocks is low.

7.5.2 Examples

7.5.2.1 The Danwei block type

The Southeast University (block no. 14, 5 and 6) was a typical Danwei in the early stage of this period. The first building in these blocks can be traced back to 1928, and the majority buildings of the university, which are for residential and educational uses, have been built after 1949. The characteristics of the university blocks remain as sizeable and gated nowadays. The original plot pattern has also been maintained despite building density has increased. Figure 7.12 shows the building pattern in the block No. 5, which is the teaching zone in the campus. The plot is gated, and its boundary coincides to the block boundary. Buildings inside are arranged geometrically with a clear central axis from the south gate to the central hall.

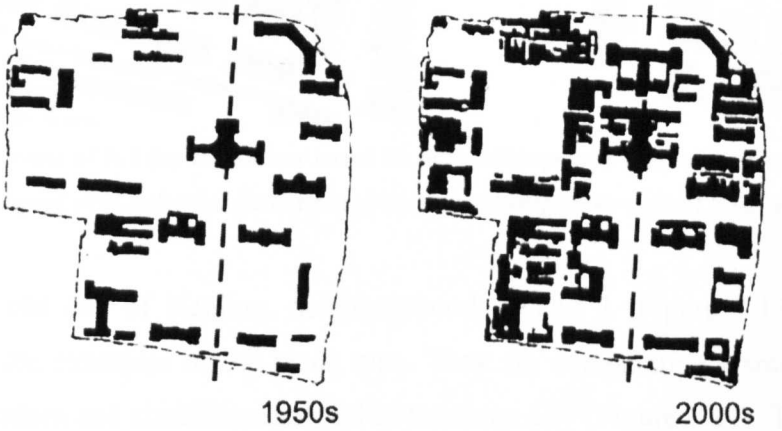


Figure 7.12 The layout and axis of the block No. 5 (adapted based on the map of the Southeast University (Yang, 1993, p57)

7.5.2.2 Juzhu Xiaoqu (the residential block type)

The newly emerged residential blocks are called 'Juzhu Xiaoqu', which is the basic residential component in the contemporary city. There are various dimensions of Juzhu Xiaoqu that can be classified into three categories as described in the government's bylaw: the first is Juzhu Qu (residential region); the second is Xiaoqu (residential district) and the third is Zutuan (residential groups) as sizes from big to

small[9]. As mentioned before, a Juzhu Xiaoqu is usually developed at large scale and in a short period of time as a massive housing development. Most of them are developed in the suburb where large land is available. The common plan of this block type is that a green park with playground or exercise facilities are placed in the centre, several standardised buildings are grouped geometrically, north-south oriented, and connected by hierarchical roads. Fences with gates and guardians are surrounded this type of blocks. Residential buildings in this type of blocks can be low-rise bar buildings, high-rise towers or villas, depends on the housing market.

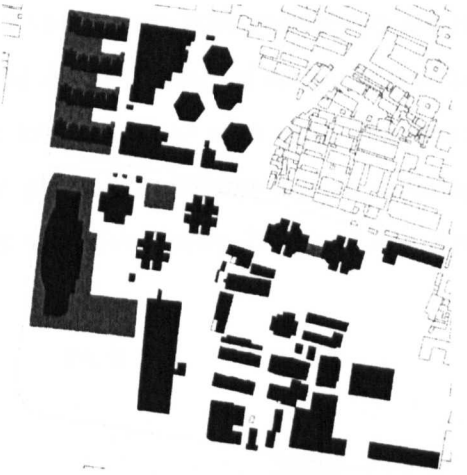


Figure 7.13 Layout of N.1 (by the author based on the contemporary map of Nanjing)
Figure 7.14 Layout of N.2 (by the author based on the contemporary map of Nanjing)

Within the old city of Nanjing, neighbourhoods 1 and 2 (Figure 7.13, 7.14) are selected as the examples of the block type. They are comparatively small, because the block pattern and sizes are restricted in the inner city (Figure 7.11). The selected block N.1 illustrates the building grouping before the 1980s. The block is located between the Western Youfu Street and the Huai Hai Road. Buildings inside are in a long and narrow rectangular shape, no more than seven stories, grouped in linear, grid, pinwheel and cluster patterns. The block N.2 is built in recent years, which is located between the Southern Hong Wu road and the Baixia Road. It has high-rise

[9] The three classes of sizes of Juzhu Xiaoqu is described in the latest version of the bylaw—'Criteria of Chinese Residence Construction, 2003'.

protruding boxes that are free-standing in the site, and high-rises near the perimeter of the block are connected with each other by commercial buildings at low levels.

Students of Nanjing University have recently conducted an investigation on the fence types of Juzhu Xiaoqu in Nanjing. The results reveal that there are two types of fences in the neighbourhoods of Nanjing: walls and balustrades, except for those edges defined by buildings directly. Furthermore, there are solid walls, carved walls, decorated walls and vegetations outside the walls in the first category. Ordinary balustrades, vegetations inside the balustrades, vegetations on the balustrades, vegetation outside the balustrades and complex vegetations with balustrades are in the second category. The study has also examined the percentage of each type among the whole Juzhu Xiaoqu blocks, as well as the total length of each type. The result and images are shown in Figure 7.15. Fences play an important role in defining streets, creating images and landscapes in today's Nanjing, since 71.5% of Xiao Qu blocks are enclosed by them.

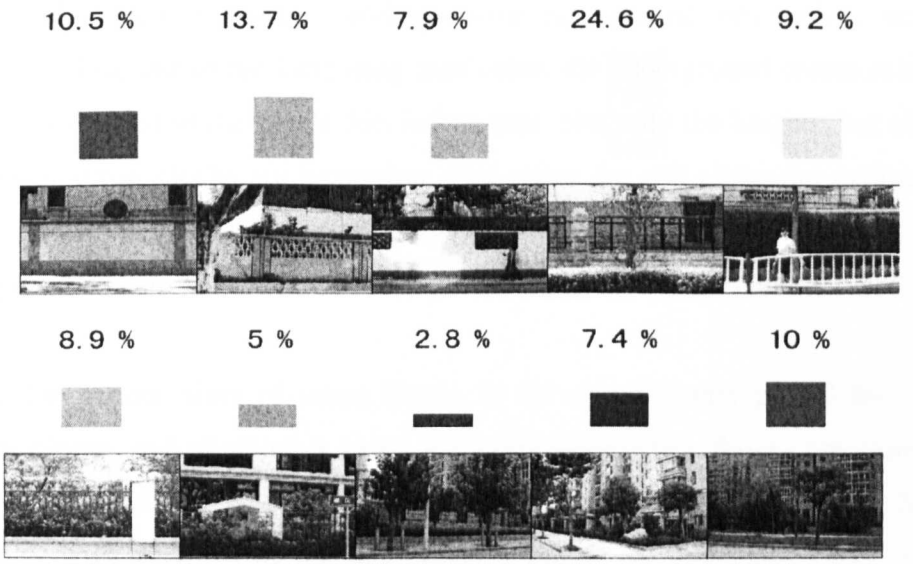


Figure 7.15 Different Types of Fences in the Neighbourhoods of Nanjing (Solid Wall, Carved Wall, Decorated Wall, Balustrade, Vegetation out of Wall, Vegetation in the Balustrade, Vegetation on the Balustrade, Vegetation out of the Balustrade, Complex, Others, in the order of left to right) (The research group of Nanjing's city characteristics of the Architectural Institute of the University of Nanjing, 2006, p171)

7.5.2.3 The development of the previous block types

During the contemporary period, the previous special blocks and the high-ranking residential blocks have been maintained as cultural and historical sites. The post-Lifang blocks and ordinary blocks have been experiencing constant changes. In the aforementioned example of the Eastern Gate blocks, the block pattern hasn't changed much, but the current plot pattern is extremely intricate because of the repeated reconstruction over time (Figure 7.4). Because of the increasing population in this period, additional shelters, extensions and temporal constructions emerged in every possible land of the area. In order to gain access for those later built structures, previous plots have split out in the east-west direction.

The transformation of the blocks of the Xin Jiekou area in this period is vertical compared to that in the second period, which was horizontal. Buildings marked as black in the map of the 2000s (Figure 7.7) are those newly built high-rises in the area, which are alongside the streets. Old low-rise residential buildings are located inside those blocks. New high-rise buildings have no specific orientation, and are voluminous. Because of the increasing land value, the underground commercial area has been developed in the whole Xin Jiekou area. Not only the heights, but also the densities of urban blocks are increasing. Plot series are still along the perimeter of blocks. However, plots sizes and shapes have changed. The same vertical development can also be observed in the Drum Tower area (Han, 1998).

In sum, the general sizes of urban blocks in the contemporary period fall to two different classes, one of which is small, while the other is big. Blocks are grouped in imprecise grid pattern. Two block types—Danwei block type and Juzhu Xiaoqu block type have emerged during this period. Both of the two block types are big, gated and north-south oriented, and they have geometrically arranged plots. The precious block types are either dramatically developed or preserved in this period.

7.6 Conclusion

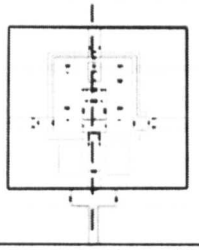
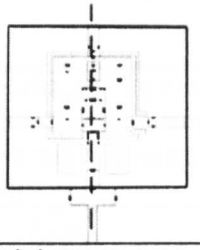
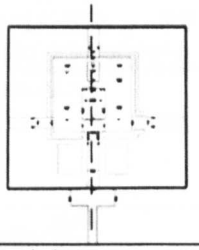
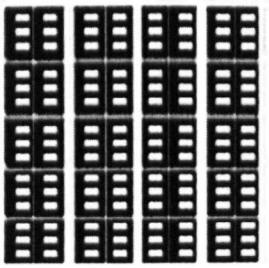
Through the examination of the transformation of the urban blocks and plots in Nanjing during the three periods, there are five types of urban blocks and

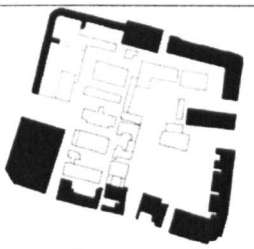
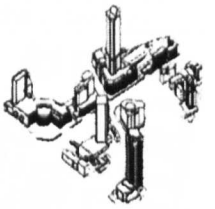
accordingly five types of plots in them. Three of the block types—special blocks, post-Lifang blocks and ordinary blocks have been formed in the historical period, while the high-ranking residential block type has emerged in the modern period, and the Danwei block type and Juzhu Xiaoqu residential block type have been found in the contemporary period (table 1). They appear very different characteristics in terms of physical properties and arrangement. Generally, (1) the historical blocks are small, and the modern blocks are bigger. The contemporary blocks become smaller than the historical ones, except those Danwei blocks and Juzhu Xiaoqu blocks.

Moreover, their typological processes are also distinctive and in different speeds (Table 7.1). (2) The special blocks have been preserved well over time, thus their features of enclosure, north-south orientation, regular shape, symmetrical and low dense remain the same. (3) The typological process of post-Lifang blocks is visible, which have changed from being enclosed to open, and from grid arrangement to less precise grid arrangement. The plot type has also changed from being long and narrow to shorter. (4) The typological process of the ordinary block type is the quickest one, because its blocks have been altered dramatically over time, for instance, the sizes, shapes, densities, height, plot pattern and buildings within them have changed, while only the arrangement of plots of them remains from the first period to the third period. This block type is the one receiving the most economic influences. (5) The modern high-ranking residential type is transforming slowly. (6) The contemporary Danwei blocks have changed from being enclosed to open, and the functions of them are also transformed. However, other features such as sizes, shapes, density and plot arrangement have remained. Finally, the Juzhu Xiaoqu blocks are constructed and spreading in the city nowadays.

As mentioned before, super and isolated blocks like Danweis or Juzhu Xiaoqu blocks bring negative impacts on the urban environment. The municipal government has been trying to subdivide them in order to release the transportation pressure, improve the monotonous street spaces and activate urban spaces. This problem needs to be solved, and the characteristics of those blocks and plots should be kept in order to

create distinctive and liveable urban environment. The techniques of maintaining these characteristics and problem-solving are proposed in Chapter 11.

Types of Blocks and Plots			
	First Period	**Second Period**	**Third Period**
Special blocks	Palace block; enclosed by walls; north-south oriented; regular shape, big; low dense; clear axis; symmetrical	remaining as the building complex remains;	remaining as the building complex remains;
			
(Plots)	Plots are equal to blocks; building complex was axially arranged; symmetrical.	Remaining;	Remaining;
Post-Lifang	Enclosed by walls (Open with symbolic gate later); small; square or rectangular shape; mostly north-south oriented but adapted to the topography some times; chessboard pattern; symmetrical; high density;	Remaining as open residential blocks; density increased;	Remaining as open residential blocks; density increasing;
	 (diagram)	 (diagram)	
(plots)	Long and narrow; arranged one by one in the same orientation alone street-lines;	Geometric arranged; split into smaller plots; mostly north-south oriented; density increased;	Split into even smaller plots; shapes are various; density increasing;
Ordinary blocks	Perimeter development; small; high density; shapes were various; mixed use.	Sizes increased;	Sizes decreased; density and height increasing;

			
(plots)	Perimeter arranged; geometrical arrangement inside; regular shapes;	Remaining but density increased, and a lot of perimeter plots were reconstructed;	Perimeter arranged; big plots along the perimeters; smaller plots inside; geometrical arrangement inside; shapes are various.
high-ranking Residential blocks	None	Geometrically arranged; not north-south oriented; shapes were regular; low density;	Remaining;
	None		
(plots)	None	Geometrically arranged; not north-south oriented; shapes were regular	Remaining but density slightly increasing
Danwei Block type	None	None	Enclosed by walls; big; mostly north-south oriented; low density; mixed use. / Mostly broken down into small ordinary blocks in 1980s
	None	None	
(plots)	None	None	Plots are equal to blocks; buildings are geometrically arranged with axis
Ju Zhu Xiao Qu (resident	None	None	Gated by fences; north-south oriented; medium density; most

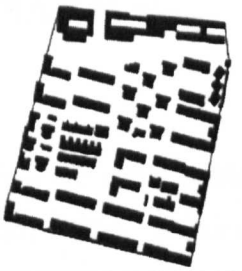
ial block type)			of them are big.
	None	None	
(plots)	None	None	Geometrically arranged; north-south oriented; cul-de-sac to each building

Table 7.1 Summary of the block types, plot types and typological processes ('||' is the end of a typological process, by the author)

CHAPTER 8 URBAN PUBLIC SPACES OF NANJING

8.1 Introduction

A city consists of solid building mass and void open spaces, which are either public (including semi-public) or private (including semi-private). The political philosopher—Hannah Arendt (1973) gives urban public spaces a scientific definition, which emphasises their social meaning, functional usage and accessibility of people. An urban public space is an urban space freely accessible for common people without excluding any groups of people for social purposes such as communication, gathering and other public activities, as opposite to a private space. An urban public space is usually owned by the state or government, and managed by a public organisation. There may be some restrictions of an urban public space, for instance, some public parks are closed in the night for the good of the public. A public open space is physically defined in three dimensions by 'the ground plane, vertical plane and the sky plane' (Dee, 2001, p34). Normally urban public spaces include civic squares, plazas, parks, linear streets, urban edges, rivers, markets, cemeteries, and small transitional spaces such as gateways, outdoor staircase and foyers of civic buildings and etc. Except streets, the most popular urban public spaces such as plazas, parks and markets exclude cars and draw people together for enjoyment (Marcus and Francis, 1998).

Undeniably, urban public spaces play a significant role in a city. They not only have environmental merits of air and water purification, wind and noise filtering and microclimate stabilisation, but also have psychological and emotional merits: easing individuals' tension and enhancing self fulfilment and individual choices (Berke, 1982, Coorey and Lau, 2005). Furthermore, some public squares play a social symbolic role of dominance and power within the city (Morris and Rodger, 1993). The configuration of urban public open spaces and their relationship with people and buildings are always important for urban design (English Partnerships, 2000, Carmona et al., 2003).

Research on urban public spaces has long tradition. Researchers were trying to build theories of designing good public spaces in cities. For instance, the City Beautiful Movement in America advocated the monumentality, eternity and uniformity of European Renaissance public spaces; Christopher Alexander (Alexander et al., 1987) and New Urbanists in contemporary America proposed methods of building good public space (Krieger, 1991, Scully Jr., 1991, Duany et al., 2001), and so forth. An early example of morphological study of urban public spaces was the well-known Nolli Map of Rome (1748). Many other scholars also provided practical examples of typomorphological examination of urban public spaces, for instance, Antoine Grumbach addressed the square typology in Alphand, which were squares made up of an island of vegetation; squares tied to a institution; squares enclosed by building; squares making use of residential space (Grumbach, 1979).

The research of public spaces of Nanjing in this chapter focuses on public open spaces (refer to Chapter 9), which refer to civic squares or plazas, parks and market places because they cover the majority of all kinds of public open spaces, while streets are mentioned briefly because they have already been examined in Chapter 6. In the light of the typomorphological theory, types of urban public spaces of Nanjing are defined based on their shapes, locations, proportions, road intersection and relationship with surrounding buildings. The analysis is divided into three parts based on the three periods of the transformation of the city in a chronological manner: the historical period (--1860s); the modern period (1860s-1949); and the contemporary period (1949-present). The Chinese context of urban public open space is also outlined as the background of public spaces design in Nanjing.

8.2 The Chinese context

Large traditional Chinese cities had hardly designed public squares and parks (Wheatley, 1971, Liu, 1989, Xu, 2000, Zhuang and Zhang, 2002). The ideal city planning concept recorded in *Artificer's Record*[1] did not mention many public spaces

[1] 'The Artificer's Record' is mentioned in Chapter 1. The book is a volume of the *Ritual Literature of Zhou Dynasty* (1027-221BC), which is regarded as the earliest publication about the ideology of

except for street network and markets. In feudal Chinese cities, public spaces were inappropriate for controlling people's free thoughts and speeches. The aforementioned Lifang system was an evidence of governments' restriction against people. However, in rural Chinese villages, there were usually central public squares adjacent to ritual buildings for seasonal gathering and ritual activities. For example, Duany (Duany et al., 2001) illustrated such a square in a small Chinese village in his book, which was a well-defined concave square surrounded by ordinary buildings and porches (Figure 8.1). Moreover, a number of public squares also emerged spontaneously without official planning in some Chinese capital cities after the Song Dynasty.

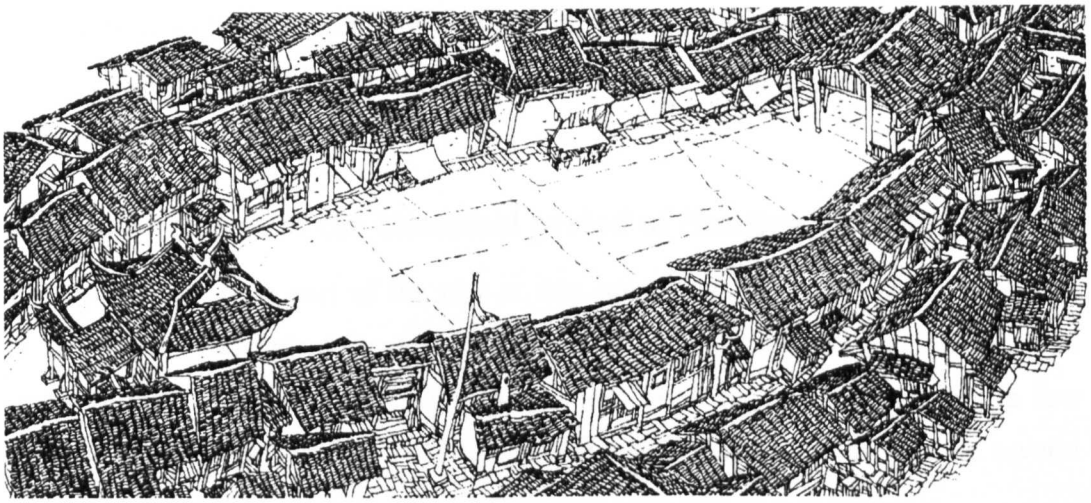


Figure 8.1 A well-defined traditional public square in a Chinese village (Duany et al., 2001, p158)

Except for street-networks, market spaces were the only public spaces indicated in the ideal city planning concept for big ancient Chinese cities. An example was Chang'an city in the Tang Dynasty (618-907) (Figure 7.1): there were two markets named Western and Eastern markets surrounded by Lifangs. The markets were identical to Lifang blocks in terms of size, shape and enclosure, but were divided into small squares by two north-south oriented streets and two east-west oriented streets (16 meters wide). Such markets were designed to accommodate all trading activities in the city, such as trades of daily food, handcrafts and pets. The two markets were

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Chinese capital city planning. The principles introduced in the book affected most of capital city design in feudal China.

open in the morning and closed in the evening everyday. Some scattered temporal shops also emerged along major streets and near the two markets (Zhuang and Zhang, 2002).

Furthermore, as mentioned in Chapter 6, street trading emerged and broke the walled Lifangs eventually from the late Tang Dynasty in some cities, and formally spread country-widely in the Song Dynasty (960-1279). As a result, mixed-use residential buildings with front shops appeared along some main streets in cities. Craftsmen were able to make and sell their handcrafts in their Lifangs. Since then, streets did not merely accommodate transportation but also commercial activities. In addition, spontaneous gathering of common people in front of temples during frequent ritual events ('Miao Hui') formed undesigned markets for trading, communication and recreation.

8.3 Public spaces in the historical period of Nanjing (--1860s)

The most flourishing part of the city at this stage was the Qinghuai River valley, because the convenient water transportation brought enormous commercial opportunities for the city. As a typical Chinese big city, Nanjing had only a few designed public open spaces—official market places and parks, as well as several undersigned markets.

8.3.1 Markets

As mentioned before, there were only fixed market spaces in traditional Chinese big cities, and almost no street trading before the late Tang and Song Dynasty (960-1279). Street trading emerged in Nanjing in the Southern Tang Dynasty (937-975) (Tang, 2003). Since then, there were three types of markets places in ancient Nanjing, which were the designed market, street market and the undesigned markets related to temples (Miaohui square), which appeared at the water bank of Qinghuai River (Figure 8.2).

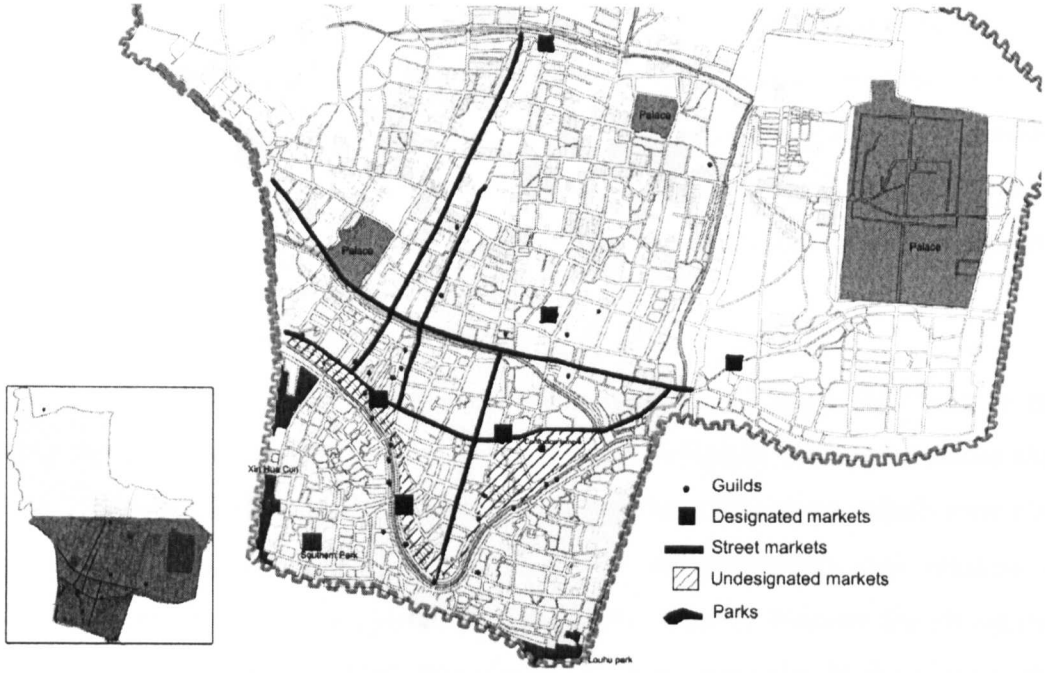


Figure 8.2 Public spaces of Nanjing in the historical period (by the author)

The first two designed markets built in Nanjing were the 'Great market'[2] and the 'Eastern market' during the Eastern Wu (222-280) period. Later on, there were many small markets emerging in the whole city in order to accommodate the increasing demand of trading, because Nanjing as a capital city had drawn a large amount of merchants from surrounding areas to the city. Markets in the Eastern Wu period did not have functional specificity (Tang, 2003). Since the Southern Tang period, more markets had been established and allocated with functional specificity: different kinds of trading. For instance, some large markets (Shi) emerged in the Ming Dynasty (1368-1644), such as the 'Great Shi', 'Da Zhongjie Shi', 'San Shanjie Shi', 'Xinqiao Shi', 'Chang'an Shi', 'Beiqiao Shi' and 'Bei Menqiao Shi' shown as black squares in Figure 8.2 (Wang, 1930). 'San Shanjie Shi' was for vegetable and fruit

[2] There were two markets named 'Great market' in the history of Nanjing, one of which was built in the Eastern Wu Dynasty and the other was built in the Ming Dynasty. The one mentioned in this chapter referred to the former one, which was located in front of the first temple called 'Jianchu Temple' at the end of Yuhua Road (present name). The Great market of the Ming Dynasty was located in the Nieqiao area (YANG, K. (1993) *Zhongguo gudai ducheng zhidu shi yanjiu(The Research on the Building History of the Chinese Historical Capital Cities),* Shanghai, Shanghai Guji Press.).

trading, while 'Neiqiao Shi' was for animal trading. Some other markets were named after their functional specificity: 'Chai Shi' for firewood trading; 'Fish Shi' for fish trading; 'Flower market' for flower trading and etc. Moreover, most of the markets were located on the north of Qinghuai River, in the commercial zone of the city. Markets were enclosed by fences and controlled by the government with fixed open hours (Yang, 1993, Tang, 2003).

The street market was the second type, which appeared in Guan Jies[3] built in the Ming Dynasty (Figure 8.2). Stalls were underneath temporal timber extensions that were of the same height as the buildings alongside Guan Jie streets, which were also allocated with specific trading goods. Guan Jies accommodating such markets in Nanjing were: the West-East Street from the Hanxi Gate to Western Da Zhongqiao (Jianye Road with Baixia Road nowadays), the street from the Shuixi Gate to the Western Da Zhongqiao (Shengzhou Road with Jiangkang Road nowadays), the 'Yu jie' (Zhonghua Road nowadays), the Great Wangfu Street and Pingshi Street (present names) from the Qinghuai River valley to the northern market (Bei Menqiao Shi) as indicated in Figure 8.1(Tang, 2003). The Pingshi Street was one of the most prosperous Guan Jies at that time (Figure 6.4). Commodities were displayed with flags of shops on the street. People and horse-driving carriages walked and ran on the narrow streets. Sometimes some temporal structures were wide enough to reach similar structures on the opposite side of the street. Therefore an roofed space had been created at certain portions of streets (Yang, 1993).

The third type was the undesigned market in relation to great temples (Maiohui square), which were usually located along Qinghuai River. These markets were shaped spontaneously by people due to the demand of trading and communication associated with regular ritual activities. Furthermore, there were lots of craftsmen's guilds located along the river, where major transactions took place (Figure 8.2). In addition, a special undesigned market in Nanjing was 'Kao Shi' (Examination

[3] Guanjies have been mentioned in Chapter 5, which were the main transport connections built by the government within the city or connecting the city with outside areas. They were usually used for material supply, official correspondence of the government and daily transportation.

market), which was in front of the national Examination Building. The national examination was held once every three years and drew thousands of candidates from the whole province or the country to Nanjing. The national examination brought commercial opportunities for the exam place, which was also close to Qinghuai River (Figure 8.3). Some cathouses behind drinking restaurants in the area emerged at the river bank as well.

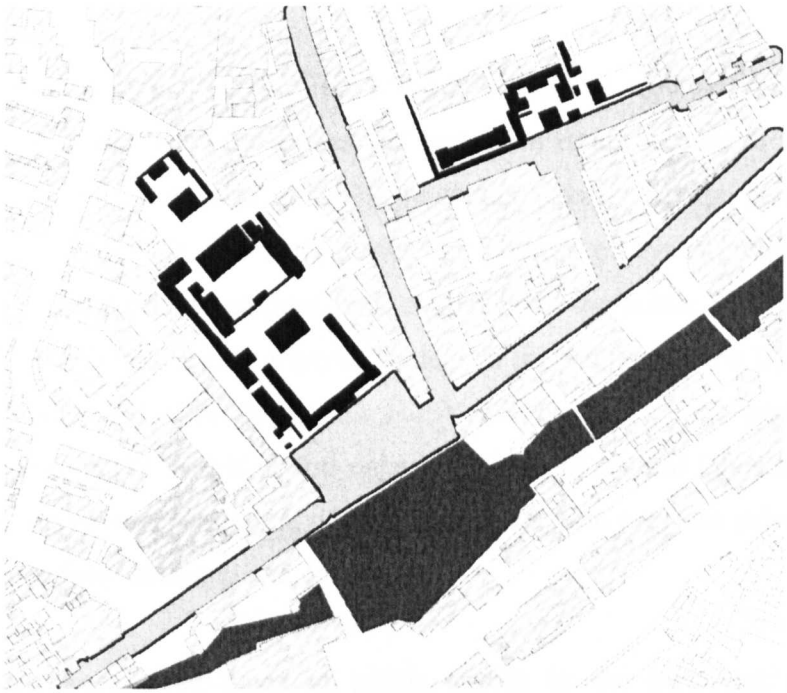


Figure 8.3 Confucian Temple market (square) and the Kao Shi (by the author based on the contemporary city map from the City Planning Bureau of Nanjing)

The Confucian Temple market at the Qinghuai River bank was one of the historical undesigned markets, which became a popular tourist site nowadays. Despite the market and the Confucian Temple have been refurnished several times, their historical features are preserved well. The square is about 80 meters wide by 50 meters deep, in which the width is the same as the temple. The square is three times deep than the height of the building, which is 16.5 meters. This proportion provides excellent view of the building. Apart from the Confucian Temple market, there is a small market square—'Kao Shi' in front of the Exam Building. The street in front of the exam building is as wide as the main building which also allows good sight views of the building. These two markets are connected by a few commercial streets (Figure 8.3).

8.3.2 Parks

According to the well-known Chinese poem by the poet Du Mu in the Tang Dynasty, there was a public park called 'Xing Huacun' located in the Western Gate area of Nanjing, which was rare in other Chinese big cities (Figure 8.2). However, there is limited resource about the layout of the park. This park presumably had beautiful natural landscape and accommodated several houses at the periphery of the city.

According to the zoning strategy of the Ming Dynasty, the southeast and southwest parts near the city wall were the garden and recreation zones because of its beautiful natural landscape, which was suitable for parks. Many private gardens [4] were demolished and rebuilt in this zone during the process of dynasty changes. As a result, some original private gardens were available for the public in later dynasties (Tang, 2003). For instance, two imperial gardens in the Southern Tang Dynasty: 'Liu Song Nan Yuan' and 'Liu Song Lou Hu Yuan' became public parks in later dynasties. Public parks in this period either consisted of natural landscape without planning and massive construction, or were converted from previous private gardens which were carefully designed and constructed.

In sum, there were three types of public spaces in the historical period: the morphological characteristics of deisgned markets were similar to that of Lifang blocks, while public parks were largely natural looking. Two characteristics of undesigned markets (Miaohui squares) in ancient Nanjing were: first, they emerged based upon people's preference of easy accessibility, for instance, at the river bank, or near Guan Jies and guilds; second, they were strongly related to public buildings, such as the Confucian Temple and the Exam Building. The Miaohui type of spaces served for trading purposes rather than social representations in society in this period.

8.4 Public spaces in the modern period (1860s-1949)

The 'Capital City Planning Scheme' (1929) launched by the new government employed western ideas of public spaces in Nanjing, which dramatically changed the

[4] The layouts and morphological characteristics of private gardens are analysed in Chapter 10.

city form in the era of Republic China (Li and Xiong, 2003, Yin, 2005). Apart from the aforementioned boulevards in Chapter 6, a number of park-like streets, public squares and parks were planned in the city in order to facilitate social economical developments of the city, represent a new democratic regime and smash the feudal spatial structure of the city (Wang, 2003). Therefore, it was the first time that a top-down city planning in Nanjing emphasised on urban public spaces. The scheme proposed a total area of 6,477,700 square meters for public squares, parks and streets, which was 14.4% of the total area of the city (The City Planning Bureau of Nanjing, 2005).

The scheme was not fully implemented due to the financial shortage and the coming war against the Japanese in 1937. As a result, only the boulevards, some of public squares and parks were built, while the park-like streets could only be found in papers. The park-like streets were planned to connect main parks in Nanjing and be parallel to the city wall and Qinghuai River. Those streets had a broad green zone containing trees, lawn and park furniture near the river and the city wall, a 20 meters zone for vehicle use and 5 meters for pedestrians (Guodu Jihua chu (The Planning Bureau of the government of the Republic of China), 1929) (Figure 8.4). Building heights were also strictly controlled to be low. Even though those streets were not constructed, the idea of beautifying urban public spaces was clear.

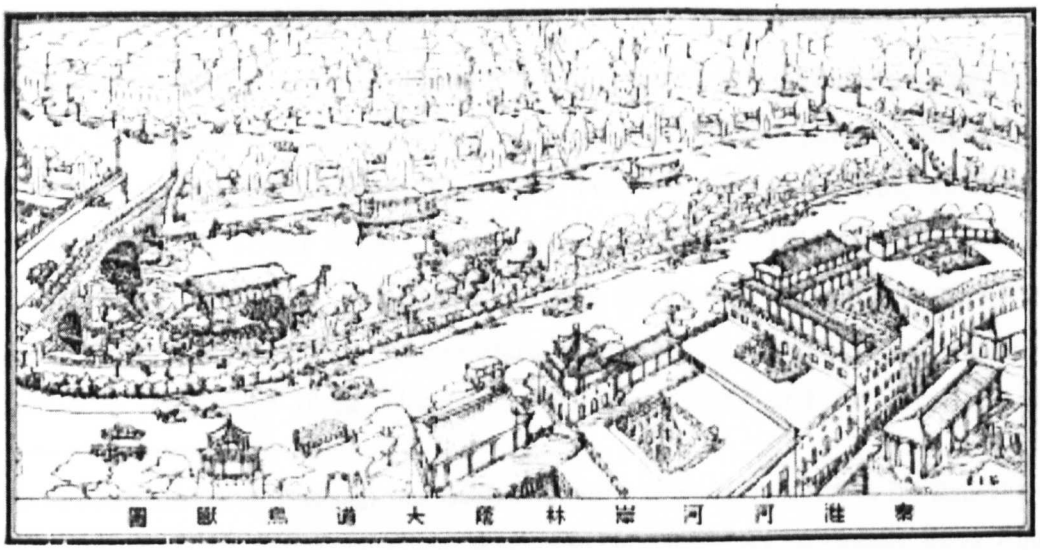


Figure 8.4 The proposed layout of park-like streets near Qinghuai River (Guodu Jihua chu (The Planning Bureau of the government of the Republic of China), 1929)

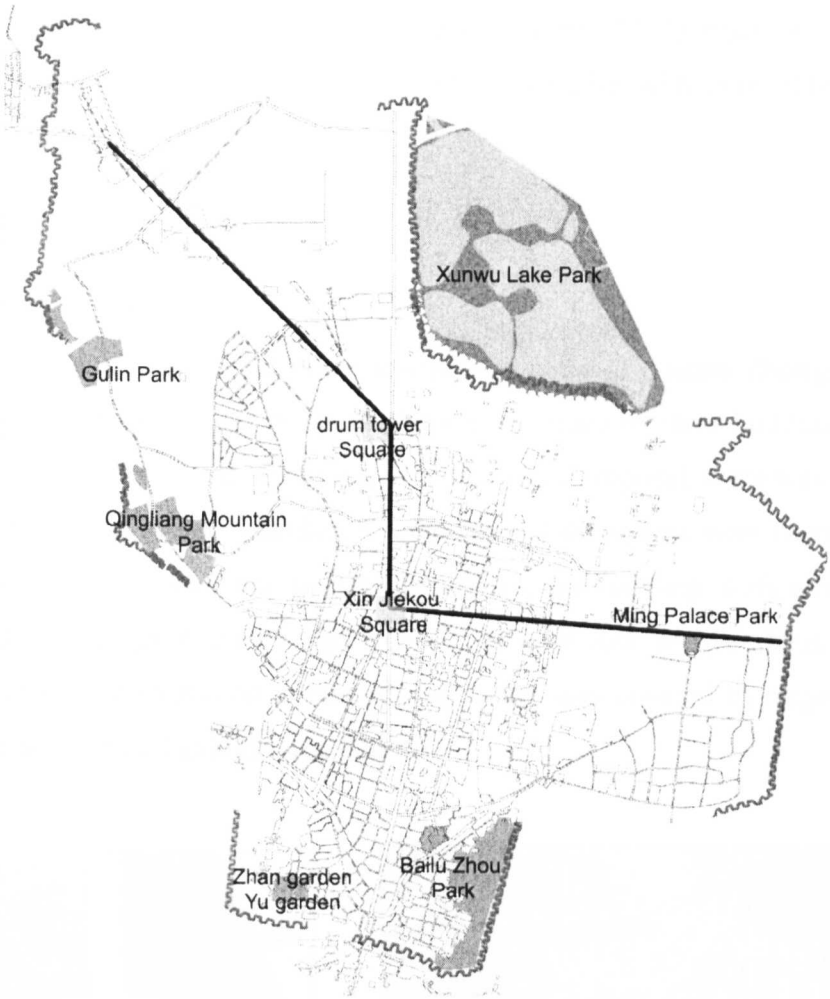


Figure 8.5 Locations of important public squares, parks and boulevards in Nanjing in the modern period (by the author)

There were three types of public spaces in Nanjing during this period: the newly built squares, boulevards and parks, together with historical private gardens which were completely open for public use in this period. Two major public squares, Xin Jiekou Square and Drum Tower Square, were built in 1928 and 1931 respectively along with the construction of the boulevards. By 1936, additional five public squares were built in the city, while another seven squares were under construction. Twenty parks planned in the 'Shiye jihua' (Industrial Planning, 1919)[5] and the 'Capital City

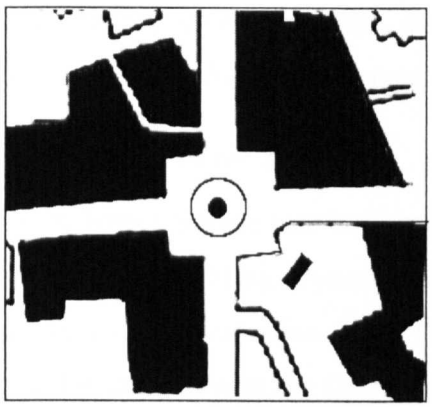
[5] 'Shiye Jihua' (Industrial Planning) was launched in 1919 by the government of the Republic of China. It proposed three aspects of the future development of Nanjing at a macro scale: firstly, adjust the land use pattern of the Yangtze River bank to become economic development; secondly, enhance the connection between the old city and areas across the river by building a tunnel between them;

Planning Scheme' were completed in this period (Xiong, 2003). Figure 8.5 shows the locations of some of the major public open spaces together with some of the previous private gardens in the city.

8.4.1 Squares

8.4.1.1 Xin Jiekou square

Xin Jiekou square was located in the intersection point of Eastern Zhongshan Road and Zhongshan Road. It was in square shape surrounded by three buildings and one open park in the Capital City Planning Scheme. In the proposal, there was a fountain in the centre of the square. Building facades around the square were decorated with western architectural elements, such as the Orders, and building roofs were Chinese traditional, having pavilions on tops[6]. Buildings were four or five stores high. The open space on the south-east corner of the square was covered by vegetation and with a Chinese symbol gate (Figure 8.6, 8.7).



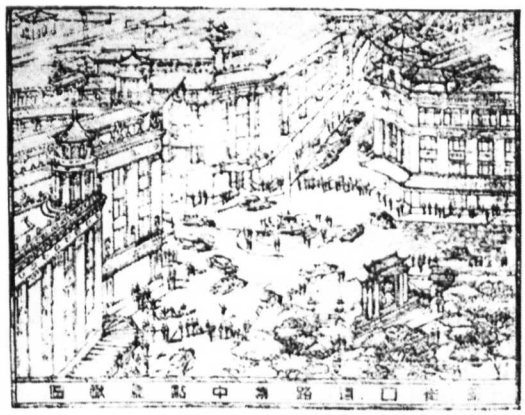


Figure 8.6 The layout of the proposed Xin Jiekou square (by the author)

Figure 8.7 The image of the proposed Xin Jiekou square (Guodu Jihua chu (The Planning Bureau of the government of the Republic of China), 1929)

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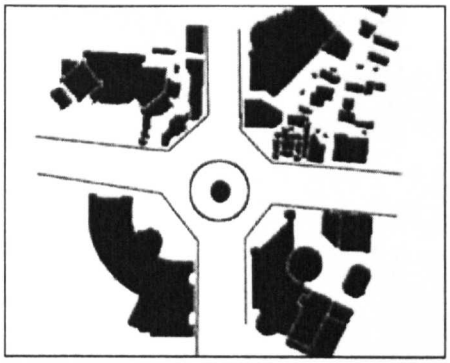
thirdly, improve infrastructures in Pukou area which was opposite to the old city of Nanjing against Yangtze River. It was not implemented because it was soon replaced by 'Nanjing shizheng jihua' (The civic planning of Nanjing, 1926) and the 'Capital City Planning Scheme', 1929. XIONG, H. (2003) Nanjing jindai chengshi guihua yanjiu(The Research on the Modern City Planning of Nanjing). *School of Civil Engineering and Architecture.* Wuhan, Wuhan university of Science and Technology.

[6] The concept and principles of building design in the modern period is addressed in Chapter 9.



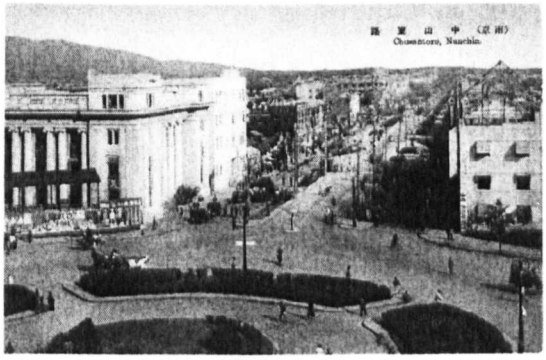


Figure 8.8 The current layout of the Xin Jiekou square (by the author)

Figure 8.9 The image of the Xin Jiekou square in the 1940s (Liu, 1998, p62)

However, the square was built differently from the proposal (Figure 8.8, 8.9), presumably because the central located land was economically unsuitable for an open park. The square became a transitional point of the cross streets, and in circle shape. It was 4500 square meters and surrounded by ring roads. It became a pure decoration of the streets since it was barely used by people. Surrounding buildings had been rebuilt many times since then, either in the proposed Chinese eclectic types or in contemporary types. Currently, each building at the four corners of the square has its own buffer area facing the mutual centre.

8.4.1.2 Drum Tower Square

Drum Tower Square was built based on the Drum Tower (Figure 8.10), a historical building of the Ming Dynasty as part of a school building complex. Figure 8.11 shows its transformation from 1914 to nowadays. The shape of the square was circular, centred with the Drum Tower in the 1930s. Similar to Xin Jiekou Square, it was also located in the cross point of several roads with the Drum Tower in the centre. Moreover, its surrounding buildings were apparently not well planned in this period, but emerged one by one in different sizes and orientations during a long time. A new more regular traffic square emerged close to the original one in 1959 (The City Planning Bureau of Nanjing, 2005).

Figure 8.10 The Drum Tower in the Ming Dynasty (Liu, 1998)

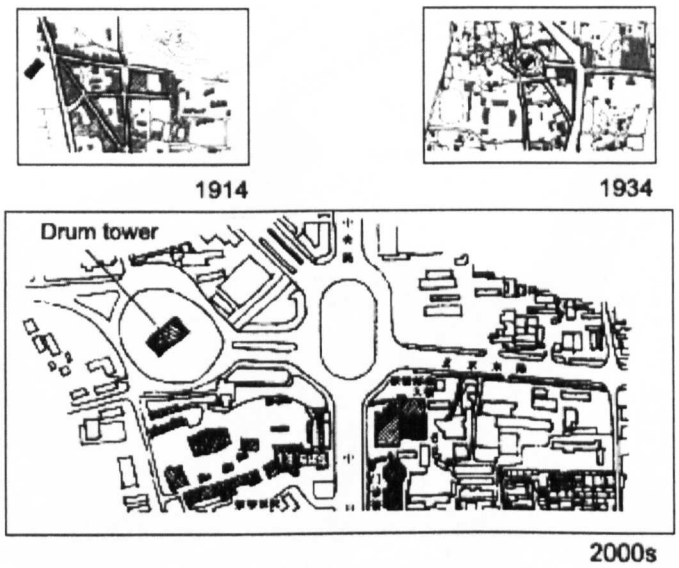


Figure 8.11 The transformation of the Drum Tower square from the 1910s to the present (Han, 1998, p12)

8.4.2 Parks

The nationalist government planned to build five public parks in the city as indicated in the 'Shiye Jihua' (Industrial Planning, 1919). They were the Eastern Park, which was based on the ruin site of the Ming Palace; the Southern Park, which was located beside the Confucian Temple and the Exam building; the Western Park, which took advantage of the natural landscape of the Qingliang Mountain; and the Northern Park related to the Jinghai Temple (Xiong, 2003). Moreover, some private gardens were opened for public use, for instance, the Xuanwu Lake Park in the north, Zhan Garden and Yu Garden in the West Gate area, and Bailu Zhou Park in the East Gate area

(Figure 8.5). Seven parks were finished and eight more parks were under construction by 1936 (Liu, 2002).

Gulin Park as an example took advantage of the natural topography in the centre of a city block, where two colleges were on the north and south corners (Figure 8.12). The park was divided into several zones with small pools and playgrounds. It had picturesque features resulting from the Chinese tradition of garden design[7], for instance, the pavilions on the top of a hill, irregular footpaths, and various shapes and oriented buildings.

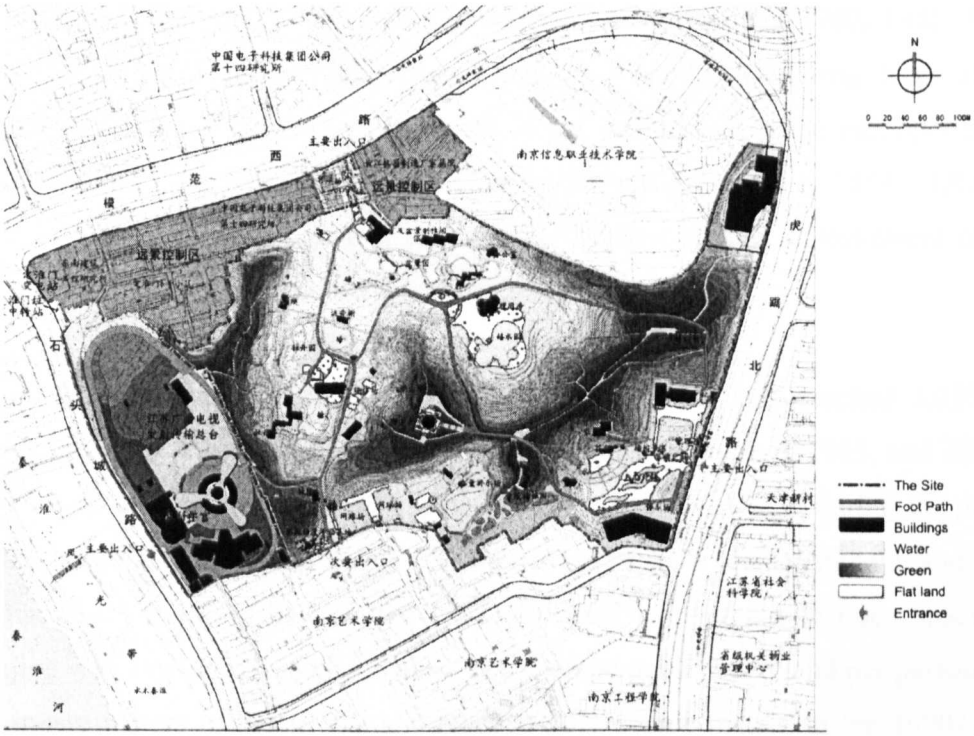


Figure 8.12 The layout of Gu Lin Park (adapted by the author according to an unpublished governmental document 2000)

The third type of public open space of Nanjing—boulevards have been examined in Chapter 6. In sum, several designed urban public open spaces emerged in Nanjing in this period. Public spaces was emphasised in the urban planning of the Republic of China to represent the new democratic country. However, those civic squares were

[7] The traditional principle of Chinese garden design is illustrated in Chapter 10.

functionally unsuccessful due to poor public accessibility. Moreover, the layouts of civic squares had ill-defined edges, harsh vegetation and with almost no public furniture. The surrounding buildings showed designers' efforts of incorporating western architecture and Chinese traditional architecture. Public parks were built based on natural landscapes and with traditional picturesque features. The locations of public parks were almost at the fringe of the city.

8.5 Public spaces in the contemporary period (from 1949)

The municipal government of Nanjing have been making great effort on increasing new public spaces and improving the existing public squares, parks and other public spaces, which are emphasised in the government's Master Plan 1980, 1983, 1991, 2001 and in some topic-related plans, such as 'Nanjing Zhucheng Lvdi xitong tiaozheng guihua, 1999' ('The adjustment of the green land[8] in the metropolitan of Nanjing, 1999'). For instance, Drum Tower square was expanded in 1959, while Xin Jiekou square was rebuilt several times, either because of the improvement of the square or because of the reconstruction of the boulevards.

Public open spaces were 655,500 square meters by 1949, and reached 3,050,000 square meters in 1964. It increased to 4,050,000 square meters in 1965, and 30% of the built-up area was covered by vegetations. The figure declined during the period of the Cultural Revolution (1968-78) due to large-scale demolishment and land confiscation for industrial use. By 1992, the total land of public open spaces in Nanjing was 21,409,000 square meters. The average public open land per person was 2.5 square meters in the 1960s, and reached 13.2 square meters in the 1990s. The government intends to further increase the area of public open spaces to 55,196,600 square meters in the 2000s (The City Planning Bureau of Nanjing, 2005). Those figures indicate the rapid growth of public open spaces in the contemporary period, and most of them are in the north of the city.

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[8] 'Green land' in Nanjing refers to public green lands (which includes public squares, parks and the forested lands of streets and rivers), industrial green land, shelter belt and other green lands for special uses such as military training. Therefore, urban public open spaces are parts of what the plan deals with.

Apart from the previous types of public squares, parks and streets, two new types of public spaces appeared in the city in relation to commercial activities: they are the 'pedestrian zone' and 'underground spaces'. Pedestrian zones are combinations of pedestrian streets in certain city blocks, serving mainly commercial purposes. For example, the Shizi Qiao/Hunan Road area (2000) is an aggregation of restaurants, while the 'Nanjing 1912' area (2002) accommodates pubs, clubs, cafes and restaurants. Those areas are relatively isolated from their environment due to the great differences between pedestrian zones and their surroundings: firstly they have high density; secondly vehicles are not allowed in them; thirdly, layouts of streets in pedestrian zones are similar to that of traditional Guan Jies. Despite this type of public spaces is a marketelised cultural product, its emergence suggests that people's preference of public open space has not changed too much from the traditional sense. The underground spaces are normally related to subway stations, or as expansions of department stores. Within the old city, the Xin Jiekou area and the Confucian Temple area are the two major underground spaces. More underground spaces will be built along with the ongoing subway project and the increasing land value in the old city in the near future. They are mostly associated with commercial use too.

Figure 8.13 shows 17 big parks and 14 important civic squares, as well as 3 pedestrian zones and 2 underground spaces in the old city. Table 8.1 illustrates the classification of the types of these parks and squares according to their relationship with surrounding buildings: civic squares connecting with public buildings, civic squares enclosed by traffic lanes, squares in planned community (Jianzhu Xiaoqu, refer to Chapter 10), natural parks, walled gardens, pedestrian zones and underground areas. Compared to public spaces in the previous period, contemporary urban public spaces have been improved, and contribute to a better living environment. Public playgrounds are also introduced into residential communities, and are located in centres of communities, and contain exercise facilities or garden settings. However, public spaces in communities are only open for local residents.

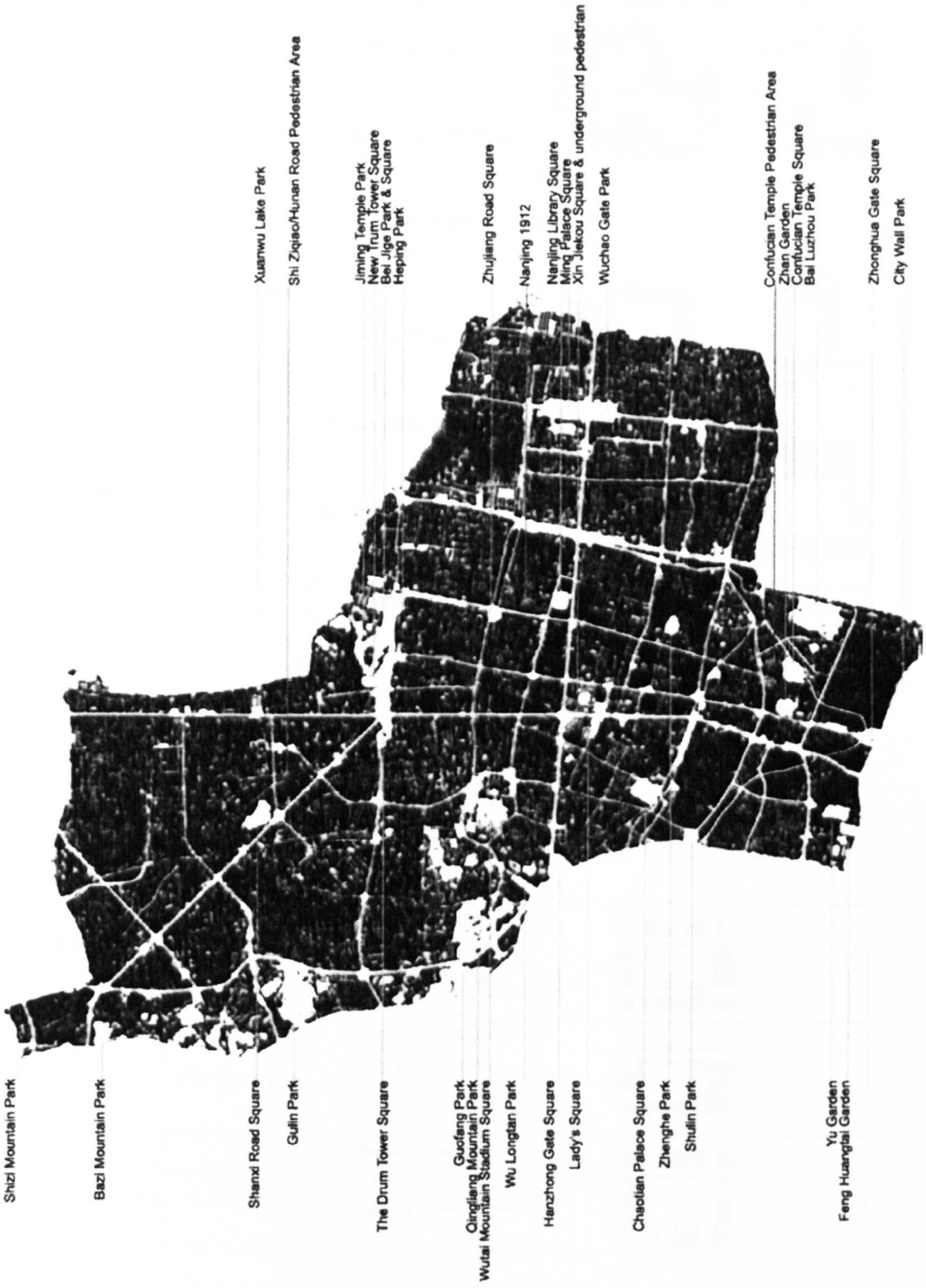
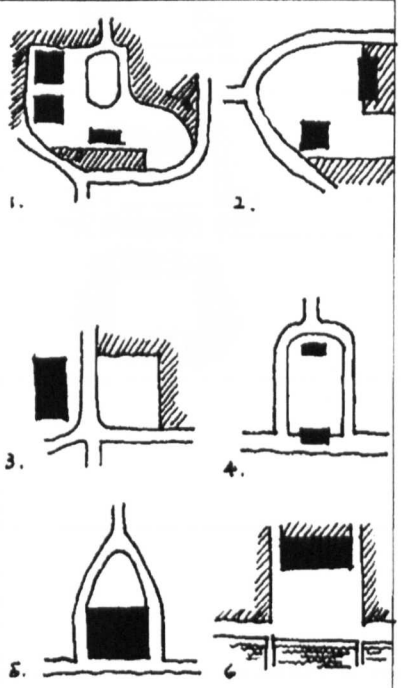
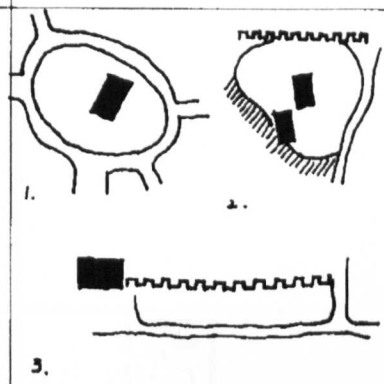
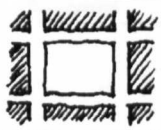
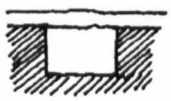
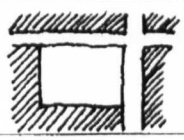


Figure 8.13 Locations and shapes of the urban public open spaces in the contemporary city (by the author)

Types	Sub-types	Examples	Diagrams
With public buildings	Civic Plaza/Square	1, Wutai Mountain Stadium Square 2, Hanzhong Gate Square 3, Chaotian Palace Square 4, Ming Palace Square 5, Zhonghua Gate Square 6, Confucian Temple Square	
	Park	1, The Drum Tower Square 2, Jiming Temple Park 3, The City Wall Park	
With Traffic Path	Open	1, Heping Park 2, Xin Jiekou Square 3, Bai Luzhou Park	
	One Side Open	1, Zhenghe Park 2, Wuchao Gate Park	
	Corner	1, Shanxi Road Square 2, Bei Jige Square 3, Zhujiang Road Square	

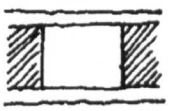
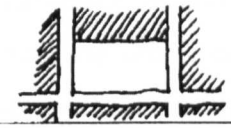
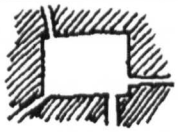
	Two Sides Open	1, The Public Library Square	
	Three Sides Open	1, Shulin Square 2, New Drum Tower Square	
	Enclosed	1, Lady's Square	
Within Community	Centralised		
	Non-Centralised		
Topographic Park		1, Shizi Mountain Park 2,Bazi Mountain Park 3, Gulin Park 4, Guofang Park 5, Qingliang Mountain Park 6, Wu Longtan Park 7, Xuanwu Lake Park 8, Bei Jige Park	
Garden with wall		1, Yu Garden 2, Feng Huangtai Garden 3, Zhan Garden	
Pedestrian network		1, Shizi Qiao/Hunan Road 2, Nanjing 1912 3, Confucian Temple	
Underground Area		1, Xinjie Kou 2, Confucian Temple	

Table 8.1 Typological classification of civic squares, parks, pedestrian zones and underground areas in contemporary Nanjing (by the author)

There are several problems of contemporary public spaces in Nanjing. Firstly, some civic squares are too big to give sense of enclosure and sense of place for people. It is because such squares are regarded as indicators of the municipal government's

achievement (Wang and Gao, 2002), and 'an explicit expression of new forms of social interaction and national pride'(Sit, 1985, p9) (Figure 8.14). Secondly, most of public spaces are not enclosed by buildings but by heavy traffic roads which have negative impact on their accessibility. Thirdly, the distribution of public spaces is mainly based on commercial needs rather than appropriate urban design, which considers factors such as local people's demand and aesthetics. Fourthly, the design of civic squares has very limited aesthetic consideration, for instance, squares have random shapes or unclear edges (Figure 8.15, 8.16). Some designs are directly borrowed from certain successful models in other cities without adaptation to the local situation, in order to achieve the same success and cut the cost. As a result, many newly built public spaces are very similar. Finally, many public spaces have little adaptability for different uses in different occasions due to their overwhelming fixed settings such as allotments, sculptures and fountains.

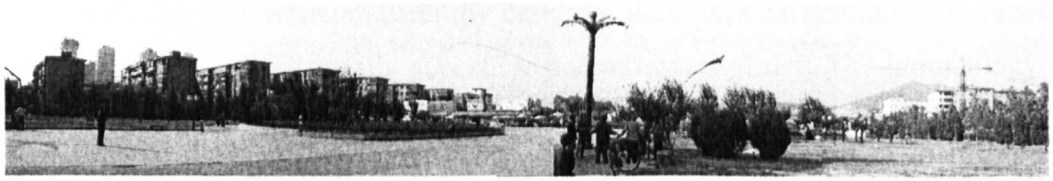


Figure 8.14 The vast scale of the Ming Palace square (by the author)

Figure 8.15 Unclear relationship between the Shanxi Lu Square and surrounding buildings (left, by the author)

Figure 8.16 Gulou Square has large-scale and ill-defined space (by the author)

To sum, a large amount of public open spaces are built in this period. Even though they have several problems, their qualities are greatly improved. The contemporary public squares/plazas can be classified into 'with public buildings', 'with traffic paths' (which can be sub-classified into 'four-sides open', 'one-side open', 'corner open', 'two-opposite-sides open', 'three-sides open' and 'enclosed'), and 'within residential communities' (either centralised or not). Public parks have types of 'with public buildings', 'natural topographic' and 'garden with wall'. Most of parks in Nanjing belong to the natural topographic type. Furthermore, another two types of public open spaces are 'pedestrian zones' and 'underground spaces'.

8.6 Conclusion

The Chinese context of urban public spaces suggests that they were not paid enough attention in urban design or city planning in the past. However, spontaneous urban public open spaces emerged in Nanjing and contributed a lot to inhabitants' daily lives. Although they were not carefully designed, their physical settings were suitable for local people's needs, easily accessible and at human-scales. The morphology of officially designed public spaces such as markets and streets experienced the process from being closed to open. Their distribution was also transformed from following government's allocation to follow commercial demanding. During the second period, western ideology of urban public spaces was introduced into China, thus civic squares, parks and boulevards emerged in Nanjing. However, the western concept of public spaces for public gathering, communication and activities were not fully understood and fulfilled in the Chinese implementation. Public squares were functionally unsuccessful, and lacked of aesthetic considerations. During the third period, the quantity of urban public spaces in Nanjing largely increased and quality of them was improved, although there were still several problems in the design of urban public open spaces.

There is obvious discontinuity and complexity within the transformation of types of urban public spaces (Table 8.2). The traditional designed market type and parks were not continued in later periods, and only the type of trading streets and the type of Miaohui squares remained till the contemporary period. The types of urban public

spaces built in the second period were inherited and improved in the third period, for instance, civic squares and parks. Furthermore, two new types of urban public spaces emerged in the third period. However, streets in pedestrian zones adopted the traditional type of trading streets.

Apart from the type of trading streets and the type of Miaohui squares, typological processes of other types of urban public spaces are not very clear over time. Therefore, they are unable to provide basis for future design. (1) The traditional type of trading streets can be references for the streets in contemporary pedestrian zones, (2) while the traditional type of Miaohui square can be references for civic squares. The aforementioned problems that current public open spaces are facing require fundamental improvement in future design. Relevant suggestions proposed in Chapter 11 are solutions of those problems.

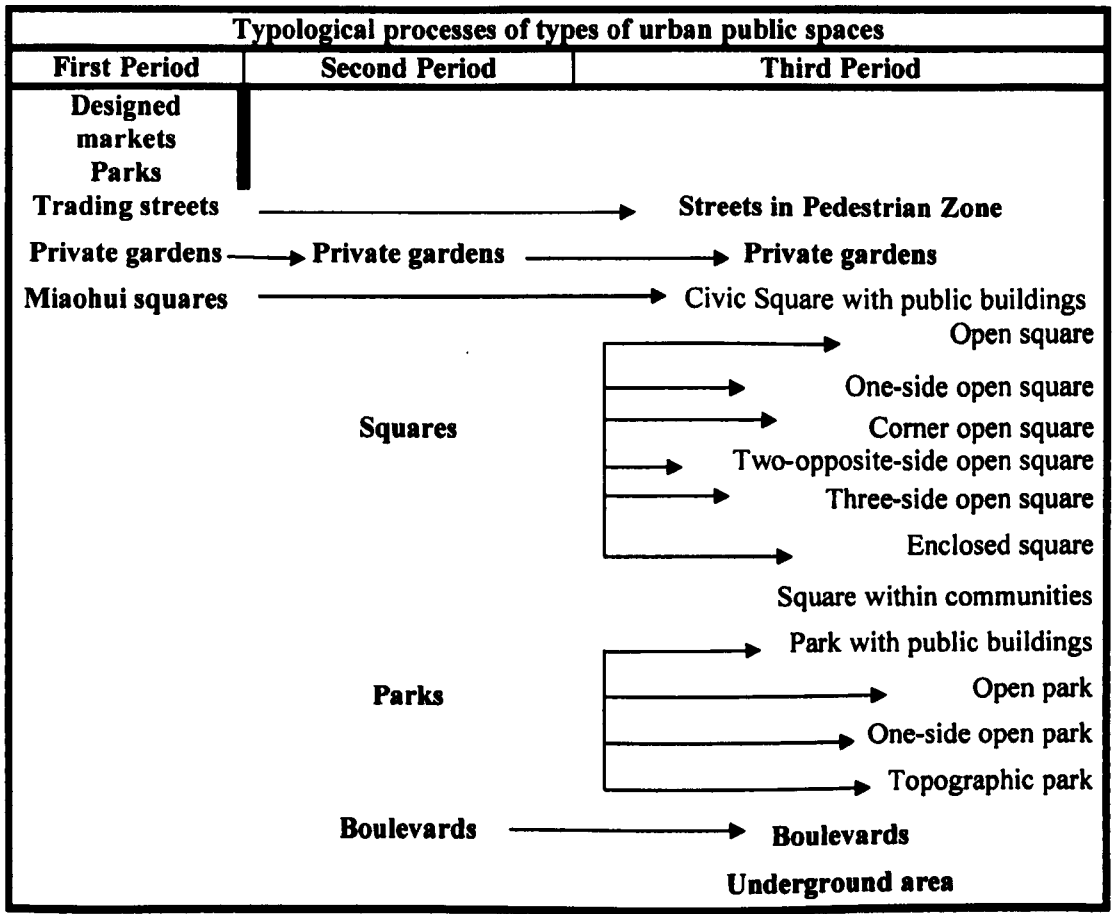


Table 8.2 Typological processes of types of urban public spaces in Nanjing ('||' is the end of a typological process, arrows represent the continuious of a typological process, by the author)

CHAPTER 9 PUBLIC BUILDINGS OF NANJING

9.1 Introduction

Public buildings and public open spaces constitute urban public spaces, which are accessible for common people for various social purposes such as communication, gathering, exhibition, administration, religion and education. Similar to urban public open spaces, public buildings are usually owned and managed by certain public organisations or the government. Public buildings in a city include city halls, churches, theatres, stadiums, museums, monuments, public libraries, markets, schools, hospitals and etc.

Public buildings are aesthetically, socially and symbolically important for western cities. For an European city, 'it is a matter of an association of buildings, every one of which shows its face to the city—buildings are oriented towards public space' (Meuser, 2003, p250). Public buildings as the interface of the interrelation between urban solid and void drew attention from the public. The arrangement of public buildings and their façades are highly important, and are a 'pure art' (Collins and Collins, 1965, p50). Their height, proportion, texture, volume and ornaments need to be designed aesthetically. Many of public buildings become monuments even though their original functions have changed. Socially, similar to public open space, public buildings benefit people emotionally since they serve public communication, tension relief, self fulfilment and individual choices. In terms of symbolism, public buildings represent local social values or ruling powers, and are important for place identity. For instance, Sonne (2003, p39-40,293) argued that public architecture as a tool of communication participated in the operation of a democratic state in several ways: 'they can demonstrate the existence of the state and its institutions in an accessible and comprehensible manner for all citizens; they can make a concrete contribution to the implementation of the ideals they represent'.

The study of public buildings has a long tradition. According to Rapoport (1984), the whole architectural theory and history in the western world is about public buildings

and monuments before his age. According to Moffett (2003), architectural history in any culture is recorded in public buildings. For example, in early architectural theory, Vitruvius (1960, p13) gave the 'fundamental principles of architecture'—order, arrangement, eurhythmy, symmetry, propriety and economy, which are inherited mainly by Western historical public buildings. There are many other studies on public buildings in literature, for instance, Durand (1802-5) established a practical formative vocabulary through documentary examination of a large amount of public buildings; Pevsner (1976) classified public buildings by functions into national monuments, government buildings, town halls and law courts, theatres, libraries, museums, hospitals, prisons, exchange and banks, railway station, market hall and exhibition buildings.

In this chapter, the Chinese context and architectural theory of public buildings are outlined as the background for understanding public building forms in Nanjing. The typomorphological examination of public buildings is also conducted in three periods: the historical period (--1860s); modern period (1860s-1949); and the contemporary period (1949-present). Several examples are selected to illustrate characteristics of public buildings in each period, which can be reused in future public building design to maintain the continuity and cohesion of urban forms in Nanjing.

9.2 The Chinese context

Traditional Chinese public buildings were temples, pagodas, street porches and commercial guilds. Compared to western public buildings, Chinese traditional public buildings lacked the role of aesthetic enhancement of cities, and had limited social benefits and cultural representation. Aesthetic attention of a public building towards outside spaces was almost absent in traditional China because of the introversion of Chinese architecture: buildings were designated specifically to be viewed from the inside (Ashihara, 1983). Viewed within the inside, façades and interior spaces of public buildings were carefully designed and decorated. Traditional Chinese public buildings did not serve for social gathering, discussion and entertainment, due to the fact that these activities were not encouraged by the government in early dynasties. For example, there was a policy called 'night injunctive' ('xiaojin') in Lifangs before

the Northern Song Dynasty, which prohibited inhabitants' night activities by closing down the gates of Lifangs in the evening. Public buildings usually served for religious and political purposes only. Architectural symbolism was utilised by the ruling class in traditional China for divinity worship or emperor worship. The representation of a public building complex relied on the strong axial arrangement of the building group rather than individual buildings.

9.2.1 Architectural philosophies

The most influential philosophies behind the Chinese traditional architectural and urban design, as mentioned in Chapter 1, were the Chinese cosmology, Fengshui, Lizhi, Confucianism and Daoism. The basic principle of Chinese architecture was seeking harmony between manmade objects and nature. Fengshui theory aimed to guide designers how to achieve harmony and take advantages of nature, which was similar to Daoism. Lizhi and Confucianism on the other hand emphasised the ritual sequences and positions of building groups, as well as moral constraints of the society (refer to Chapter 1).

The perception, depiction and realisation of the natural environment for Chinese buildings focused on spatial sequences and potential forces of spaces ('shi'), which could only be aesthetically perceived from inner spaces. An important Chinese public building was usually a building complex, which consisted of a group of buildings arranged in long sequences of movement, for instance, the Forbidden City in Beijing. The arrangement of a public building group created space with strong potential forces ('shi'), because the underlying nature of the universe was explained by the balance between open ('Kai') and close ('He'), void ('Yin') and solid ('Yang') (Zhong, 1986). Thus the alternation of 'Kai' and 'He', 'Yin' and 'Yang', all of which was the 'Shi', were embodied in architecture in order to achieve harmony with the universe. The stronger the 'Shi' experienced by people in their movement was, the stronger the intended symbolic metaphor of the architecture was. Therefore, spaces created by a group of public buildings were more important than buildings themselves.

9.2.2 Architectural forms

Chinese traditional architecture[1] are described by some scholars as below,

> *'The buildings were timber framed, elegantly stabilized by massive tilted tile roofs that often seemed poised in flight above the ground. The buildings were brightly coloured. Cities, towns and emperor's urban palace were oriented and laid out according to cosmic calculation, heaven being considered a round and the earth counterpart to be a square. The huge urban complexes were axial, geometric and built to impress' (Jellicoe and Jellicoe, 1975, p69).*

> *'Chinese architecture relies on axial arrangement, formal cues, and sequencing to establish dominance, for few buildings (aside from watchtowers and pagodas) is over one story tall. More important buildings are elevated on a podium and distinguished by greater size, central location, elaborate ornamentation and timber bracketing, hipped roofs, and symbolic colours schemes (yellow and red), while ordinary buildings are smaller and have simpler framing, gable roofs, and sober (black, brown and white) coloration. Axial governs all composition' (Moffett et al., 2003, p91).*

They all indicated that the main features of Chinese public buildings[2] were symmetrical, axial, timber-made, clearly structured and symbolically decorated. Chinese architecture could be divided into two systems: official buildings (mostly public buildings) built by the government, and vernacular buildings built by ordinary people following their ancestors' experiences (Wood, 1983, Liang, 1998, Xu, 2000, Pan, 2001). The main difference between the two systems was that the official ones

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[1] Chinese traditional architecture mentioned in those scholars' texts mainly refers to public buildings and palaces, because only public buildings were so well designed and constructed. Some wealthy people's private buildings were also carefully designed and constructed, which might appear some of the features mentioned. However, they were not the majority of private buildings.

[2] Those features of Chinese traditional architecture belonged to the Han nation (culture), which is the culture mainstream of China. There are additional 55 nations (culture) in China, each of which has its cultural tradition, for instance, the Mongolian, Tibetan, Manchu and etc. Therefore, their traditional architecture may have different features. The architecture of minority nations was distributed in limited regions in China, which is not examined in this study.

were constructed according to strict rules of proportion, dimension and building details, while the vernacular ones had no absolute measurement but with desirable and practical dimension (Wood, 1983). The measurements of some important public buildings were recorded in a few official publications such as 'Yingzao fashi' ('The methods of architectural construction') (Li, 1103).

9.2.2.1 Characteristics of architectural forms

The characteristics of Chinese traditional public buildings can be summarised in four categories: the plan arrangement; the structural elements; the architectural components; and the ornaments.

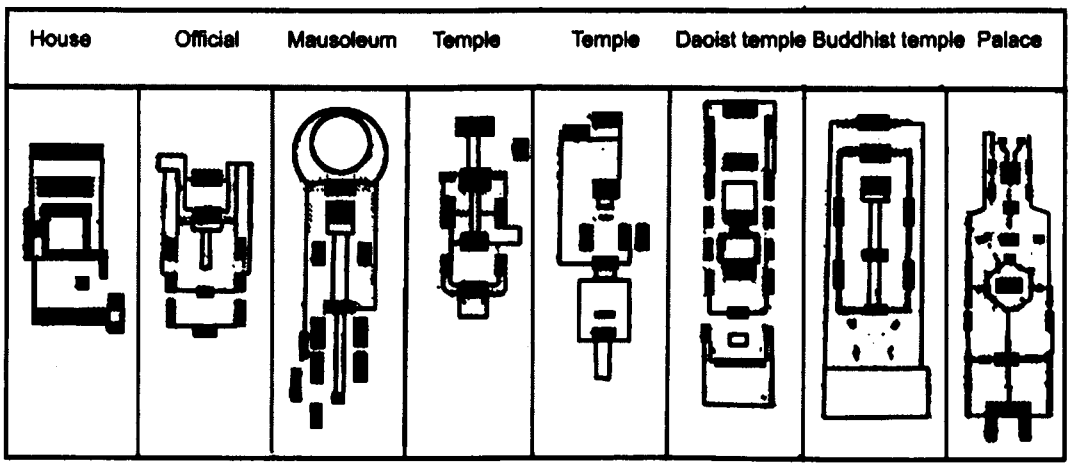

Figure 9.1 Examples of plan arrangement of buildings of different functions (Li, 2005, p78)

'Jian' or bay was the basic unit of measurement for the plan arrangement of single buildings. One 'Jian' was a rectangular space defined by walls or columns. The standardised 'Jian' could be extended along a longitudinal or latitudinal axis to form a hall or a single building. A longer axis, which was usually north-south oriented, connected several single buildings to form a building complex. The measurement of 'Jian' was fixed in official buildings, in which the 'main Jian' ('Mingjian') located in the centre of a building was the widest (3-7 meters)[3], while the rest 'Jians' ('Cijian')

[3] The actual measurement of Jian might be various from building to building in different dynasties. However, a measurement was integer times of a fixed modulus according to the Chinese traditional metric unit 'Chi' or 'Fen'. A comprehensive study of some important traditional public buildings has

were slightly narrower. All 'Jians' were symmetrical along a longitudinal axis (Liu, 1989). In a single building, the number of 'Jian' was odd: three, five, seven or nine. A module of measurements was applied to buildings without much concern of the topography of a site (Di, 1997). Figure 9.1 shows the plan arrangements of groups of buildings serving for different functions, which followed the process of 'Jian—single building—building group' along axes.

In the second category, traditional Chinese architecture mainly had two types of timber structures—Tailiang and Chuandou. Tailiang structure was used widely in both official and vernacular buildings, while Chuandou was mainly in vernacular buildings in south China. In Tailiang structure, columns were installed in stone platforms and beams were placed upon them. The beams were used to support pairs of much shorter columns, set in from the line of the first column and thus giving a smaller span, on which another beam could be placed. This process could be repeated for several times to form a timber truss, named as 'Jujia' (Figure 9.2). The curve of traditional roofs was therefore defined by the structure, which, with appropriate alterations, could also be used in buildings with other plan shapes, such as triangle, pentagon, hexagon or circle. In order to protect timber structures from dampness, the basement of a building was usually driven up, while the height was set according to the importance of the building: the higher the more important.

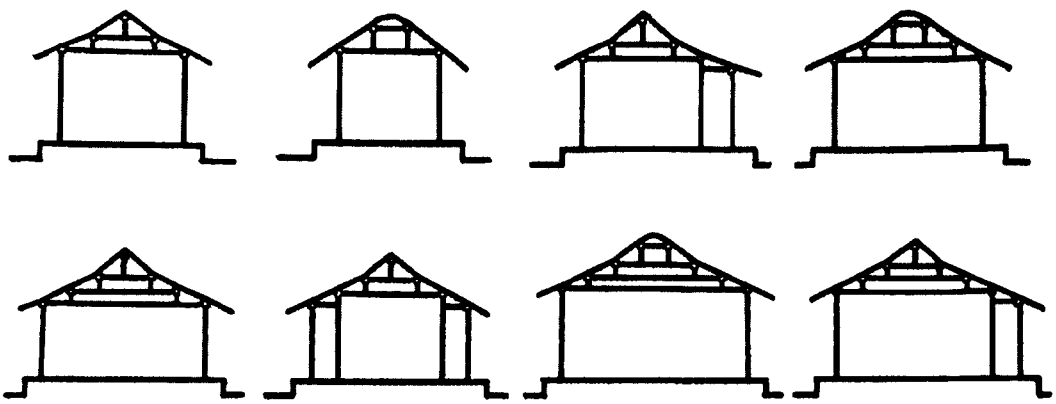

Figure 9.2 Different types of Jujia in Tailiang structure (Silbergeld, 2004, p219)

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been conducted by Fu Xinian FU, X. (2001) *Zhongguo gudai chengshi guihua jianzhu qun buju ji jianzhu sheji fangfa yanjiu (The methodology of the Chinese traditional city planning and architectural design),* Beijing, Zhongguo Jianzhu Gongye Press (China Industry Construction Press)..

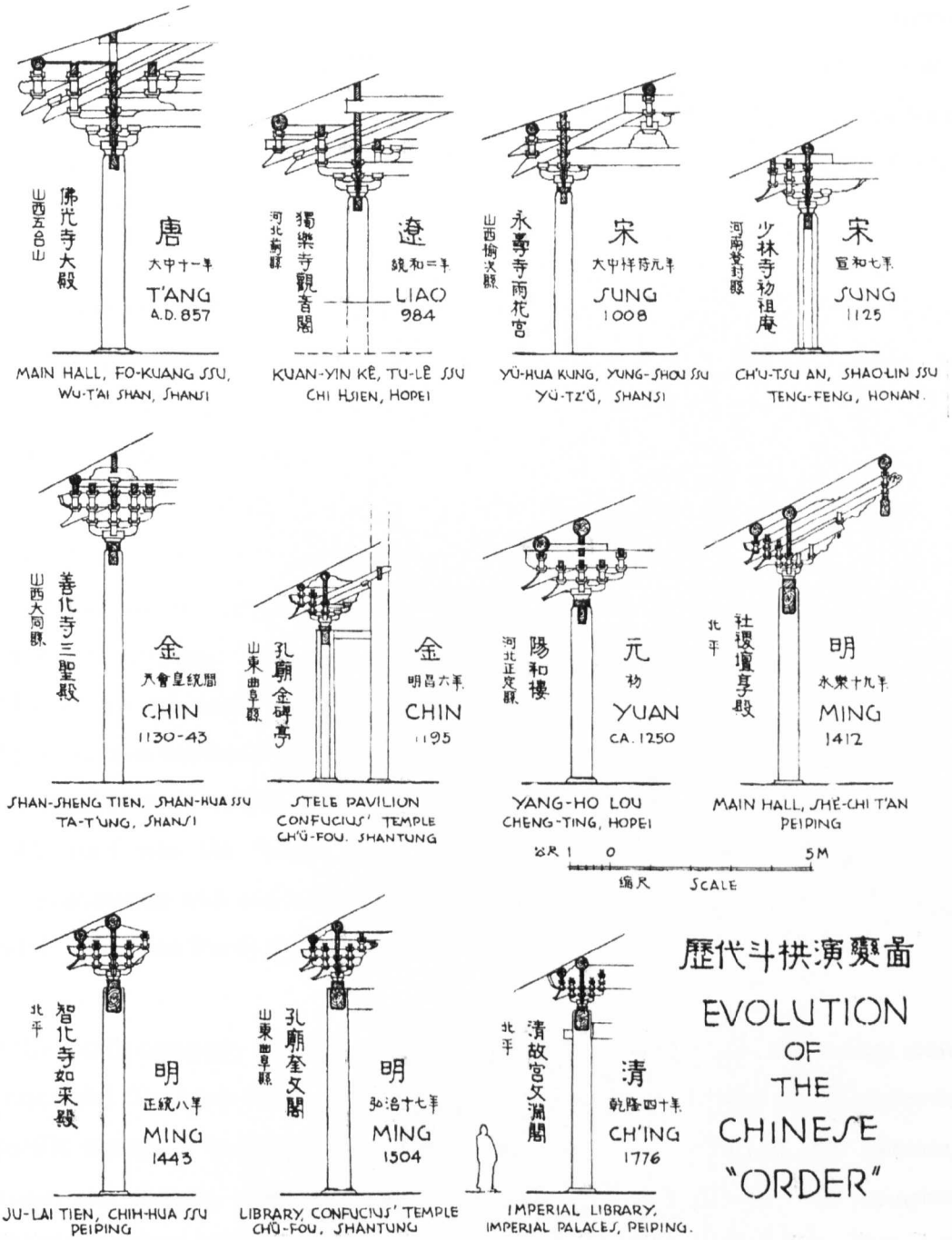

Figure 9.3 The transformation of Dougong in the Chinese architectural history (Liang, 1985, p32)

Furthermore, the bracket-set (Dougong or Chinese Order) was another distinctive structural element to support beams from the end of columns. The Chinese scholar Liang Sicheng (1998) identified the transformation process of Dougong from the Tang Dynasty (850s) to the Qing Dynasty (18th C) (Figure 9.3). It is widely

acknowledged in China that the complex structure of Dougong indicated the highest achievement of timber structural technique in history. However, it transferred to be a special ornament gradually, and the form of Dougong was altered from the structural necessary to be multifarious decorations in order to show off the importance of a public building in later dynasties.

In the third category of traditional public architectural characteristics, roofs were the most unique component. There were four basic types of roofs representing the degrees of importance of relevant buildings. The first one was called Wudian roof (hip roof), which was used in highly important buildings, such as the main hall of a temple or the throne halls of a palace. Since the Jin and Yuan Dynasties, the double-eave Wudian roof was employed in the most important building within a building group. The second was Xieshan roof (half-hip roof), which was used in secondarily important buildings. Similarly, the double-eave Xieshan roof was employed in a building that was more important than the building with the Xieshan roof but less important than the building with the Wudian roof. The Cuanjian roof (conical roof) was the third type, which was usually used in ordinary buildings such as pavilions. Gable roof was the fourth type, which had two sub-types according to the interrelationship with end walls—hanging over the wall (Xuanshan roof) or flushing with it (Yingshan Roof) (Figure 9.4).

In the fourth category, carved decorations and colours used in public buildings were meaningful. The basic idea was that specific ornaments and colours were allocated to specific classes of buildings, and used by specific classes of people. For instance, dragon and phoenix were in relation to palaces used by emperors. The metaphor behind the pattern of dragon and phoenix was power, divinity and eternity. This kind of ornament would never appear in an ordinary building. There were certainly some changes of ornaments and colours in long history. For example, the most prestige colour in the Chuiqiu era (770-476 BC) was red, while bright yellow was the most prestige one in the Qing Dynasty (1644-1911), which were only applied to imperial architecture or instruments. However, the idea of gradations of ornaments and colours according to social classes never changed in the feudal China. Furthermore,

ornaments and colours implied people's superstitious desire for luck, fortune and health in every social class. For example, there were usually sculptures of lucky animals such as horses, lions, birds, kylins at tile ends of roofs. The ornamentation system of traditional public buildings was well developed and maintained in history.

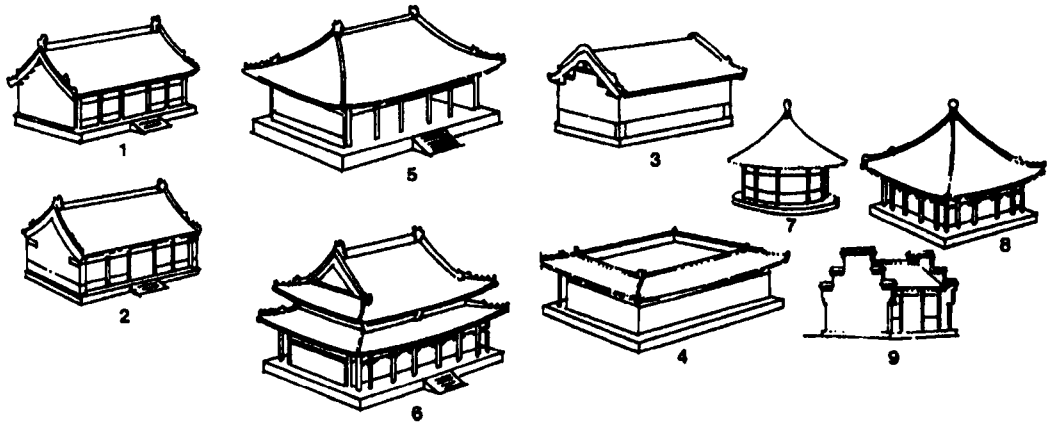

Figure 9.4 Roof types of Chinese traditional architecture: 1: Xuanshan roof; 2: Yingshan roof; 3: Juanpeng roof (minority); 4: Luding roof (minority); 5: Wudian roof; 6: Double-eave Xueshan roof; 7 & 8: Cuanjian roof; 9: Gable roof with parapet wall (Liu, 1989, p32)

9.2.2.2 Single building types

There were five principal public building types[4] which could be built either independently or as parts of a building group in traditional China: pavilions ('Ting'), terraces ('Tai'), storied buildings ('Lou'), pagodas ('Ta') and ritual gates ('Paifang').

Pavilions were typical in garden designs and usually made of wood, bamboo and stones. A pavilion had no walls but supportive columns to define the space. Its plan could be in square, triangle, hexagon, octagon, a five-petal flower shape or a fan shape, and had Cuanjian roofs. A pavilion was built usually for three purposes: firstly, to create solid space in gardens as opposite to void landscape; secondly, to provide weary wayfarers a place for rest: 'cooling kiosk'; thirdly, to protect a stone tablet which recorded important information about historical events or master piece calligraphy. In contemporary cities, pavilion-like structures accommodate postal stalls or small retail shops.

[4] Roofed corridors which usually connected single buildings to form a building group or building complex was not considered as a building type but a structural component of buildings in this thesis.

A terrace was a structure with flat top in great sizes, which was built from clay, stones or bricks. A terrace was for people to view landscape from a distance. Therefore, terraces were usually built in broad landscapes or imperial gardens. In some cases, a storied building stood on the top of a terrace.

Storied buildings were the most popular type among all types of traditional public buildings in China. The majority of single buildings that formed a public building complex belonged to this type, and was one story high. They could also be two or three stories high and thus became 'towers'. The majority of one-story buildings accommodated most of public functions, while towers were built either as a belvedere on the top of terraces or as drum or bell towers or libraries.

Pagodas were normally located in temples, which were perceived as religious symbols. A pagoda was similar to a multi-story pavilion, but had solid side walls, windows and doors. The technique of building tall timber buildings was well developed in historical China so that wooden frameworks were bale to joint together through Dougongs without using metal. In a temple, the pagoda was placed in the backyard as an essential component of the temple complex, and housing important lections and documents of the temple. In some cases, a pagoda was built on top of a mountain in order to enhance its potential force ('Shi') and provide space for long distance viewing.

The fifth building type—the ritual gate derived from the gates of Lifangs. Despite the Lifang system had been abandoned, exaggerated gates without their original function were kept to celebrate the ritual order in society. Those gates were decorated with ritual patterns and characters. A gate usually had four well-carved columns disposed along one direction and connected by short beams. A ritual gate was built after an admirable ritual event or a moral people's emergence in neighbourhoods. Nowadays, ritual gates were used to represent 'China towns' in foreign countries as a distinctive traditional piece of Chinese architecture.

Traditional Chinese public buildings were constituted by the five single building types with the four categories of characteristics. They functioned as palaces, temples, schools, guilds and drum or bell towers in traditional Chinese cities. Their forms were largely similar since they formed by very limited single building types at a large scale (Xu, 2000, Pan, 2001, Qin, 2006). Private buildings sometimes also had some similar characteristics (Chapter 10). As a result, urban forms of traditional Chinese cities were harmonious and coherent.

9.2.3 The development of Chinese architectural theory of public building design

Architecture was considered as a consumable product in Chinese history rather than an artwork or permanent artefact as that was in the western culture. The absence of historical architectural theory in China is widely acknowledged by many scholars (Lai, 2005). However, architectural technology was greatly developed from generations to generations. Important techniques and measurements of public buildings were recorded in official literature as references for buildings in later generations, for instance, the aforementioned *Artificers' Record* (11^{th} C BC) and *Yingzao Fashi ('The methods of architecture construction'*(Li, 1103). Apart from these two, there were several others, such as *Yuan Ye ('Garden design', 1631)* by Ji Cheng in the Ming Dynasty which concluded design principles of gardens; *Yingzao Fayuan ('The rationale of architectural construction')* by Yao Chengzu in the late Qing Dynasty which recorded architectural techniques in the Yangtze delta region and so forth. Furthermore, there were many famous architectural craftsmen in history whose buildings had not been recorded literally, for example, Lu Ban (450s BC) in the Chuiqiu era (776-476 BC), Yu Wenkai (580s) and Li Chun (610s) in the Sui Dynasty (581-618), Kuai Xiang (1398-1481) in the Ming Dynasty (1368-1644) and a family of craftsmen--Yangshi Lei in the Qing Dynasty. Craftsmen usually took charge of entire building processes from design to construction without theoretic guidelines. The feudal governments set a specific bureau to take responsibilities of national projects, and craftsmen were promoted as officers.

During the early twentieth century, along with the perdition of the feudal regime, Chinese architectural theory, particularly in relation to public buildings, began to shape and influence building forms. The first generation of Chinese architects and

theorists such as Liang Sicheng (1901-72) and Liu Dunzheng (1879-1968), who were educated in American and Japanese universities respectively, brought western architectural theories and education system[5] into China, meanwhile, they were trying to integrate western theories and architectural forms with Chinese traditional building forms. Promoted by Zhu Qichen (1872-1962), the first domestic organisation for systematic research on traditional architecture—the Society for Research on Chinese Architecture (SRCA, Yinzao Xueshe) were found in 1929-30 (Whitehand and Gu, 2006). The organisation conducted many field surveys on techniques and literature of traditional Chinese architecture and gardens, and founded a professional journal—*The Journal of the Society for Research on Chinese Architecture (Zhongguo yingzao xuehui huikuan)*. Various drawings, ideas and debates[6] emerged in the 1930s and afterwards until the Anti-Japanese War and the Civic War.

The organisation and the first generation of Chinese architects continuously made their effort after the P.R. China was founded. Economic and functional concern about architecture was specially paid due to the urgent needs of the country recovering from wars in the 1950s. Meanwhile, the Soviet influence was so strong that designs followed principles such as 'socialist realist creative method', 'socialist contents and national form' and etc (Di, 1997). Some other architectural publications and journals appeared in this period positively facilitated debates and discussions on architecture. A contestable topic was about the 'New and Chinese' architectural form promoted by Liang Sicheng. He explained that the 'new' was the socialist content of architecture,

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[5] Liang Sicheng founded the architectural school in high education in the University of Qinghua in Beijing, while Liu Dunzheng found the architectural school in the Southeast University in Nanjing. They are the first architectural educational institutes in the nation, which almost followed the western educational mechanism.

[6] Detailed literature review on this issue will not be included in this thesis. Relevant research has been done by many other scholars, such as Di Hongbo DI, H. (1997) The Incorporation of Features of Traditional Chinese Architecture in Modern Buildings in the People's Republic of China. *Faculty of Architecture.* Sheffield, University of Sheffield.; Whitehand and Gu WHITEHAND, J. W. R. & GU, K. (2006) Research on Chinese Urban Form: Retrospect and Prospect. *Process in Human Geography* 30, pp1-18..

while the 'Chinese' form was in 'national style'. It drew lots of criticism because firstly, socialist content of architecture was hardly defined; secondly, architecture in national style was regarded to be a backward attitude as opposite to social development; and thirdly, it was technically unnecessary and cost too much if the elements of traditional architecture such as Dougong were copied. In the light of this debate, both of new architecture with traditional features and without appeared during the 1950s and 1970s. The pursuance of 'national style' reflected the need of self-identity and searching for the position of new China in the world (Di, 1997, Lai, 2005).

The development of architectural theory in China was stagnant during the period of the 'Cultural Revolution' due to the prohibition of free thoughts and ideas. Only until the last three decades, the development was progressing. Debates in relation to pluralism and culture in the field of architectural form were extremely active. One argued that Chinese contemporary architecture should be diverse rather than in a single approach, and architecture is about both technology and art. Furthermore, the national characteristics and local features needed to be preserved and continued in new design (Dai, 1989, Wu, 1999). In 1986, the central government published the policy in order to protect and regenerate historical cultural heritages (Ruan and Liu, 2005, Chen, 2006) (Chapter 3). In addition, western architectural theories of post-modernism, rationalism, regionalism and so forth were introduced to China in recent years, and also brought arguments and implementations.

In short, traditional Chinese architectural theory was more technical oriented. New Chinese architecture in the 20th century was continually searching for the right way of integrating the national and regional characteristics with new technologies and western theories. The Chinese tradition of architectural form is never abandoned completely, and it draws more and more attention from scholars nowadays.

9.3 Public buildings in the historical period (--1860s)

Within the over 2500 years' urban history, Nanjing had great palaces, temples, mausoleums and gardens, for instance, the earliest palace—Taichu Palace (248); and

Zhulin Temple, Dinglin Temple, Qingyuan Temple, Yanlin Temple, Yongfeng Temple, Nanlin Temple in the 420s; buildings of Shanglin Yuan garden (459), the pagoda of Xixia Temple (601), Guozi Jian (national school) (1365), Drum Tower and Bell Tower (the 1360s) and other great public buildings (Zhuang and Zhang, 2002). However, these building complexes were almost demolished in wars of the alternation of dynasties. The existing historical public buildings in the current city normally date to the Ming and Qing Dynasties, many of which have been refurnished and renewed in recent years. Such public buildings are the historical City Wall (1371), the Ancestor's Temple (1373), Yuejiang Tower (1374), Xiaolin (the emperor's mausoleum) and etc. Among public buildings built in the first period, the Confucian Temple, Presidential Palace and the City Wall of the Ming Dynasty are selected to illustrate the characteristics of traditional public buildings in Nanjing, because they are main attractions in the city nowadays due to their well-preserved traditional features.

9.3.1 The Confucian Temple

The Confucian Temple was located at the riverbank of Qinghuai River. The temple functioned as both a worship place of the Confucius and a school when it was built as 'Jiankang Fuxue' ('official school of Jiankang') in 1034-38. The temple today was rebuilt based on its original arrangement in 1984-6 by the municipal government, and its function changed to become a museum of the Confucius. The temple consists of a group of single buildings settings along a clear central axis. From the south to the north, they are the Great Zhaobi (image display wall), Ban hu (lake combining Qinghuai River), stone balustrade, Paifang (symbolic gate), Juxing Gate (stone-made symbolic gate), Dacheng Gate (roofed gate), Dacheng Dian (the main hall), Mingde Tang (the second hall), Zunjing Ge (pagoda) (Figure 9.5). There are also several side halls, together with the main ones, forming a sequence of courtyards.

The axial sequence is important for the temple and there are five elements in the sequence before[7] it reaches the main hall as preludes in a piece of symphony. The

[7] The axis is considered as starting from the south to the north. Therefore, elements on the south of the main hall are 'before', while elements on the north of the main hall are 'after'.

potential force of the building therefore can be created by the sequence. It starts with the image display wall decorated with dragons and lanterns opposite to the water. The two symbolic gates (Figure 9.6) are made of different materials. Despite none of them stands for original ritual meanings, they become necessary components of the public building complex. The main hall (Figure 9.7), which accommodates the steles of the Confucian ideas and stories, is rectangle, 27.3 meters deep, 20.9 meters wide, and 17.22 meters high. It has seven Jians and six bays, in which the main Jian is 5 meters wide and the related bay is 7.2 meters long (Yang, 1993). The main hall is built on a raised terrace, and has a dual-eave Xieshan roof, which indicates its high importance. Ornaments and colours of the exterior and interior spaces of the main hall are exquisite and bright. The second hall—Mingde Tang behind the main hall, is more modest both in terms of dimension and decoration than that of the main hall. These two halls are connected by roofed corridors. In addition, there is a pagoda at the end of the sequence.

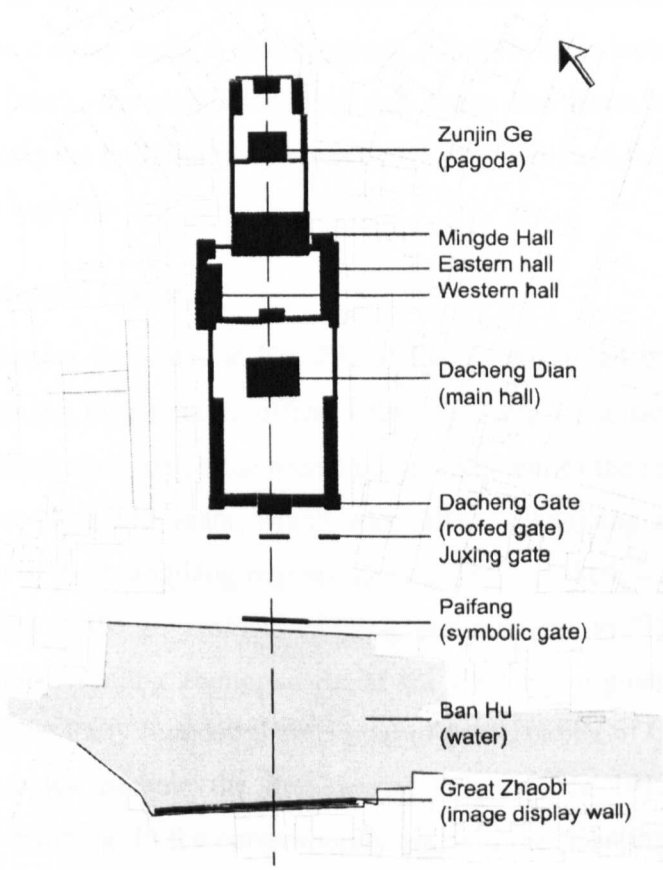

Figure 9.5 The plan configuration of the Confucian Temple (by the author)

Figure 9.6 The Juxing Gate on the Confucian temple square in front of the Dacheng Gate (left, photography by the author)

Figure 9.7 Dacheng Dian--the main hall of the building complex (right, photography by the author)

The potential force of the temple is not formed by single buildings but by the sequence. The building complex is constituted by three single building types: symbolic gate, hall and pagoda, as well as other structural components such as roofed corridors and the display wall. A public square (Chapter 8) is included in the axial sequence, as a result, the public building and space has direct relationship. The public space allows the building to be appreciated very well, and they create a strong identity of place together.

9.3.2 The Presidential Palace

The building complex is located at No. 292 of Changjiang Road of Nanjing. It was originally built as the high-ranking officer Chen Youliang's mansion in 1368 in the Ming Dynasty. It accommodated the municipal government of the region in the Qing Dynasty for more than 250 years, which was called 'Liangjiang zongdu shu' (the viceroy's bureau of the Liangjiang region). During 1853 to 1864, it was occupied by the insurrectionists of the government of Qing, and renamed as 'Tianwang fu' (the palace of the king) (Nanjing zhongguo jindai shi yizhi bowu guan, 2005, p56-60). After the Nationalist Party founded their capital of the Republic of China in Nanjing, the building complex became the Presidential Palace since 1912, and therefore became a public building. In the contemporary era, it is the 'Nanjing jindai shi bowu guan' (the museum of Chinese modern history of Nanjing).

During the historical period, the palace was altered and rebuilt several times by different occupiers. However, the basic plan arrangement of the complex was maintained (Figure 9.8). At present, the palace has six almost north-south oriented parallel axes. The second one on the west going through a garden called 'Xiyuan', while the second one on the east is the main axis. The dimension of 'Jians' of the halls along the main axis is bigger than that along the other axes. The main sequence of the building complex starts from the gate in western style as a replacement of the original Paifang (symbolic gate). A large courtyard follows the gate in the sequence and in front of the main hall. The last two halls are replaced by modern buildings in the 1910s, the front one of which has a Chinese Xieshan roof, and the back one is entirely modern-looking. Some single buildings in other axes are also replaced by modern buildings in similar volumes of historical ones (Figure 9.9).

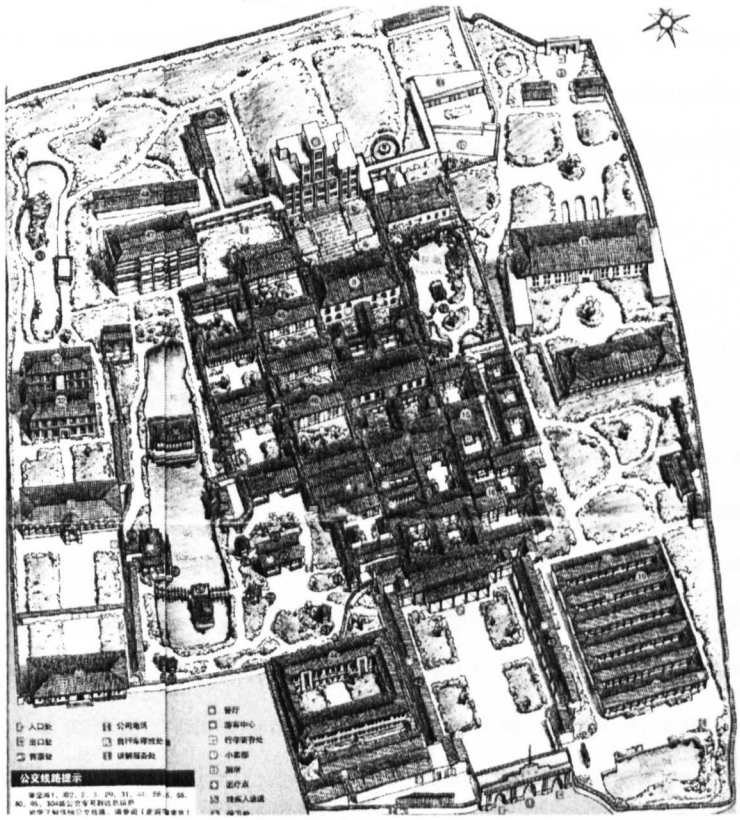

Figure 9.8 Bird's eye view of the Presidential Palace (Nanjing zhongguo jindai shi yizhi bowu guan and Nanjing shi cehui kancha yanjiu yuan youxian gongsi, 2005)

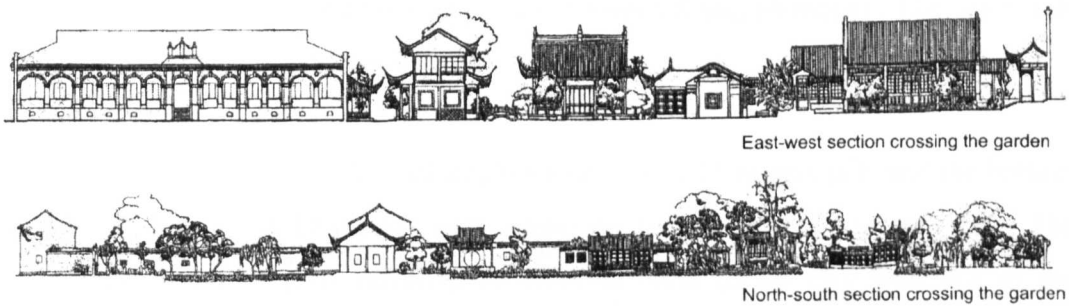

Figure 9.9 Sections of the Presidential Palace (Ding, 2003, p90)

Like the layout of Confucian Temple, the layout of Presidential Palace also shows that the sequence of a traditional public building complex is more important than individual buildings. The layout of the palace is tolerant to changes of individual building types, and the garden is harmoniously integrated. Differing from the Confucian Temple, the palace is enclosed by walls. Individual buildings within the group are also less magnificent than those of the temple, because the building complex was originally built as a private mansion. From that comparison, traditional Chinese architectural forms of public buildings and large private buildings had some similarities, especially in terms of the plan arrangement.

9.3.3 The City Wall

City walls were special public constructions in many historical Chinese cities as necessary defensive structures, which normally also defined the territories of cities. The first emperor of the Ming Dynasty, Zhu Yuanzhang had built the main city wall of Nanjing by connecting the fragments of walls built by emperors of previous dynasties in 1366-86 (Jiang, 2006, Zhang, 2006). The circular wall took full advantages of the geography of Nanjing, going through Zhong Mountain and Xuanwu Lake on the north, the Rock Mountains and Yangtze River on the west. During 1390, the emperor commanded to build an outer circular wall which enclosed the main wall and a broader territory for more intensive defence (Figure 9.10). However, along with the death of the emperor, the massive construction left unfinished because his continuator decided to move the capital to Beijing (Yang, 1993). The uncompleted outer wall was sixty kilometres long and consisted of eighteen gates. It was made of mud, in a trapezium section, in which the top was

between 6 and 8 meters and the bottom was between 8 and 10 meters. The outer wall has been almost demolished nowadays.

The main city wall was 35.267 kilometres long, 14 to 21 meters tall, and the bottom of the wall was about 14 meters wide, while the top was about 9 meters wide. The measurements are slightly different in different parts of the city wall due to the topography and different defensive demands. The total length of the remaining fragments of the city wall is 25.091 kilometres by 2006 (Zhang, 2006) (Figure 9.11). The main wall was made of specially baked bricks and had thirteen gates[8]. The city gates become important landmarks of Nanjing nowadays.

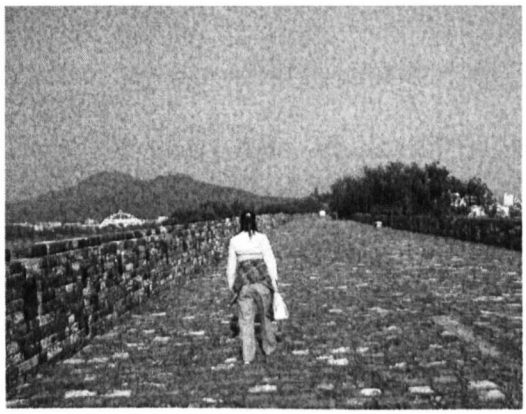

Figure 9.10 The plan of the outer city wall and main city wall (Zhuang and Zhang, 2002, p132)
Figure 9.11 On the top of the main city wall near the Xuanwu Gate (right, photography by the author)

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[8] The thirteen gates, in the clockwise sequence, are the Chaoyang Gate on the east, Zhengyang Gate, Tongji Gate, Jubao Gate (Zhonghua Gate as today's name), Sanshan Gate, Shicheng Gate, Qingliang Gate, Dinghuai Gate, Yifeng Gate, Zhonggao Gate, Jinchuan Gate, Shence Gate (Heping Gate as today's name) and Taiping Gate. Only four gates have kept their original names nowadays. Later in the Qing Dynasty and the era of Republic of China, more city gates have been built due to the high transport demands, for instance, the Caochang Gate and Fengrun Gate (Xuanwu Gate as today's name) have been built in the 1880s, whilst Hailing Gate (Yijiang Gate as today's name), Wuding Gate, Hanzhong Gate and Zhongyang Gate have been constructed in the 1920s to 1930s YANG, K. (1993) *Zhongguo gudai ducheng zhidu shi yanjiu(The Research on the Building History of the Chinese Historical Capital Cities),* Shanghai, Shanghai Guji Press. P.209-10.

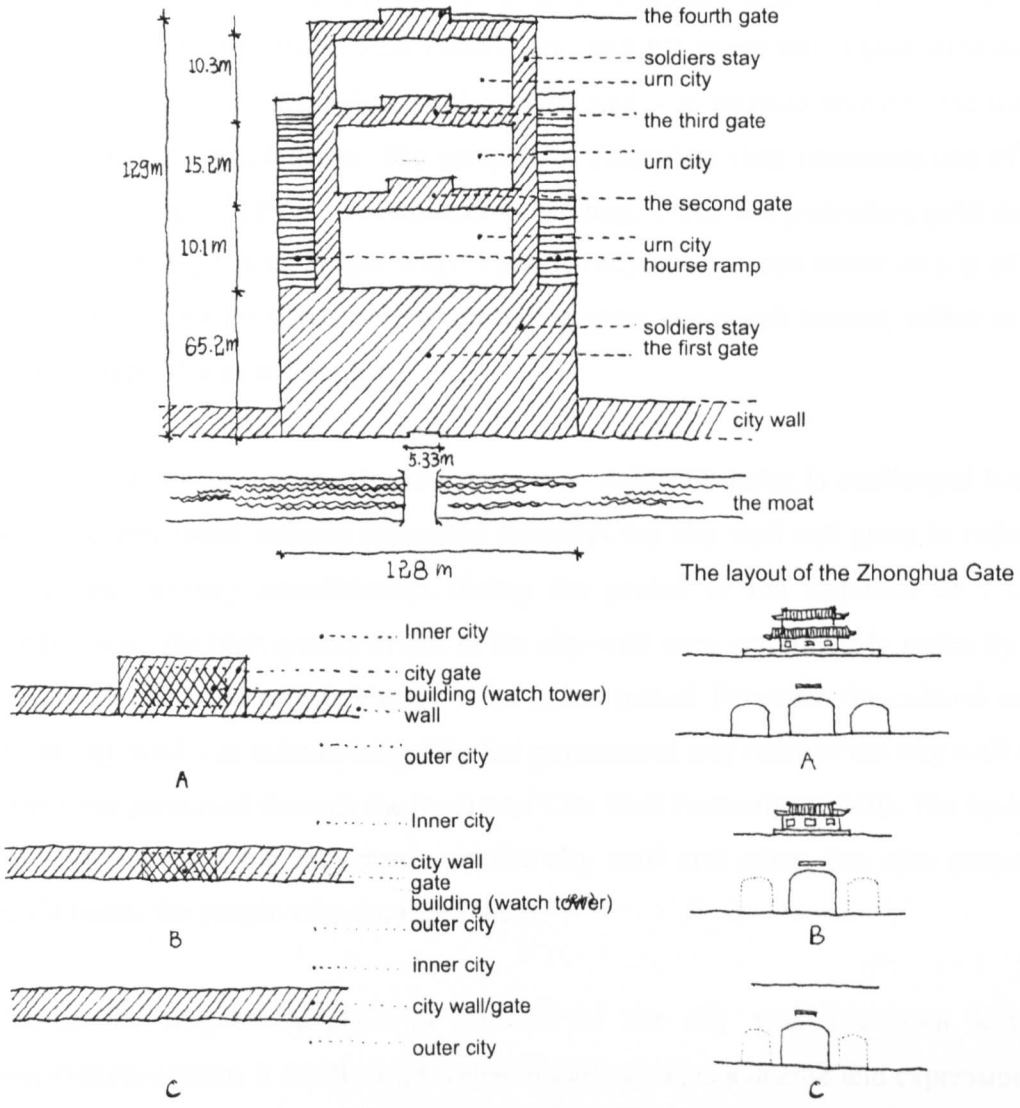

Figure 9.12 The layout of the Zhonghua Gate, and the three types of gate complexes in Nanjing (by the author)

The layout of the Zhonghua Gate and its adjacent city wall was well designed as a complex structure for defensive purposes (Figure 9.12). The gate was located in the south edge of the city and was 128 meters wide, 129 meters long, 20.45 meters tall, and 16512 square meters. The gate complex consisted of four-fold gates, each of which was made of heavy wood with metal finish to prevent fire, and three parts (urn city), which contained seven halls that could accommodate about one thousand soldiers for them for approximate three months during wars. There was a watch

tower on the top of the wall, which however were destroyed in history. The outmost gate was 5.33 meters wide, 52.6 meters long and 8.7 meter tall. There were horse ramps on the east and west sides of the gate complex to provide access to the top of the wall and the watch tower. The complex of Zhonghua Gate represents one of the three basic types of city gate complexes in Nanjing, which has protruding gates and a watch tower (type A in Figure 9.12). Type B only has a watch tower on top of the city wall, while type C has neither protuding gates nor watch towers, which is the simplest type of a gate complex.

The survival of the historically important city walls and gates is challenged today. Some governmental officers suggested demolish the city wall and gates in order to build new military establishment during the period of the Republic of China. Furthermore, the high quality bricks of the city wall were continuously stolen by the local people to build private houses in the unrest period. However, the cultural value of the city wall was acknowledged by the government and most of the city wall and gates were preserved through the by-law of City Wall Protection (1940). The by-law[9] not only signified the importance of the city wall and gates, but also proposed punishments for people who damaged them.

Despite the original function of defence of the city wall has been lost in contemporary times, it has the high value of cultural representation and expression of technical achievement of ancient China. It contributes to the identity and imageability of the place and carries the social collective memory. Therefore, the city wall is a precious public building and space in Nanjing, although it is facing several

[9] The by-law of city wall protection stated that: first, the bricks of city wall which have been used in private building construction should be reported to the government; second, buildings which have used the bricks of the city wall should be pulled down and the government would pay for the return of those bricks; third, a certificate is needed for moving bricks of the city wall, otherwise, it is a crime to move them; fourth, any person who destroy the bricks of the city wall will be fined for less than 1,000 Yuan; fifth, any person who steals or sell the bricks will be put into prison for more than six months, less than three years (Resource is from Archive number 2013 (7), record number 1041, the Second Historical Archive of China).

challenges at present. For instance, some parts of it have been damaged, and the management of conservation of the city wall is chaotic (Huang, 2003).

To sum up, traditional public buildings in Nanjing showed very similar characteristics to the general Chinese historical architecture mentioned in the Chinese context. They were outlined in the four categories as the plan arrangement, structural elements, building components and ornamentations. The architectural forms of public buildings with different functions were similar. Through the examination of three examples of public buildings in Nanjing, the relationship between a building and its urban space has been illustrated: traditional public buildings included public open spaces in their sequences, or were closely connected to open spaces, and as a result, were easily accessible.

9.4 Public buildings in the modern period (1860s-1949)

Influenced by the western advanced technology in industry and military in the end of nineteenth century and early twentieth century, the Chinese society began to change. As mentioned before, the national-wide debate on appropriate architectural forms in China was undergoing in the period of the Republic of China. Along with the launch of the 'Capital City Planning Scheme' in 1929, the appropriate architectural form was proposed to embody the Chinese traditional or classic features, and to follow the western beaux-art principle in plan arrangement, which was called 'Xiti zhongyong' (Li and Xiong, 2003, p52). The government intended to show their wise leadership and a bright blueprint of the new nation through the planning scheme as a start of rapid development. Public buildings such as governmental offices, museums, theatres, libraries, hospitals and etc were proposed to be built, as well as many public open spaces (refer to Chapter 8). As a result, the image of the traditional Nanjing dramatically changed.

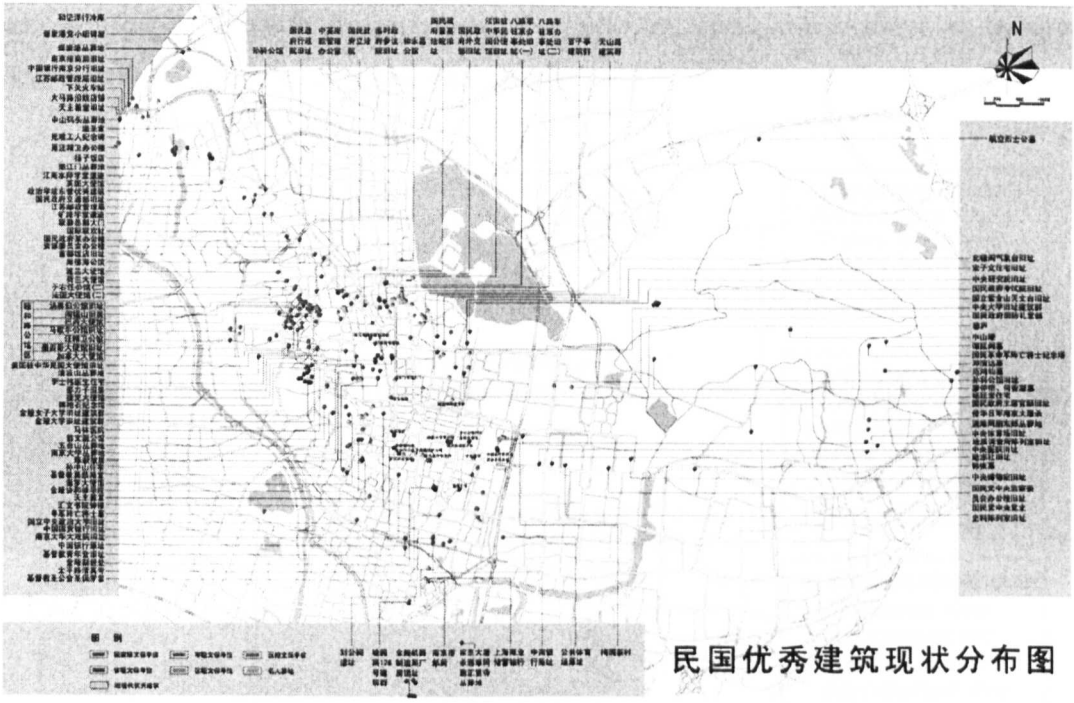

Figure 9.13 Locations of buildings built in the period of the Republic of China in Nanjing (resource is from the City Planning Bureau of Nanjing, 2005)

Public buildings built in this period existing today were mostly distributed along the boulevards—the Northern Zhongshan road, Zhongshan road and the Eastern Zhongshan road (Figure 9.13). In order to reveal the characteristics of public buildings in this period, those public buildings are classified into five categories by the author according to the ways their appearances are shaped, which are: a) 'buildings followed the western classical model' (Table 9.1); b) 'buildings followed the western eclectic model' (Table 9.2); c) 'buildings incorporated with both Chinese and western characteristics' (Table 9.3); d) 'modernist buildings combining Chinese features' (Table 9.4); and pure e) 'modernist buildings'[10]. The categories and features

[10] Stylistic terms are employed here because the appearances of public buildings are essential to the identity and imageability of the city. In relation to urban design, the relationship between buildings and public open spaces is also clarified. The definition and explanation of those stylistic terms can be found in many books on architectural history, for instance KIDNEY, W. C. (1974) *The architecture of choice: Eclecticsm in America, 1880-1910,* New York, George Braziller, SUMMERSON, J. (1980) *The classical language of architecture,* London, Thames & Hudson Ltd. The term 'style' relates to material, construction and decoration, which, in aesthetics, is the signal character and a mode of expression of a nation or an epoch (Wiegmann, R. 1829, cited from MALLGRAVE, H. F. (Ed.) (2006)

are outlined in Figure 9.14. One or two examples are illustrated to show the features and buildings' relations to public open spaces.

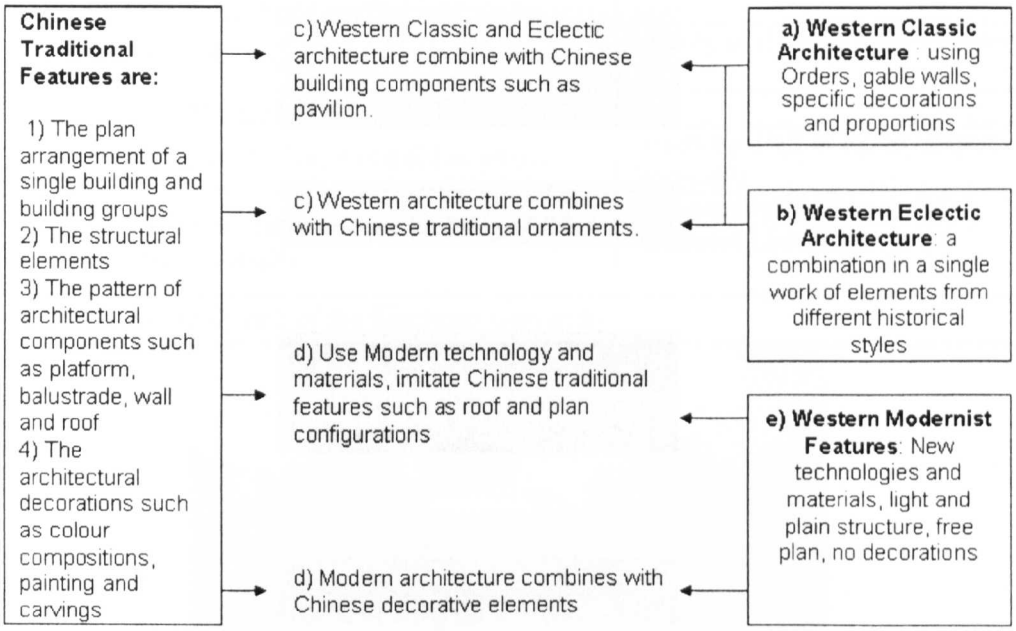

Figure 9.14 The five categories and the ways how the appearances of public buildings are formed in the second period (by the author)

9.4.1 Buildings in Category a

Buildings in the first category were located in several universities of Nanjing, which were built in the 1920s and the 1930s. The western classical language of architecture had been applied to those buildings. For instance, the assembly hall of the Southeast University had a dome, a gable pediment and Ionic Orders on its façade. It was designed by 'Gonghe Yanghang' (British architects' studio) in 1930 and finished in 1931. The building had three floors and a total area of 4320 square meters, which was 34 meters high, and able to accommodate 2700 people for performances and

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Architectural theory: Volume 1 an anthology from Vitruvius to 1870, Oxford, Blackwell Publishing. P411). Therefore, the stylistic categories in this chapter are not identical to building types. Building types of those public buildings could be more than five depending on the criteria of classification. The purpose of using the five categories is to focus on the issue of identity of the city and to simplify the typological analysis of public buildings, which otherwise can be far beyond the length of a chapter. More discussion is at the end of this chapter.

conferences. It becomes the landmark building of the university later. It is free-standing on the middle of the central axis of the university campus.

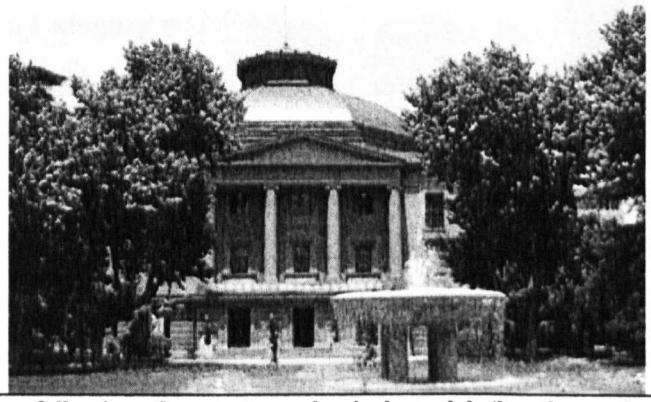
Year	Original name	Current name
1922	Sports centre of the Central University	
1922-24	Mengfang Library of the Central University	Library of the Southeast University
1929	Biology Building of the Central University	
1930-31	Assembly Hall of the Central University	Assembly Hall of the Southeast University
	Architectural Departmental building of the Central University	Architectural School of the Southeast University
Example: the assembly hall of the Southeast University		
		

Table 9.1 Buildings following the western classical model (by the author, picture is from www.seu.edu.cn/seuc/xxqk/seua2.htm)

9.4.2 Buildings in Category b

There were a small number of buildings in the second category, which included a church, the Drum Tower and several governmental offices. In Table 9.2, the gate of the Navy Department building was in the Baroque or Rococo style, while the gate of the Presidential Palace was constituted by the Orders, arches and a flat roof. Despite the two gates were wrapped with western skins, they functioned as traditional symbolic gates, which was leading a main axis connecting major buildings in their groups.

1870	Catholic church on the Shigu Road	
1888	Drum tower in the Huiwen School	
1909	Jiangsu Ziyi Ju (Jiangsu Information and Consulting department building)	
1920s	The Navy Department of the central government	Partly demolished
Example: the gate of the Navy Department (left) & gate of the Presidential Palace (right)		

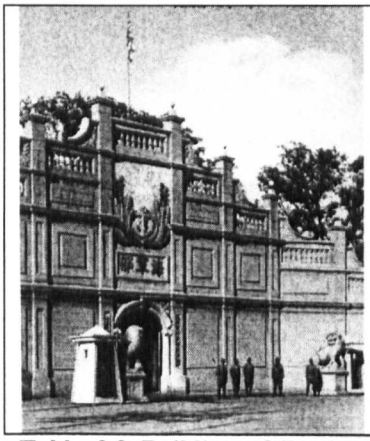


Table 9.2 Buildings following the western eclectic model (by the author, pictures are from (Huang, 2001)

9.4.3 Buildings in Category c

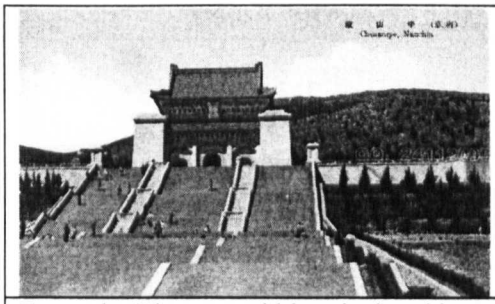
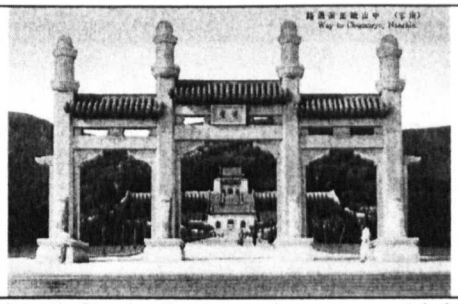
The majority of public buildings built in this period combined either western classical or eclectic features with Chinese traditional features in terms of plan, structure, building components and ornamentation, reflecting the architectural mainstream at that time. The mausoleum of the founder of the Republic regime—Sun Zhongshan was a good example of buildings in Category c (Table 9.3). The design of the mausoleum aimed to represent Sun's ideal of 'Sanming Zhuyi', which were livehood, democracy and nationalism.

A design competition was held by the government to invite international designers to search for the symbolic discourse of the Chinese modernity in May 1925. The architect Lv Yangzhi, who was educated in the US, won the competition with his symbolic bell-shape plan of the mausoleum and building compositions incorporating with both Chinese and western architectural features. The bell-shape plan, which implied to wake up people, consisted of a sequence of single buildings as a building group consisted of a symbolic gate, stairway to the ceremony hall, the ceremony hall and the tomb. The grand stairway was 100 feet wide and 550 feet long leading to the two halls along a rising axis. The mausoleum was located in the south slope of Zhong Mountain, where the natural landscape was magnificent and was included into the sequence. The plan arrangement of the mausoleum followed the Chinese tradition very well, and fulfilled the function of holding ceremonies and paying worship to the leader.

At a smaller scale, the layout of the ceremony hall and the tomb referred to the arrangement of the Lincoln Memorial, where the coffin was placed in a sunken circular space in the end with white marble balustrades. The façade of the building employed the Roman triumphal-arch tradition in terms of proportions (Lai, 2005). The interior design of the halls was in western style as well. Furthermore, Chinese features were also employed, such as the Xieshan roof, the dimension of the hall, which was five 'Jians' and five bays, the bracket-sets of Dougong and some ornamentations.

The mausoleum was the first attempt to look for the appropriate national identity of architecture in China in the modern period, which not only represent Sun's ideology of republic and modernity, but also the ideal of Chinese architectural renascences (Wang, 2003). To represent monumentality and eternity, the traditional axial sequence and the grand roof were the best choices. On the contrary, traditional Chinese building plan was no longer suitable for the functional demand of the mausoleum. Therefore, western layout and the solid base underneath the Chinese roof were created (Table 9.3).

1917-26	Assembly Hall, tutorial buildings in Jinling University	
1922-34	Jinling Female University	
1926-29	The Sun Yat-sen Mausoleum	
1928	Building of the Railway Department	
1929	Lizhi She	
1931	Geographical research department of the Central research Institute	
1931	President's residence at the xiaohong Mountain	
1931-33	Tan Yankai Mausoleum	
1931-36	Memorial buildings of the soldiers of the national revolution	
1933	Offices of the Transportation Department	
1935-36	Library building of the Sun Yat-sen Mausoleum	
1935-36	Central censorial committee building	
1935-36	The archive building of the Nationalist Party	The Second Historical Archive of China
1947	Central research Institute office building	
1936-48	Preparation committee for the national museum	
Example: The Mausoleum of Sun Zhongshan: the ceremony hall (left) and the symbolic gate		

Example: The second historical archive of China (left); the Railway department (right)


Table 9.3 Buildings incorporating with both Chinese and western characteristics (by the author, pictures are from (Huang, 2001, p48-9)

9.4.4 Buildings in Category d

Most modern buildings built in this period had also incorporated traditional Chinese features in various forms. They belong to the fourth category, such as the central stadium, the astronomical observatory station, the central hospital, the national art gallery and etc (Table 9.4). Take the office building of the Ministry of Foreign Affair as an example, the general layout of the building clearly reflected the Beaux-art tradition, and it was surrounded by circular vehicle roads and vegetations. There was a small square in front of the building. The arrangement of rooms inside followed modernist plan and the roof was flat. Furthermore, the façade was extremely plain without additional decorations, except the simplified bracket-set to show the traditional Chinese feature of Dougong. In addition, the constructive techniques and materials were completely modernised. Such modernist buildings with a few Chinese decorative elements largely emerged in this period and the later period.

1930-33	Central Stadium	
1930-34	Astronomical Observatory station on the Purple Mountain	
1931-33	Central Hospital	
1932-33	Bandstand of the Mausoleum of Sun Zhongshan	
1932-33	Office building of the Ministry of Foreign Affairs	
1935	Civic Assembly Hall	
1935	National Art Gallery	

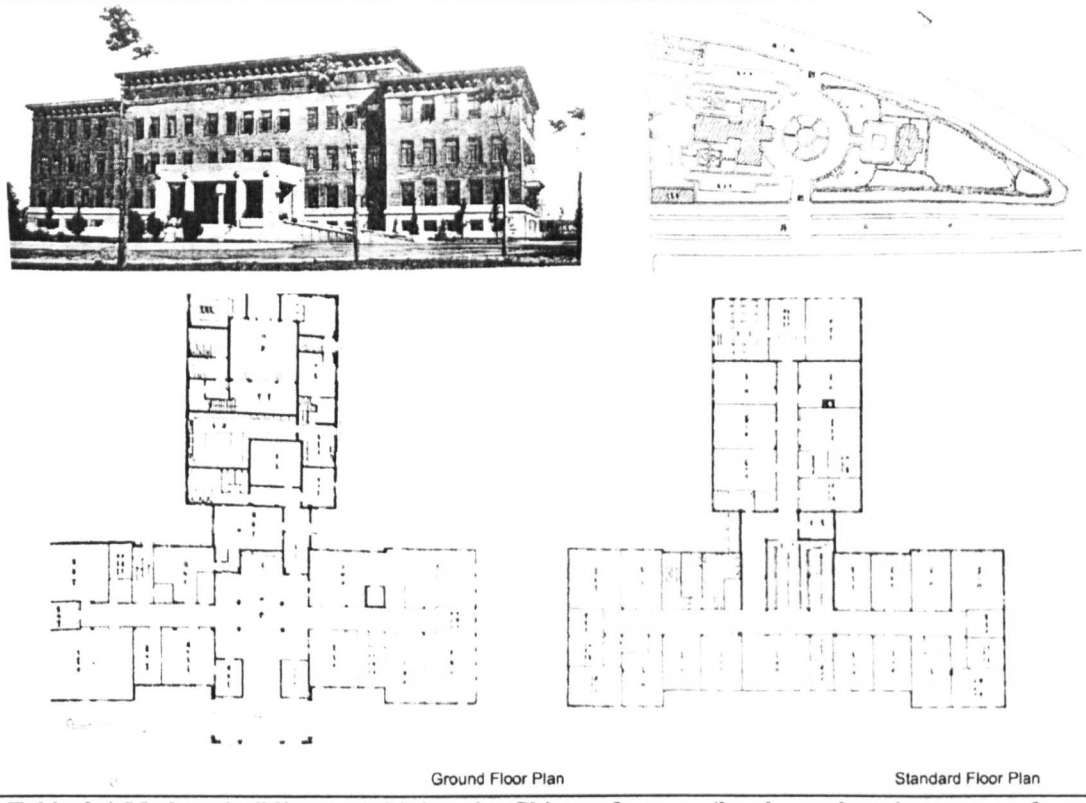
Example: The Ministry of Foreign Affairs building


Table 9.4 Modern buildings combining the Chinese features (by the author, images are from (Yang, 1993, p51-2)

9.4.5 Buildings in Category e

In the 1930s and 1940s, there were public buildings built without any reference to Chinese traditions, for instance, the Supreme Court of the government (1932-3), the Exhibition Centre of Geological Minerals (1933-5), the Xindu Theatre (1935-6), the International Activity Centre (1935-6), American Embassy (1946) and the office building of the Central Highway department (1947) (Qin, 2006).

Freedom of thoughts and the search for a modern national identity in Chinese architecture in the second period enabled great diversity of building appearances and types. The examples of public buildings in this period have shown that the four categories of Chinese traditional architectural features—plan arrangement, structural elements, building components and ornamentations, can still be incorporable with the new. In some cases, buildings wrapped with western skins were arranged in the Chinese way (buildings of the Presidential Palace) or the other way around, for

example, in the proposed plan of the central administrative zone of the 'Capital City Planning Scheme' (1929) (Figure 4.8), buildings wrapped with Chinese skins were arranged according to the planning of the western Renaissances tradition; the building of the Second Historical Archive of China was another example. In other cases, both Chinese and western architectural features and plan arrangements were hybrid (the Sun Zhongshan's Mausoleum).

9.5 Public buildings in the contemporary period (from 1949)

Modern buildings infused with traditional Chinese features in various forms and buildings in the 'international style' have largely emerged in this period, especially after the social reform of 1978. Because of the political campaigns following Mao's ideology such as the Great Leap Forward and the Cultural Revolution, the development of the city was extremely slow. Most of the state's attention had been paid to the development of heavy industries. As a result, the construction of new public buildings in Nanjing by 1979 was limited and they concentrated merely in the Xinjie kou area and the north area. Compared to the distribution map of the public buildings in the second period, there was very little increase of public buildings in 1979 (Figure 9.15); by 1994 instead, the increase of public buildings was dramatic. They were still located along the main roads within the old city, and more buildings have been built in the south city as well (Figure 9.16).

The types of public building during this period are accordingly various, such as high-rise buildings, glass boxes, high-tech buildings and etc. However, the architectural language is less and less related to Chinese traditions. The loss of local identity in the contemporary city is outstanding. Since the Chinese traditional types are emphasised in this study due to their merit of enhancing the cultural identity of the city, most of the contemporary types of public buildings, which are disconnected from the tradition and in the 'international style', are not to be analysed in detail in this chapter. However, an example of a contemporary public building is shown to give a glimpse of the situation—the main library of Nanjing, 2007.

Figure 9.15 Locations of public buildings in Nanjing in 1979 (left, (Liang and Sun, 2003, p29)
Figure 9.16 Locations of public buildings in Nanjing in 1994 (right, (Liang and Sun, 2003, p30)

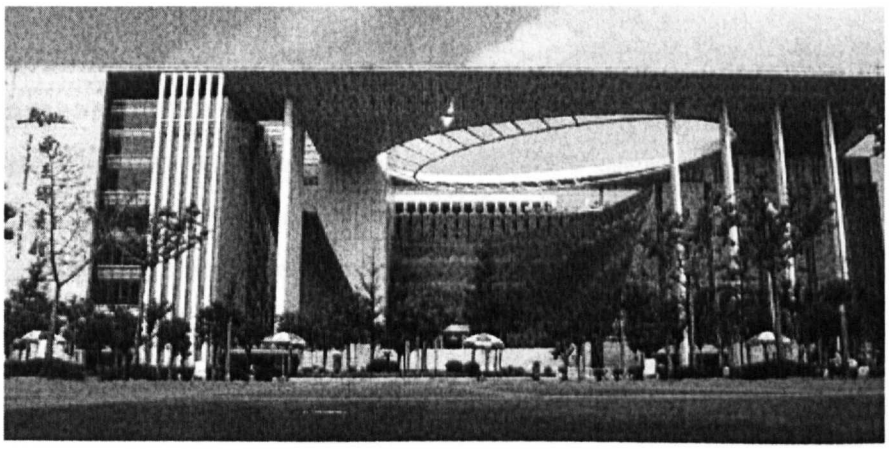


Figure 9.17 The main library of Nanjing (photograph is from www.333cn.com)

The library building and its adjacent entrance square occupy an entire city block defined by the Changjiang road, Eastern Zhongshan road, Northern Taiping road and the north part of the Changbai street. The building has been finished by 2007, which has a construction area of 78,000 square meters and all under one roof. It is in a rectangular shape, built with steels and glasses and equipped with high-tech facilities. Its building form contrasts remarkably with its neighbour buildings—the Presidential Palace (Figure 9.17). Since the location of the library building is close to the historical monument, it would be better for a coherent city image if the building had referred to Chinese traditions either in terms of plan arrangement or ornamentations.

9.6 Discussion and conclusion

9.6.1 Discussion

The methodology used in this chapter is slightly different from the analyses of other city elements in previous chapters, because the number of buildings is enormous in the city so it is hard to examine every building in details. Normally, building types is defined by the criteria at different scales: the relationship between buildings and public spaces, the plan arrangement, building height, width and volume, façade proportion and ornamentations In the first period, several examples have been selected to show their characteristics. Traditional public buildings in Nanjing strictly followed the official building system, in which the number of building types was small, and the characteristics of those building types could be outlined in the four categories in the following conclusion.

In the second period, public building forms were much more diverse than that of the first period. They were classified into five categories according to the ways they incorporated western and Chinese architectural features. The classification is based on the appearances rather than all the criteria of building types. One reason is that the appearance of an artefact is very important for the visual identity and imageability of the city. The other reason is to make the analysis of buildings in each category easier, since it would be a large number of building types (categories) if all the aforementioned typological criteria were considered. In each of the five categories, one or two examples are selected to illustrate the characteristics of buildings in that category. This method is a simplification. Further analyses on public buildings with more comprehensive view on building typology can be carried out for future study.

In the third period, the number of public buildings increases dramatically along with the development of the city. However, many building types are borrowed from other culture and have caused the crisis of losing identity of the city. Therefore it is not necessary to analyse all of the newly built public buildings for the purpose of this study, which is to sustain the local identity of the place.

9.6.2 Conclusion

Traditional public buildings in Nanjing belong to the traditional system of official architecture. Its characteristics have been mentioned in the Chinese context and illustrated with some cases during the first period, which can be outlined into four categories:

1) the plan arrangement of a single building and building groups;
2) the structural elements such as Dougong, columns and beams;
3) the pattern and arrangement of architectural components such as platforms, balustrades, windows and roofs;
4) the ornamentations such as colour schemes and carvings.

In details, the plan of a single building and building groups was based on certain modules and arranged longitudinally and latitudinally along axes. The plan was symmetrical and north-south oriented. The sequence of the arrangement of a group of buildings was essential, which usually consisted of a symbolic gate and several buildings. A public open space was included in the sequence. The traditional structure was restricted to timber buildings, which therefore is difficult to be used with new materials and updated technologies. In the third category, different types of roofs were the most popular components in new designs as seen in those examples built in the second period. Ornamentations were various, which were allocated for buildings of different classes. Apart from those, five single building types—pavilions, terraces, storied buildings, pagodas and symbolic gates were the basic components of building groups. They are hardly applied to new buildings as entities.

The typological process of the traditional buildings has been observed in the three periods, although many new types of public buildings are from the western world. The features of traditional buildings have been reapplied to buildings built in later periods, especially in the second period. Through the examination of those examples of public buildings, traditional plan arrangement, types of roofs and various decorative details are regarded as common factors to represent the Chinese tradition. However, the vast traditional planning of building groups which includes public open spaces in its sequence is hardly applicable in the contemporary city due to the limitation of land. As a result, traditional features at small scales are more popular in

typological designs of contemporary buildings. However, if reached the extreme, it would fall to the danger of pure image making. Careful consideration on not only the building images, but also their new spatial and social relationship with the urban environment, needs to be taken in order to avoid the danger. New public buildings should be considered at both the urban scale and building scale, which is further discussed in Chapter 11. Traditional Chinese characteristics in housing at the building scale and the relation to urban open spaces are also analysed in the next chapter.

CHAPTER 10 HOUSING OF NANJING

10.1 Introduction

One of the major functions of a city is providing residences for people. Housing is a fundamental component of the urban form of a city, which is also usually the majority. Traditionally, houses were the natural products of common people as instinct reflections on their physical environment, climate, culture and life styles. According to Laugier (1753), the primitive hut was the first invention of human being to provide a place for living without any guides from technologies and sophisticated consciousness. It functioned as a house and was the origin of architecture because its form was purely from the nature. In China, two types of ancient houses had been found 10,000 years ago by archaeologists: the cave and the nest (Pan, 2001). Along with the development of the society, houses are also under evolution so that their forms, materials and even some parts of function have been gradually transforming.

The study of housing—the ordinary and historically vernacular architecture, is important for a culture. Unlike the public grand buildings and monuments, which were the emphases of architectural theory and history both in the west and in the east during the past, ordinary and vernacular architecture was translated from 'the force of law (from a tradition) honoured by everyone through collective assent' (Rapoport, 1969, p6). Public grand buildings may be the work of unusual and represented the value of a certain group of people, while vernacular buildings were the work of usual and represented the collective value, which had high originality as well. Another reason for the necessary of housing study is that vernacular housing was closely related to inhabitants' individual identity, because traditionally, the construction of a house was from one local model, and the rest was determined by family requirements—size, relation to the site and micro-climate (Rapoport, 1969). Vernacular houses were so much more sentiment than civic architecture that 'the majority of person will always build for themselves, and, unconsciously, throw something of their own character into their dwellings' (Downing, 1850, p465).

The study of vernacular housing was not common in literature from Vitruvius, Alberti to the second half of twentieth century in the west. Some of the earliest studies was given by Downing (1850) in his book *The architecture of country houses*, Rapoport (1969)'s *House form and culture*, and several others on houses of certain regions (Rothery, 1976, Worsdall, 1979, Holl, 1982). In China, according to Kanpp, the first academic treatment of Chinese vernacular architecture was a brief report by Long Feiliao in 1934 on the relationship between recent archaeological excavations, textual references and existing cave dwellings (Knapp, 2000). Furthermore, Liu Zhiping (2000) and Liu Dunzhen (1957) surveyed a number of country houses and prepared manuscripts of the drawings for publication in the 1940s and the 1950s, however, Liu Zhiping's work was unpublished at that time because of political reasons. Since then, Chinese vernacular buildings became a field of academic study in Chinese academy.

In typology and morphology, the study of house types is a popular topic. Quatremere de Quincy (1825) claimed that there were three basic house types in human history: cave, hut and tent, in which the tent was the origin of Chinese houses. Aldo Rossi also studied house types, which were central court house, gallery type and separate dwelling type as the basic types (Bandini, 1981). In some studies, houses were classified into the types of detached house, bungalow, semidetached house, terrace house, apartment, maisonette and etc, which were closely related to specific social meanings and formal images (King, 1994). In Holl's study of North American country houses, he outlined them and named them as father-son-holy ghost house, shotgun house, double shotgun house, camel-back shotgun house, flounder house, double house, row house, courtyard house, continuous row house, one room house, stack house and so forth (Holl, 1982). Moreover, the Italian School announced that ordinary building types were the basic and most precious types for a culture (Caniggia and Maffei, 2001). Scholars in the school conducted abundant research on this subject. At the urban scale, the study of spatial organisation of a neighbourhood with relation to its social impact was also done by scholars, such as Jan Gelh (2001).

Similar to other components of urban form, the contemporary challenge of housing in China is that it follows more western types and breaks up with its tradition. At the present, the traditional common shared social value and the image of the world has been lost. Urban and architectural design encounters more complex problems, and is increasingly the concern of professionals rather than ordinary people. Nowadays, the mass production of housing commodity causes the lack of individual identity, owners' participation and flexibility of space in a living unit. Appropriate solutions and improvement are urgently needed. For example, huge scaled Olympic housing facilities constructed for athletes and foreign visitors in Beijing, which are for sale after the game, sprang in very short period of time and showed high-tech and modernised images. They were built forcedly on the ashes of local people's old neighbourhoods and will be turned into luxury resorts of China's new rich, creating new space of social exclusion in the city's landscape (Broudehoux, 2007).

In this chapter, the Chinese context of house forms, especially in the region of Nanjing is reviewed first, in order to understand the traditional Chinese local housing. It includes the philosophical background, the form of houses and gardens as parts of wealthy houses. The transformation of house forms is examined in the three periods: the historical period (--1860s), the modern period (1860s—1949), and the contemporary period (from 1949). Several examples of housing are illustrated in each period. Types and possible typological processes thus can be summarised at the end.

10.2 The Chinese context

Because of diverse geographic conditions and multi-national culture in China, there were various house types around the country. The classifications of traditional house types by many scholars are based on plans (Liu, 1957), structural systems (Liu, 2000), overall appearances of houses (Long, 1990), regions with different climates and cultural differences (Wang and Zhang, 1994). For instance, in China, house plans could be circular, rectangular, L shape, four-in-one courtyard, three-in-one courtyard, and ringed; house structures could be cave, Ganlan, Tailiang, dome and etc; according to the overall appearances, houses could be courtyard houses, circular

clay buildings (Tulou), cave houses, rise-up timber houses (Diaojiao lou), tents and so forth.

The courtyard house type was the most common type used by the Han nation that was the majority in the north, east and some parts of south China. The courtyard house type can be further divided into some sub-types as adaptations to different climates in different regions, which is explained in the following paragraphs. Nanjing is located in the Yangtze delta region, and the traditional house type in the city is called 'Tianjing courtyard house' or 'Huizhou courtyard house'[1].

10.2.1 Philosophical background

In the feudal Chinese society, a family containing several generations was the basic unit of social organisation, which played essential role in all social affairs, including city planning and housing design. As mentioned in Chapter 1, Chinese urban and architectural form received fundamental impacts from the traditional cosmology, Daoism, Confucianism (Lizhi as a ramification) and Fengshui. Traditional courtyard houses were also products of these thoughts.

Like traditional regular grid Chinese cities, a courtyard house was a symbol of heaven and earth and a symbol of life eternity, which was embodied on the symmetrical and steady central courtyard and roofed rooms surrounding it (Blaser, 1995). Daoism, a philosophical system derived from the cosmology, advocated the balance within the universe: the harmony of Yin and Yang. Within a courtyard house, the building mass and the void courtyard represented the Yang and Yin respectively. The harmony of the physical form of a house was enabled to bring harmony to the family and to oneself, which was related to some good moral characters such as 'patience', 'simplicity' and 'contentment'. The introversion of a house kept out

[1] The Tianjing courtyard type implies that the courtyard is so small that can be regarded as a 'well' formed by surrounding one or two stories tall buildings. This type of house is usually located in the region of Anhui province (Huizhou) and the adjacent provinces such as Jiangsu. Therefore, it is also named as Huizhou courtyard. This type is adapted to the climate and life style of people in that region, which is addressed in the text.

noises from the outside and provided privacy for the occupants, ideal for relaxation and meditation. Psychologically, it also reinforced the inhabitants' life style and pedestrian circulation within the house to achieve inner harmony.

Confucianism and Lizhi promoted a moral order within the society and a family, for instance, the concept of zoning for different social classes at the urban scale. Within a family, the moral order indicated that the older generation had precedence over the younger, and the male of the older generation had the most prestige. The concept of 'parent kindness and filial piety' was embodied in house arrangement: the tallest and most exquisitely decorated hall was for the older generation, while the secondary or side halls facing east and west were for the younger. The axial sequence of halls with different sizes expressed the moral order (Liu, 1989).

Fengshui was another factor influencing vernacular housing construction widely in the country. The theory helped buildings to obtain maximum comfort and conductive physical environment through the understanding of 'the disposition of stars and the cycle of changes, the weathering processes, the forces of nature, and the characteristics of various landforms' (Lip, 1995, p61). It usually determined the orientation and position of a house, the front door and even furniture arrangement. For instance, the front door of a four-in-one courtyard house was normally facing the south, on the southeast corner of the house and avoided facing the front doors of other houses, because it was believed that this arrangement prevented negative energy of the nature, and therefore brought luck and fortune into the family. Furthermore, ornaments on walls, beams and columns were either ritual stories or symbolic patterns, which were believed to be beneficial for the health and wealth of a family.

10.2.2 House forms

The earliest known example of the courtyard house type in China dated to 1000 BC (Whitehand and Gu, 2003). The major features of this house type were: enclosing, with centralised courtyards, and the separation of supportive structure and walls (Tao and Zhu, 2005). Pillars and beams constituting the structure of a house supported roofs were unrelated to walls. It gave great flexibility and adaptability to walling and

fenestration by simply adjusting the proportion between walls and openings in order to render a house comfortably in many climates and landforms. There were many sub-types of courtyard houses due to different climates, landforms of different regions and different requirements of families, for instance, four-in-one courtyard houses, which were normally located in northern regions such as Beijing; three-in-one courtyard houses; two-in-one courtyard houses; H-shape courtyard houses; 凹-shape courtyard houses, which were normally in the east and south regions of China (Zhao, 2002, p21) (Figure 10.1).

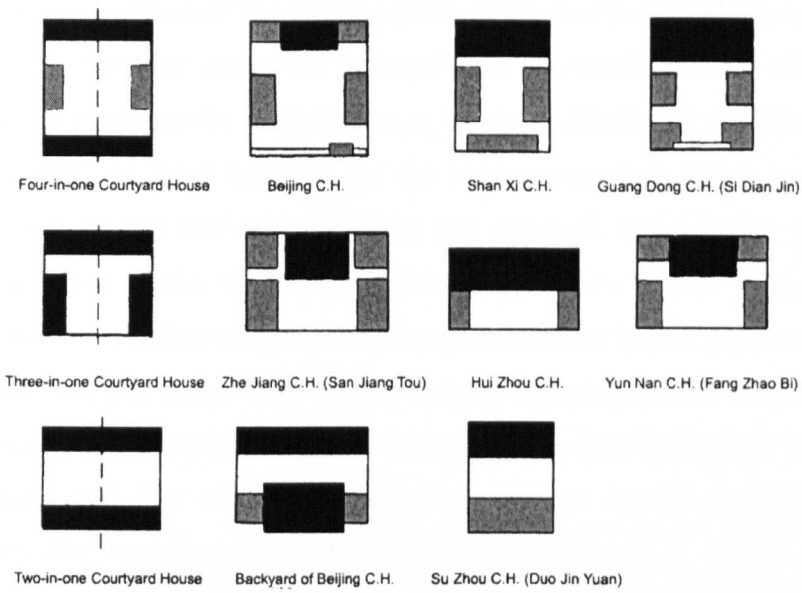


Figure 10.1Three courtyard house sub-types, their variations and locations (Zhao, 2002, p21)

Courtyard houses in Nanjing were also called 'Tianjing courtyard houses' due to their deep and narrow courtyards, which were only around 7 square meters (Zhao, 2004). The form of such houses was suitable for the climate in the region where it was very hot in the summer and slightly cold in the winter. Four seasons were clear that the average temperature was 15 to 16 degree centigrade, and there was a rain season in a year. Wind came from the north in the winter, while from the south in the summer. The deep and narrow courtyards could prevent direct sun from the courtyard by shadings from the roofed buildings and could facilitate ventilation. Moreover, halls in a courtyard house were open, light and longer in the north-south direction, and shorter in the east-west direction, which was essential for better ventilation to release the hot air. Furthermore, east and west outer walls of this kind

of courtyard houses were almost solid, also because of the purpose of sun preventing and ventilation. In addition, main buildings in the 'Tianjing courtyard houses' were normally two-story high, because firstly, the upper floor gave better privacy for females within a family; secondly, it left the lower floor cool in the summer. Unlike courtyard houses in north China, the orientation of buildings in this region was not strictly north-south because of the uneven land and high population density in this region.

Inside blank walls and under the floating pitch roofs, the functional arrangement of a house followed the ritual order: the first hall from the south entrance (Daozuo) was for reception (sometimes for workshop use), the second hall was the living room for family activities, the third hall was for the older generation, which was the most grand one, and the last hall was for utility and serving[2]. The younger generation's rooms were either on the south of the older generation's hall or in the side halls depending on the number of halls and courtyards of the house. Guest rooms were usually located in side halls. The size and number of courtyards of a house indicated the social status of the owner: it could be from one Jin (one courtyard) to five 'Jins' (five buildings and four courtyards) along one axis or several Jins along several parallel axes. The wealthiest houses had large private gardens.

Building details also contribute to the identity of a building, such as end walls, ridges, main beams, basso-relievo of windows and gardens. The style of building details of courtyard houses in the Yangtze delta region (east region) was called 'Xiangshan bang' (Xiangshan style), which fundamentally influenced imperial buildings since the technicians of 'Xiangshan bang' were employed by the emperor of Ming to take charge the construction of the Forbidden City in Beijing (Cui and Chen, 2004). In this sense, there were many similarities between official buildings and vernacular houses. For instance, there were six styles of ridge ends of courtyard houses in this

[2] Normally, the degree of importance of halls was increasing from the south to the north. However, the service hall was on the very north of a house because the inhabitants believed that it was bad luck to live in the back of a building since most of halls were facing south. As a result, the hall at the very back (north) of a house was not favourable for living.

region (Figure 10.2), which was also one of the factors to show the identity of the owner of a house. The details of ridge ends in official buildings were much more exquisite than that in vernacular buildings. Another example was the end wall of houses called 'Matou wall', which was stepped and taller than building roofs in order to prevent fire to spread over a high dense neighbourhood.

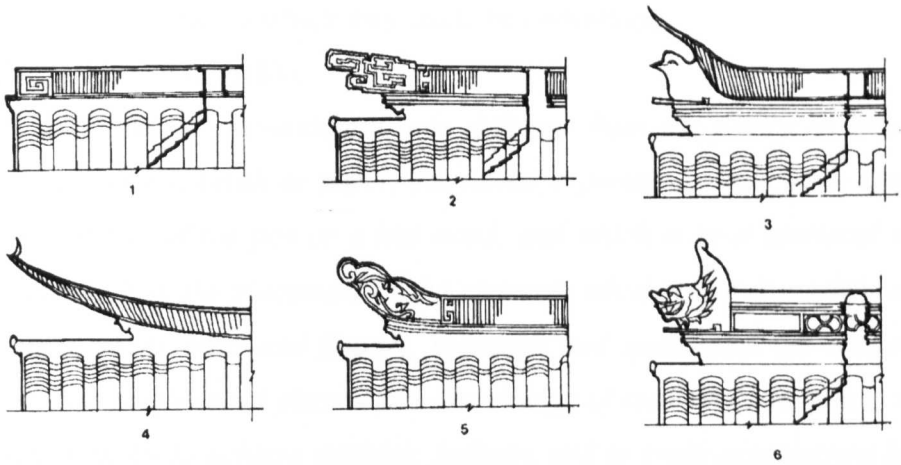


Figure 10.2 The six styles of ridge ends in houses of Jiangsu Province: 1, Gaozhe ridge; 2, Wentou ridge; 3, Fuzi ridge; 4, Cimao; 5, Wentou; 6, Fulong ridge (Liu, 1989, p177)

10.2.3 Gardens in houses

Private gardens were important components in big courtyard houses as an expression of the owner's ability, wisdom, taste and wealth. The origin of garden concept was a symbol of the paradise, which was strongly linked to a house as an architectural extension into the landscape (Laurie, 1975). As asserted by William Chambers (1772, cited from (Mallgrave, 2005, p298-9)), the designers of Chinese gardens were 'not only botanists, but also painters and philosophers, having a thorough knowledge of the human mind, and of the arts by which its strongest feeling were excited' by imitating the beautiful irregularities of nature.

The influence of Daoism on garden design was explicit, as well as on Chinese poetry and painting. Dao was the rule of the universe, and the study of Dao was not for practical purpose but for one's inner salvation. The individual solitude promoted by Daoism could be achieved in a natural-looking garden because it provided a place for one to escape from the reality and cultivating one's morality. The harmony or balance between Yin and Yang in a garden was the balance between rocks,

mountains and water, architecture and landscape. Moreover, one's inner confidence was far more important than his actual achievement in reality. Despite the owner was no longer successful in reality, he could find peace in his garden by embedding his spirit into the micro environment of nature. As a result, most of the private gardens in Nanjing were built by previous high-ranking officers or scholars, who embraced their wishes on their gardens, by which they could be understood.

According to Liu (1989, p183),

> '*Garden design, nevertheless, was different from the poetry or prose. The media are not brush or paper, but rather a process, where there is never a final stroke of the pen or a last word, and which is in a continual state of change. It is the placement of the elements which make a garden--such as water, rocks, trees and flowers, buildings and space--and the utilization of the effects of natural phenomena--the change of seasons, light, color, shadow and sounds--to achieve aesthetic feelings, and to evoke associations between objects and the observers. Through these a communication between the designer and the beholder can eventually be reached.*'

The characteristics of private gardens can be revealed from the arrangement of the four basic components: buildings, rocks, water and plants. The idea was that there was no static viewpoint and vanishing point of a garden. The scenes were changing dramatically and came up unexpectedly with the moving of the observers and their understanding. There were always hidden views behind a rock or a building or borrowed views from the outside. Building mass as the object of Yang framed the view, meanwhile participated in creating views. Building types in a garden were pavilions (Ting), platform (Tai), pagoda (Lou) and etc, which shaped various forms of buildings. Rocks represented fortune of the owner, and a good piece of rock should be grotesque, spare, porous and slim. The third component—water pool was the object of Yin, which was elaborately divided by rocks and bridges to form diverse shapes. A water pool should present the rhythm of openness and closeness, brightness and darkness, wildness and peace. Water banks were usually decorated with small rocks, which, with the reflected images of the water, formed a suppositional vision to enrich the picturesque quality of the garden. In addition, the

abundant plants were not only changing scenes of a garden along with the alternation of seasons, but also delivering vitality and diversity to the garden.

Private gardens were important parts of traditional Chinese wealthy houses. They carried the inhabitants' spirit and identity, and became valuable heritage of traditional architecture.

10.3 Housing in the historical period (--1860s)

The earliest human settlement in Nanjing dated to 4,000 to 5,000 years ago in the Drum Tower area (Yang, 1993). Since Nanjing was the capital for several ancient dynasties, human settlements in this region spread to the Qinghuai River valley in the south of the city 3,000 years ago due to the convenient water transportation. As introduced in Chapter 4, there were massive constructions in Nanjing in the Southern Tang Dynasty. However, most of the urban artefacts were demolished in wars caused by the alternation of dynasties later on. The oldest exiting houses in the contemporary city were built mainly in the Ming and Qing Dynasties, which were located in the Qinghuai River valley.

10.3.1 General examination

According to the zoning policy of the Ming Dynasty, houses of people in the upper class were located either near the palace or in the Western Gate area, which was in the southwest part of the old city, and ordinary houses were distributed in the commercial zone, which was in the river valley and the Eastern Gate area in the southeast part of the old city (Figure 10.3, 10.4).

Despite the Tianjing courtyard house type was the most common one in Nanjing, there were a few small houses without courtyards in ordinary people's residence zone due to the commercial bloom in the Ming Dynasty and the increasing population and land demand[3]. For instance, there was a unique house type along

[3] As mentioned in chapter 4, the first emperor of Ming forced merchants and skilled people to move into Nanjing from the surrounding cities or rural areas in order to develop the city. As a result, the population in Nanjing in the Ming Dynasty increased dramatically.

Qinghuai River, called 'hefang' (river houses). They were built close to the river or partly above the river, sometimes as extensions to tea houses. They housed legal prostitutes, which were easily accessible from the river. Some houses in the commercial zone were transferred to the mixed-use of residence and workshops by owners.

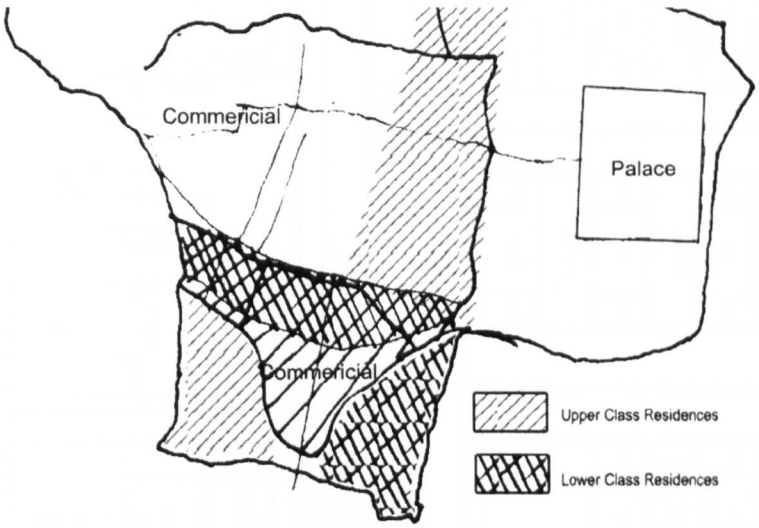


Figure 10.3 Residential zones in the Ming Dynasty (by the author)

Figure 10.4 The traditional house fabric in the contemporary city (Yang, 1993, p542)

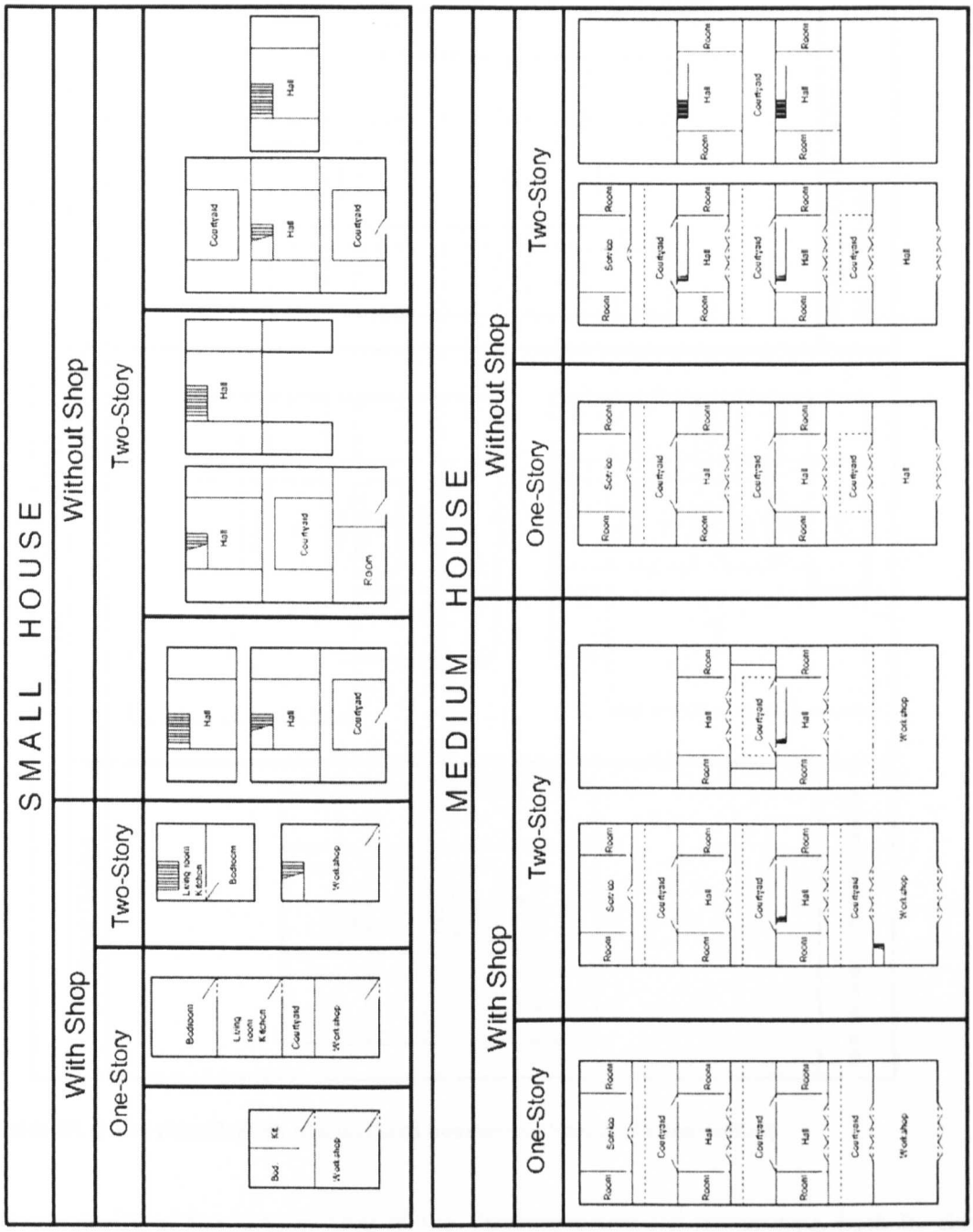


Table 10.1 The classification of courtyard houses--small houses and medium size houses (by the author)

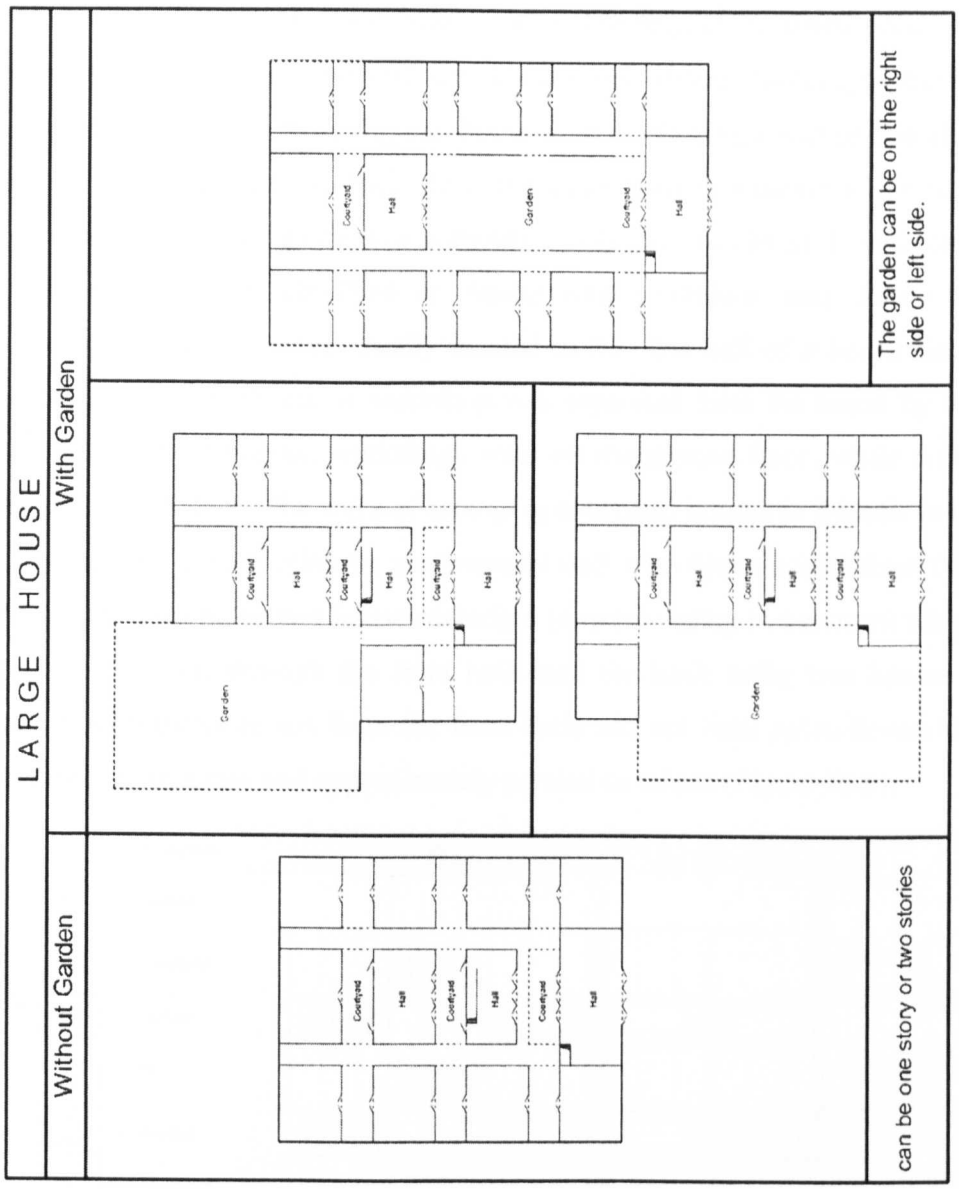


Table 10. 2 The classification of courtyard houses--big houses (by the author)

The majority of the houses were in the Tianjing courtyard house type, built by the inhabitants themselves. The self-building of houses was encouraged by the government of Ming following certain regulations: firstly, the width of houses should not exceed three 'Jians'[4], but can be extended lengthways; secondly, Orders (Dougong) should not be used in ordinary houses; finally, no decoration and colour

[4] Jian was the basic measurement unit in traditional Chinese architecture, which was elaborated in Chapter 9.

on end walls of houses (Liu and Miao, 2002). The regulation aimed presumably to enhance the contrast between ordinary houses and official buildings, obeying the ritual order. As a result, the traditional house form of Nanjing could be classified into three categories according to their sizes: the small houses, medium size houses and big houses (with private gardens or without) (Table 10.1 and 10.2). In each category, houses can be further classified as 'house with workshop' and 'house without workshop'. Workshops were usually located in the first hall of a house since they were directly facing streets. A workshop was separated from the house by the first courtyard. In small houses, workshops were on the ground floor, while residences were on the first floor. The ways of arranging courtyard houses in a block were: two houses attached to each other by a communal wall with direct access from the front halls and the back halls; two houses detached (a narrow alley in between) with direct access from streets through the front halls and the back halls; two houses partly detached with direct access from the front halls and the back halls. Several houses were arranged in a row and approximately parallel to others (Figure 10.5).

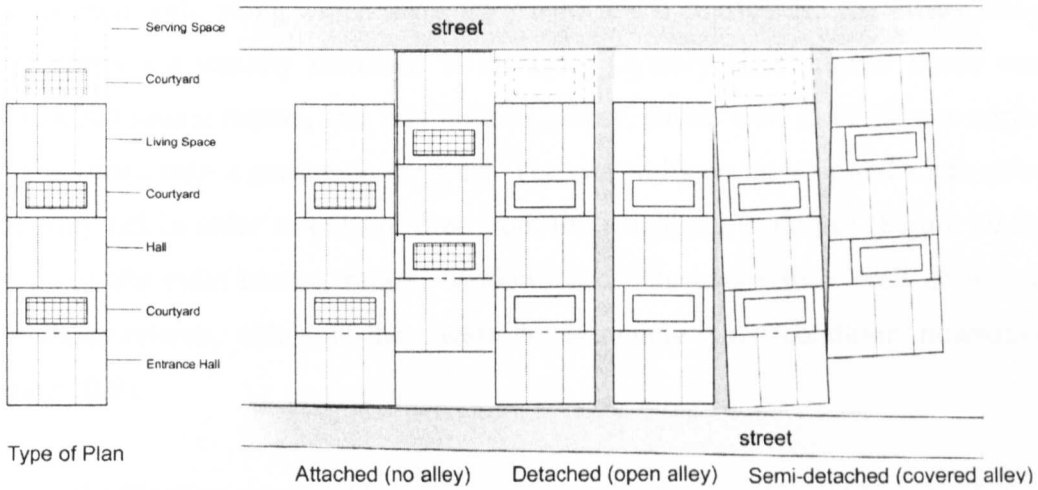


Figure 10.5 The courtyard house type and the three ways of house grouping (by the author)

10.3.2 An example—the Eastern Gate area

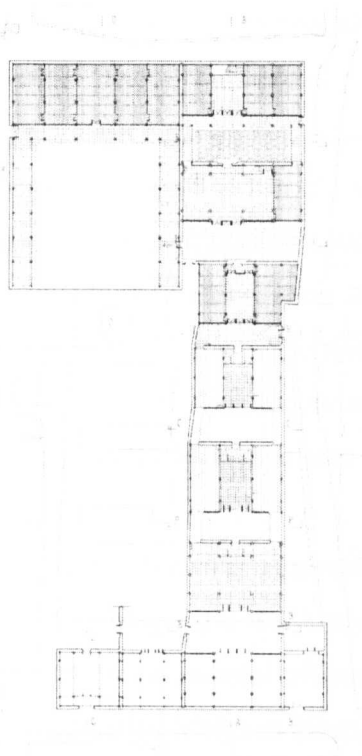
The Eastern Gate area is a typical traditional neighbourhood in the contemporary city, where most houses were originally built in the Ming and Qing dynasties. The area was for military use in the late Qing dynasty since it was close to the city wall and the Zhonghua Gate. The block and plot patterns of the area have been illustrated in Chapter 7, which are extremely complex due to the self-construction and continuous

refurbishment over years to fulfil the changing requirement of living. Inhabitants moved out to flee wars during the late Qing and late Republic eras and rural migrates moved in to seek jobs in the city nowadays. The changing process is addressed in detail in later periods.

According to the plot pattern of the area (Figure 7.5), traditional houses were not strictly north-south oriented in the river bank region, but arranged along the path of the river. The rest of houses built in flat land were almost north-south oriented. A typical house plot was 6 to 10 meters wide and 32.5 meters long. Roofed buildings in a house were normally 4 to 8 meters by 4 to 8 meters, and one or two stories high.

The house of Jiang Shoushan (so called Jiang Baiwan) was an example of an individual house to show the layout of the traditional courtyard houses in the area. Figure 10.6 shows the existing part of the house, which is only half of the original house, and the rest of the house was deconstructed to be shelters. The existing part has one main axis, along which there are 7 halls and 6 courtyards. The owner Jiang Shoushan was a wealthy merchant in the Qing Dynasty. The original house was about 4,000 square meters, and was built in timber, paved with stone. It was north-south oriented with a garden on the west. The end walls on the east and south sides were very tall in order to prevent fires from the neighbour buildings (Figure 10.7). Details of the main beams, ridges, windows and balustrades were well decorated with basso-relievo, although they were in extremely poor condition nowadays (Figure 10.8).

In sum, the Tianjing courtyard house type was symmetrical and could be extended as a standardised unit, which consisted of a roofed building and a small courtyard, towards an axis lengthways due to the strict regulation of the Ming government. Courtyards of those houses were narrow and deep, opening to the sky for ventilation and sun preventing. Furthermore, the appearance of the house type was generally modest, with grey plain end walls. In addition, houses were parallel to each other (can be attached, detached and semi-detached) and had direct access from streets through the first hall and the back hall.



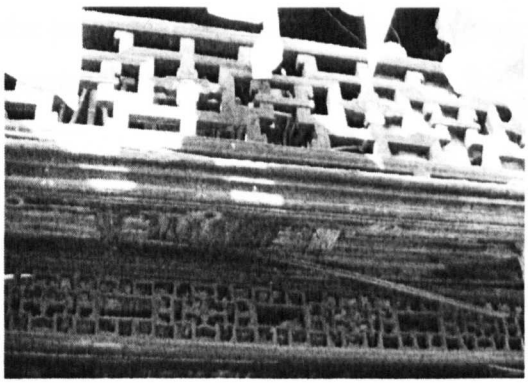


Figure 10.6 The layout of Jiang Shoushan's house (mapping by the students of the Southeast University, 2002, left)

Figure 10.7 The end wall of the house (photography by the author, top right)

Figure 10.8 The detail of the balustrade of the house (photography by the author, bottom right)

10.4 Housing in the modern period (1860s-1949)

10.4.1 The proposal of housing development in CCPS

After the Opium war and civic wars in late nineteenth century, the government of the Republic of China began to develop Nanjing by launching the 'Capital City Planning Scheme' (CCPS, Shoudu Jihua, 1929). The concept of zoning following the Modern Movement was adopted in the scheme together with residential development. It was proposed that houses should be constructed in three districts within the city according to three kinds of residents: the high-ranking governmental officers, normal governmental officers and ordinary people.

According to the scheme (Guodu Jihua chu (The Planning Bureau of the government of the Republic of China), 1929), the high-ranking residential district was located in the northwest of the city near the Northern Zhongshan road, because the area was

suitable for future expansion since it was undeveloped suburban at that time. The residential district for normal governmental officers was located around the central administration zone on the east of the old city. The western type of row houses was employed and arranged in the vast 'organic' pattern. A central axis connecting the district to the central administration zone was clear in the scheme, and ring roads were built for vehicles (Figure 10.9). Green trees were planted near the houses and at the edge of the district. The third residential district for common people, especially for those who lost their properties in the construction of boulevards, was proposed to be built in the undeveloped area in the central and northern city.

However, the housing proposal for ordinary people was not implemented due to financial shortage and the Anti-Japanese War in the late 1930s. Parts of the houses for normal governmental officers were built, however, located near the Presidential Palace (so called Meiyuan Xincun) rather than in the original planned area of the east of the city (Yan, 2006, Liu, 2007). The high-ranking officers' houses were built completely. The scheme did not mention the existing traditional houses in the south of the city, where a few modern villas were built by individuals during this period.

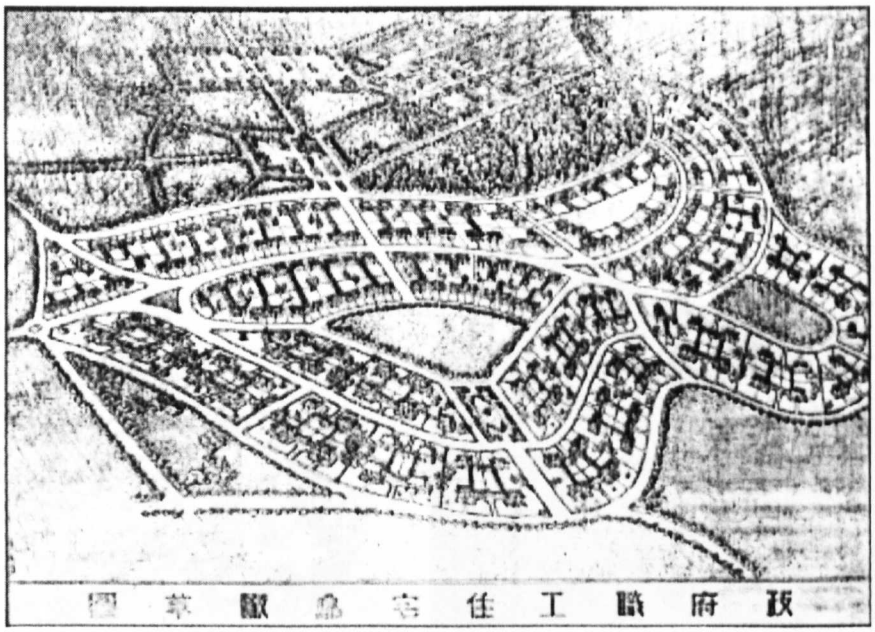


Figure 10.9 The residential planning for normal governmental officers in the Capital City Planning Scheme (Guodu Jihua chu (The Planning Bureau of the government of the Republic of China), 1929)

10.4.2 Examples—the high-ranking officers' houses

The high-ranking residential district was located in the northwest of the city, surrounded by the Shanxi Road, Yihe Road, Ninghai Road, West Beijing Road and Ningxia Road. The location and its block and plot patterns have been analysed in Chapter 7 (Figure 7.6, 7.9, and 7.10). According to the proposal of the Capital City Planning Scheme, the house type employed in this district was the western detached house with front and back yards. The average built area per house was 400 square meters. The built ratio was 20% and the green ratio was 64.8%. There are 225 houses existing today out of the total 287 houses in the original plan (Yu and Zheng, 2004).

The plot pattern was extremely geometric in the district, and most of the detached houses were placed on the bottom of the plot lines opposite to the front lines facing the streets (Figure 10.10). Infrastructures such as water-supply and drainage system were well constructed for those houses. A typical house was 16 meters wide by 10 meters deep, and not north-south oriented. Most of the houses were two stories high, and some of them had three stories. They were designed either in the western Modernist style or the classic style, which was embodied on the functional plan and modern technology and materials (Figure 10.11). A few houses combined Chinese traditional features such as traditional pitch roofs and some ornaments. This new house type represented high-ranking officers' willingness of pursuing advanced modern life styles of the west.

Figure 10.10 The high-ranking residential district (by the author)

Figure 10.11 A house in the high-ranking residential district (photography by the author)

At the present, despite most of the houses in this area are preserved, there are a lot of temporal structures built by later occupiers serving as extensions to those houses. This area is now legally protected as one of the historical preservation regions in Nanjing. Houses in the district are under refurnishing and renewal to show the original appearances (Yu and Zheng, 2004).

10.5 Housing in the contemporary period (from 1949)

10.5.1 The influences of the social reform

Large-scale economic growth and political land reform fundamentally changed the resource of housing provision, housing market and people's sense of house ownership since 1949, when the P.R.China was founded. China's economic situation changed along with the launch of Open-Door policy in late 1978 by Deng Xiaoping. During the pre-reform period, the state-owned enterprises dominated the production business. The self-sufficient Danwei (work units)[5] contained various buildings including housing in an enclosed urban land. The 1978 reform brought many private enterprises and foreign-fund enterprises to China. The growth of these two types of enterprises and increasing number of their employees dramatically impinged the original social obligations such as housing and other welfare provision, which has to rely on the market to satisfy employees' housing demands. Gradually, under the corporate transformation, the system of remuneration in the state-owned enterprises also became market determined and directly tied to labours' productivities: the need of housing in the state-owned enterprises also has to rely on the market until quite recently.

Apart from the changing social organisations, two land reforms also influenced the housing of Nanjing. The first land reform, which is acknowledged as the turning point in urban development of China, started in 1988 (Yeh and Wu, 1996) with the

[5] The concept and definition of Danwei has been explained in Chapter 7. It is a walled compound of living/working environment, which is responsible for housing provision and provision of other social services for its workers. Relative research on the relationship between Danwei and housing can also be found in KIM, J. (1987) China's Current Housing Issues and Policies. *Journal of the American Planning Association,* 53, p 220-226.

State Council's publication—'Implementation Plan for a Gradual Housing System Reform in Cities and Towns', which called for raising public housing rent and the sale of public housing to sitting tenants on a nation-wide basis (Tang, 2006, Yeung and Howes, 2006). Because of the political turmoil in 1989, the reform was reintroduced in the early 1990s by the publication of 'Decision on Deepening the Urban Housing Reform'. This document was calling for the establishment of a dual housing provision system comprising a social housing sector of 'economic and comfortable housing' focusing on low- and middle-income groups, and a commercial or commodity housing sector focusing on higher income groups. Since then, the Chinese Constitution was amended to formally delineate two different land rights—ownership right and usage right. The State owns the urban land, and leases the land to developers for usually 70 years for residential use and 40 years for commercial and industrial use, upon payment to the municipal government. However, the suburb land is owned by collectives[6]. The state has the right to buy the land from collectives and use the land for real estate. This reform effectively commoditised urban land and changed the housing provision into a market-driven realm.

The second important land reform was in 1998, launched by Premier Zhu Rongji: the 'Notification to further deepen the reform of urban housing system and accelerate housing construction'. It was a comprehensive policy to establish a new housing system involving the transition to monetary subsidies, the improvement of 'housing accumulation fund' system, the establishment of housing mortgage system, and the promotion and regulations of the housing exchange market. Although some state-owned enterprises still offered housing subsidies to their workers, the reform toward marketisation and commoditisation started to present a clear picture nation-widely

[6] Collective ownership is hard to be certain. Lands usually are occupied by individual farmers. In order to take advantage of this policy, farmers who live in the outskirt of a city build multi-story houses in dubious lands and rent the rooms to rural migrants who are seeking jobs in the city. Along with the expansion of the city, some lands are required for real estate development. Then farmers can get compensation from developers. Some other lands remaining as poor migrants' accommodation are gradually surrounded by the expanded city. This phenomenon is called 'Cheng zhong Cun' (village in the city), which attracts many scholars' attention in recent decades.

(Po, 2001). Furthermore, in February 2007, the construction department of the central government reemphasised the notification of establishing the system of low-rent housing in every city and town. It pointed out that there were still many problems, for instance, more than 141 towns did not have the system so far and more than 166 small cities did not clear the money from the profit of land renting to build the system. The government would superintend the continual development of the system of affordable social housing since the late 2007 (China News Website, 2007).

10.5.2 Housing development

In relation to the social changes and housing reforms during this period, housing development in Nanjing was devious. The average living area per person in 1949 was only 4.83 square meters in Nanjing (The editors committee of the gazetteers of Nanjing, 1986). Since 1952, the municipal government started to invest housing construction. The first modern neighbourhood for the working class was built in the north of the city in 1952. During the period of the first five-year plan[7] (1953-7), more large-scale modern workers' communities appeared. However, housing of over one million square meters was demolished for industrial acceleration in the period of the second five-year plan because of the Great Leap Forward campaign. As a result, average living area per person decreased to 3.23 square meters. Until 1978, 122 million square meters land in Nanjing was used for housing. The government also encouraged developers to build massive modern communities. For instance, a neighbourhood in Nanjing built in the 1970s was 51 million square meters, which contained 278 residential buildings with five to seven stories high, accommodated 10,000 households and 40,000 people. The average living area reached 6.1 square meters per person in Nanjing in 1985 (The editors committee of the gazetteers of Nanjing, 1986). During the 1980s, many traditional neighbourhoods started to be improved and renewed, while during the 1990s, affordable housing was under

[7] Centrally planned economy is one of the socialist features of China from 1949 to the Economic Reform of 1978. During that period, the country followed several five-year economic plans. The first one was from 1953-57, the second one was from 1958-62, the third one was from 1966-70, and the fourth one was from 1971-1975. The period of 1963-5 was for economic readjustment after the failure of the Great Leap Forward and the three-years of calamities (Appendix 1).

construction in order to follow the central government's housing policy. Since 1995, commodity housing has been rapidly developing (The Institute of Civic Building Design of Nanjing, 2005, The City Planning Bureau of Nanjing, 2001). The height of residential buildings is continually increasing from the 1950s to the present. The average housing was three stories in the 1950s, four to six stories in the 1960s and high-rise at the present (Shen and Yao, 1985).

10.5.3 House forms

The arrangements of contemporary housing have been examined in Chapter 7. Apart from that, individual houses, especially their plans, changed completely from the courtyard house type. Houses built in the 1950s were mainly located in Danweis. The major requirement at that time was to accommodate as many people as possible due to the low living standard and dramatically increased population. Thus room-corridor based multi-story houses were built largely in the 1950s. This type consisted of a series of standard rooms connected by an inside corridor or side-corridors, public toilets and staircases. The standard room accommodated all the housing functions. Sometimes the corridor became an extension to each family for cooking and dining. Aesthetic consideration of houses was almost absent.

Between the 1950s and the 1970s, bedrooms for different generations in one family were separated in a living unit. Since the 1980s, living rooms appeared, thus living units became apartments. Although the appearances of houses were still monotonous concrete boxes, the living condition in the city was significantly improved.

After housing was marketilised since the 1990s, the sizes of apartments are various according to market demands, which are generally between 30 square meters and more than 200 square meters. A small apartment may contain open-plan bedroom and living room, while a big apartment can have two stories, more than four bedrooms, servant's room and luxury living and dinning spaces. The layouts of apartments have been optimizing according to different life-styles, for instance, 'Soho' for single workers, home-office for home workers, and complex flats for large families (5 people) (Figure 10.12). The appearances of these high-rise blocks

are also improved. In addition, sustainable issues such as using new energy resources rise in recent designs.

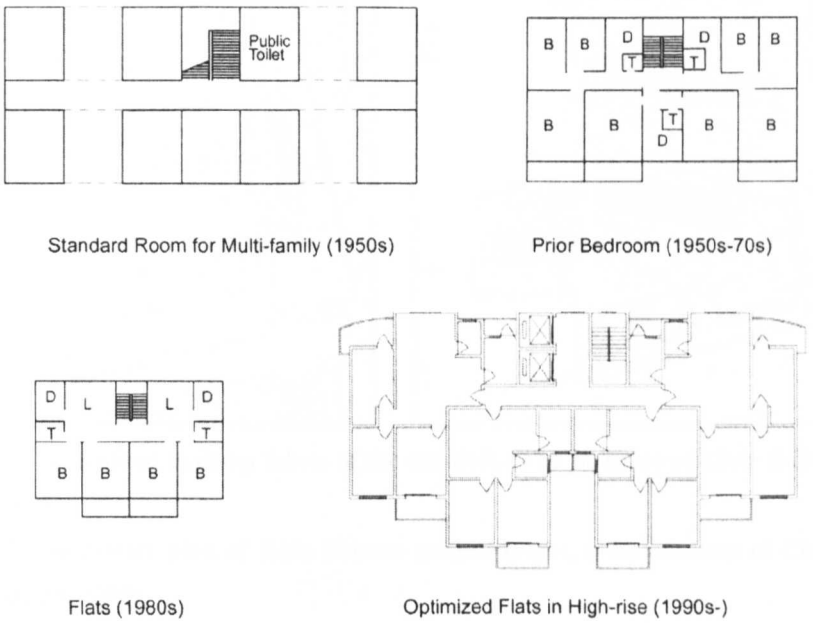


Figure 10. 12 The transformation of plan types of housing in the third period (by the author)

10.5.4 An example—the Jiqin jiayuan project

The high-rise residential type containing optimised apartments is the most popular housing type in the contemporary housing market. A standard model is usually copied hundreds of times in a massive development in order to decrease the cost and gain maximum profit. Jiqin jiayuan is one of the recent estate developments in the traditional area of Nanjing.

Figure10.13 and 10.14 show that new high-rise apartments have replaced the historical residential fabric. The development occupies 28,000 square meters of land, in which 75% for living and 25% for commercial use and services for the new community. It accommodates 312 households and 982 people. The five buildings are 9 stories high (The Institute of Civic Building Design of Nanjing, 2005). Buildings are basically in narrow rectangular shape, north-south oriented, and placed in far distance from each other. There are circular routes and gardens in between buildings. Shops and services are facing the surrounding urban streets.

Figure 10. 13 The original built-up fabric of the site (left, (The Institute of Civic Building Design of Nanjing, 2005))

Figure 10. 14 The master plan of Jiqin jiayuan project (right, (The Institute of Civic Building Design of Nanjing, 2005)

This project is comparatively small since its location is in the old city of Nanjing where no large urban land is available for new development. In the west, east and north areas outside the old city, there are numerous large-scale estate developments as typical patterns of city expansion in the contemporary period. For developers, this type of development is highly efficient for land-transaction, planning, construction and selling to individual consumers. Standard apartment plans and buildings are copied, and cul-de-sac routes are planned for each building parcel in order to be sold while other buildings are still under construction (Monson, 2008). Those large-scale developments disrupt existing rural and natural system and facilitate urban sprawl. Furthermore, standard apartment plans without spatial flexibility bring environmental damage and resource waste due to second-time renovation of the interior space of each apartment by individual consumers after purchase, in order to adapt to their requirements and add personal identity. In addition, the identical appearance of buildings in a broad land and row-and-column arrangement of them create monotonous city image and negative public spaces. For local residents, the scale of those development leads to high vehicle demand and inconvenient access to social services.

10.5.5 Another example—the Eastern Gate area

10.5.5.1 Political and social context

Large-scale contemporary residential developments create new 'ideal' living environment for people who are willing to spend most of their earnings on new properties. Meanwhile, traditional neighbourhoods are under serious pressure of land value increasing, potential demolishing for new estate and out-of-date infrastructures.

Most of the traditional communities are becoming urban poverty areas because of three reasons. Firstly, the living facilities and equipments in traditional neighbourhoods are in poor condition or absent, and therefore they are insufficient for the inhabitants' demand of modern living. As a result, original inhabitants who have comparatively good income are moving to new housing. The rest of the inhabitants are either poorly educated or elder people.

Secondly, land ownerships are usually vague in traditional communities because of the incompletely implemented land reforms from 1949. For instance, historical private owned courtyard houses were allocated to many families during the socialist reform in 1949. The owner of houses became the state, who leased the houses to original residents with very low rent. In the period of market economy, many houses become collective owned, which are supervised by the 'street office'[8]. Inhabitants are able to expand and rebuild houses through informal negotiations with their neighbours. As a result, house types in traditional neighbourhoods are mixture of traditional courtyard house type, extensions and self-built compact house type. House tenure is also in complex conditions: some houses are in private ownership (normally well preserved courtyard houses), some belong to the state, and some

[8] A street office is not a government in itself but rather the agency of the district government. Since the consolidation of local governments in China, the street office has literally become the lowest level of government, responsible for implementing various policies designated by the district and city governments. Relevant researches are for instance, WHYTE, M. K. & PARISH, W. L. (1984) *Urban life in contemporary China,* Chicago, University of Chicago Press. And WU, F. (2007) The Poverty of Transition: From Industrial District to Poor Neighbourhood in the City of Nanjing, China. *Urban Studies,* 44, 2673-94.

belong to the collective. According to a survey of a traditional neighbourhood in Nanjing, there are 57.6% respondents living in traditional courtyard houses, 34.8% in self-constructed building and left 7.6% living in extended shelters (Chen, 1992). The unclear ownership of land and houses in traditional neighbourhoods leads to chaos of construction and lease.

Thirdly, rural migrants who are seeking jobs in the city usually living in traditional neighbourhoods[9], because the rent can be very low due to the poor facilities, crowed rooms and extensions and shelters. Those migrants are normally low-skilled, and employed in either manufacturing or low-level services such as trade and catering in informal sectors. Their incomes are limited so that they are so called 'marginal group' or 'weak group' in the current society.

10.5.5.2 Eastern Gate Area

The Eastern Gate area is one of the traditional neighbourhoods in Nanjing, which are greatly influenced by the transition of political and social conditions. The current complex plot pattern is the result of the mixture of existing courtyard houses, self-built compact houses, extensions and shelters.

According to the interview of Mr Zhu's family by the author, his story exemplifies the influence of the ownership transformation on his house. Mr Zhu's parents have bought a large house with three courtyards and four halls in this area in the 1930s. His family fled home from the Anti-Japanese War and authorised a family friend to take care of the house during the war. They came back and lived in the house again since 1945 until 1966 when the Cultural Revolution started. During the unrest period, Mr Zhu was sent to the countryside for physical and mental training as one of the educated young people in the campaign of Shangshan xiaxiang. His house was confiscated by the state and managed by the street office. The house was largely altered, refilled with extensions in the courtyards and allocated to many families

[9] Apart from traditional neighbourhoods, rural migrants also concentrate in pre-urban areas (Chen Zhong Cun) as mentioned before, and previous 'workers' villages' developed with major industrialisation.

when he and his family finally came back to the city in 1979. His family had to live in a temporal shelter since then until 1996, during which he appealed to return his house. In 1996, his family was allocated only 62.4 square meters for living in the original house. However, according to his statement, the actual area is 54.4 square meters due to the other families' self-construction in the house, which even obstructs his back door. This kind of situation is common in the area and untouched by the local authority so negotiation with his neighbours is ineffective. As a result, he and his family currently live in the first hall of the house, which is only 54.4 square meters, and the other halls and courtyards are entirely unidentifiable due to severe alteration of the structure of the house.

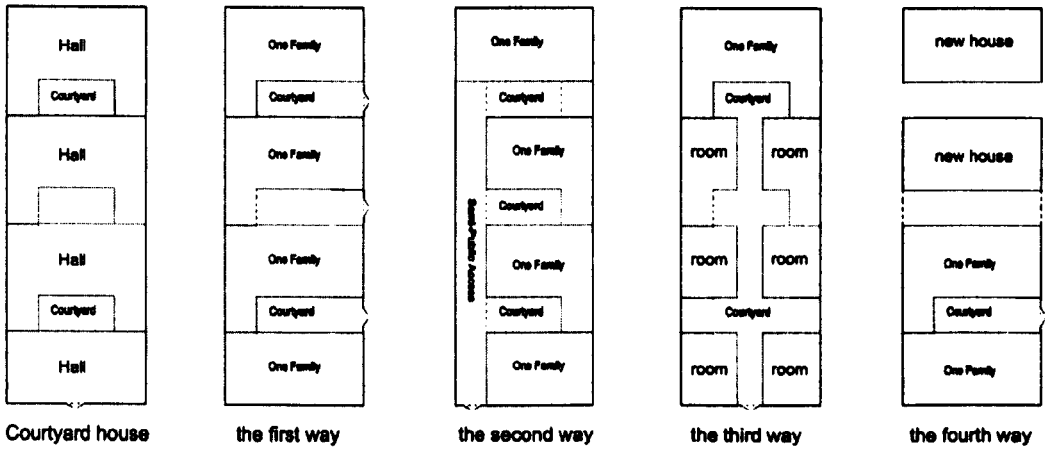


Figure 10. 15 Diagrams of the four ways of altering a traditional house in the Eastern Gate area (by the author)

Currently, residents in this area include the original residents, city residents who rent houses from the street office, and rural migrants who rent rooms from the original residents. Through the field survey by the author, there are generally four ways of altering the courtyard house type to be used by several families with minimum structural reconstruction (Figure 10.15). The first one is that each family occupies one hall and the courtyard is for communal uses such as cooking and dinning. A communal door is created in the original side-wall of the house. The second way is that a communal corridor is created to connect each hall, which is occupied by a family. Each family build their extensions in the courtyard attached to the hall. Therefore, the main door to access the house is still facing the front street. The third way is to divide the front halls of a house into the right part and the left part, with a

communal corridor in between. Each part can form a room for rent, while the last hall of the house is for the host. In some partly destroyed courtyard houses, the fourth way of alternation is to build two-story compact houses in the position of the original halls, thus the basic plot pattern remains.

Traditional neighbourhoods are facing great challenge to survival in the rapid development of Nanjing. Local people still live in the area, because they like the relationship and interaction between neighbours (also because the new housing is unaffordable for them), which is facilitated by the traditional housing (Wu and He, 2005). Meanwhile, they desire comfortable modern lives supported by advanced equipments and facilities. The preservation of traditional houses therefore is not to purely maintain the original form as images, but to adapt it to the new requirement of each family. As mentioned before, one of the features of traditional architecture is that the supportive structure, column and beams, is separated from the enclosed structure—walls. Therefore, the traditional housing configuration is possible for alteration to provide new comfortable spaces. The existing ways of alternation can be the references of future renovation of the area, but with more professional consideration and improvements of infrastructures. Furthermore, temporal structures such as extensions and shelters need to be cleared, and official planning and investment should be applied. Moreover, the participation of local residents during the process of regeneration of the area is essential, because to apply a standard model of layout would cause the problems which the contemporary new housing is facing. With users' participation, the traditional intimate neighbour-relationship can be preserved. Detailed suggestions on this issue are proposed in Chapter 11.

10.6 Conclusion

In this chapter, not only the house types appeared in different periods of the development of Nanjing, but also the social, cultural and political transition related to the housing issue have been addressed. In traditional areas, (1) the traditional courtyard house type has narrow halls and courtyards along one or several axes. Tianjing courtyard houses can be directly accessed from the streets. Their orientation is approximately in the north-south direction, adapting to the land form. The

structure of this house type allows flexibility of spatial division, and the details of the house form are comparatively modest. Modern detached houses appeared in the second period received great influences from the western world. Their arrangement followed the western geometrical planning principle without consideration of the local climate. Even though some of those houses combined some Chinese traditional features, they were isolated from the surrounding area. The emergence of this house type represented people's dream of modern luxury life, and it was not continued in the later period. There are various apartment house types emerging in the contemporary period, which nowadays dominate the housing market. They have been experiencing improvements to adapt to the changing life-styles and market demands. As mass productions, they are facing problems of limited flexibility, variety and sustainability and having negative impact on public realms.

A clear typological process has been revealed from the transformation of traditional house type in this chapter. In order to accommodate more families, the inter spaces of traditional houses are rearranged based on the original structure. (2) The compact house type is a result of the transformation. Such houses have contemporary plans to suit people's new needs, but are arranged according to the original plot pattern, and therefore can stay harmoniously in the traditional fabric. The typological process from the courtyard house type to the compact house type shows their robustness for the local areas.

At present, people's life style, habits and patterns of living in the city have changed, which results in the emergence of apartment house types and alternations of traditional house types. The regeneration of traditional houses and new developments in traditional areas should certainly acknowledge the changes and maintain the local identity through typological design. The revealed typological process of traditional house types shows such possibility. Detailed suggestions on how to adopt the traditional house types are given in Chapter 11. In other areas apart from the traditional areas of the city, new house types are inevitable products of the current housing market. However, they can be improved to avoid problems, contribute to the local identity of the city and make a coherent city image with the traditional ones.

The detailed suggestions are also explained in Chapter 11. Similar attempts have already been pursued through design projects by many architects and urban designers in China in recently years. The aforementioned Ju'er Hutong project conducted by Wu Liangyong is an example, although it is not fully successful (Chapter 2). For another instance, the recent 2008 Beijing Olympic constructions in Beijing also try to brand the city with both modernised images and unique national identity: on the one hand, high-tech stadiums are built to show the city's modern image; on the other hand, traditional residential areas are renovated to accommodate not only traditional houses, but hotels and restaurants. A harmonious hybrid place combining the old and the new is likely to be achieved.

SECTION 3

DESIGN SUGGESTIONS AND CONCLUSION

INTRODUCTION TO DESIGN SUGGESTIONS

1, Urban design guidance

Urban design guidance, as a part of urban policies of western countries, is essential for producing good urban spaces, which provides sound practical advices to help implementing a central government's or local authorities' commitment to good design (DETR, 2000). Urban design guidance encourages designers to think about their living environment and to affect it positively by creating quality urban spaces in an existing context (Cowan, 2002). According to Cowan (2002), there are five roles of urban design guidance. Firstly, it offers additional detailed information on design issues mentioned in a framework of urban policy. Design guidance contributes to the process of reviewing the local authorities' plans and policies. Secondly, urban design guidance can reflect the views and values of the local authority, partnerships, developers, local people and other interests, and facilitate the dialogue and negotiation between them. Thirdly, it expresses a vision of how to achieve desired urban spaces in design proposals, which contribute to the local social and economical development. Urban design guidance acts as an assessment criteria for potential proposals. Fourthly, it describes and illustrates the required urban space, and inspires and educates designers to generate appropriate designs. Finally, urban design guidance can provide a basis for producing more detailed guidance at small scales, such as one particular site, streets and etc, therefore, to form a comprehensive framework ensuring good design.

1.1 The objective of design guidance

In the current urban design literature (Chapter 2), the qualities of good urban forms and spaces, as the objectives of urban design, are proposed and elaborated in detail by various researchers. For instance, according to Kevin Lynch, the urban environment should be legible, with clear structure, unique identity and make sense to people (Lynch, 1960). He gave five dimensions of the performance of an urban form—vitality, sense, fit, access and control (Lynch, 1981). In *Towards an urban design manifesto*, Jacobs and Appleyard (1987) advocated that diversity of urban forms was so important for the diversity of activities, social organisations and etc.

Camillo Sitte and Peter Smith emphasised on aesthetic qualities of urban public spaces (Sitte, 1965, second edition, Smith, 1980). In *Responsive environment: A manual for designers*, a group of scholars illustrated several essential qualities of urban forms named permeability, variety and legibility, as well as how to achieve those qualities by design (Bentley et al., 1985). Christopher Alexander (Alexander et al., 1987) emphasised the importance of sustaining the continuous structure of a whole city. He and his research group established systematic rules for achieving coherent urban structures in the growth of a city. There are many others who suggest a number of urban qualities such as liveability, accessibility, authenticity, self-reliance, high density, adaptability and etc for designers to fulfil (Jacobs and Appleyard, 1987, Leccese and McCormick, 2000, Carmona et al., 2003, Sonne, 2005, Thwaites et al., 2007).

Based on such literature, the governments of different countries set up their requirements for quality urban environments. For instance, the Department of Environment, Transport and Regions (DETR) (2000) outlines the objectives of urban design in the UK, which are character, continuity and enclosure, quality public realm, ease of movement, legibility, adaptability and diversity. Furthermore, similar qualities are also proposed in *Urban design compendium,* as a design guidance in the UK (English Partnerships, 2000). In detail, a place identity (character) refers to the local distinctive patterns of townscape, natural settings and culture, which needs to be promoted and reinforced. The continuity of street frontages and the enclosure of space by development which clearly defines private and public areas are highly encouraged. Cities should have accessible, safe and attractive public realms which work efficiently for all the local people including disable ones and elders. The ease of movement refers to the accessibility and permeability of a place. Legibility of urban forms means that a place has recognisable routes, intersections and landmarks to help people find their way around. The adaptability of a development requires robust urban forms which can respond to changing social, technical and economic conditions. The diversity of urban forms can provide various choices for local people through a mix of compatible developments and different functions.

1.2 The format of urban design guidance

There are several forms of design guidance in an urban design framework, such as the master plan of a city, a district level plan, and development briefs. The formats of design guidance in the western literature can be classified into two types: design recommendations (discretionary system) and design codes (regulatory system). The aforementioned British design guidance such as *Urban design compendium* is an example of design recommendations, while the latter format of design guidance is more common in the European continent and some states of the US (Yu, 2005, Punter, 2007).

Design recommendations are not compulsory and not exhaustive, and design codes set out in great details of how the design principles should be applied to the development of a specific place. Design recommendations acknowledge the future uncertainness in developments and leave sufficient space for design creation. Design codes are extremely precise and compulsory in specific developments, which are criticised to restrain the design possibilities.

In the British urban design framework, there is a national framework of policy set by the central government, for example, the so called *Planning Policy Guidance Note (PPGs)*. The PPGs provides several design guidance on specific design issues such as general policy & principles, housing, town centres & retail development, countryside, transport, and conservation. Moreover, other formats of design guidance such as *Regional Planning Guidance (RPG)* and *Strategic Planning Guidance* on specific topics or areas are also important design references in the UK (DETR, 2000). Under the national guidance, local authorities produce additional design guidance on specific sites, topics and areas, which is appropriate for the local built environments, for instance, the *Edinburgh Standards for Urban Design* that guides the urban design in the city of Edinburgh (Holmes, 2003).

The design codes promoted by the New Urbanism in the US are a typical coding in design practices. The SmartCode, as the product of the coding, addresses the relationship between building facades and the public realm, the form and mass of the

buildings in relation to one another and the scale and types of streets and blocks (SmartCode Central, 2007). The codes are based on the 'transect', a system of classification of various urban forms from rural to urban core. The codes are clear and user friendly, which aim to be applied to a local governmental office effectively and practically.

The SmartCode is not only enthusiastically grasped in the US, but also in the UK in the recent decade. For instance, a programme of seven pilot coding projects for new housing is promoted in England by the Sustainable Communities Plan (ODPM) in 2003 and the CABE in 2006 (CABE, undated, Department for Communities and Local Government, 2006).

1.3 Typomorphology and design guidance

No matter what format an urban design guidance is in, the fundamental aim of design guidance is to enhance the original good qualities of spaces, improve the existing urban forms, and control new developments of forms. This objective is directly connected to urban morphology and building typology, which are the study objects of the theory of typomorphology. For instance, both of *Urban design compendium* and *SmartCode* discuss the mix use, walkable streets, safety and so forth through block structures, plot patterns, street networks and building types.

Local traditions are essential concerns for local design guidance. The thoughts in the British design recommendations and American design codes call for a return of traditional human scale, diverse, structurally clear and aesthetic European urban forms. Although there is almost no design guidance in literature directly mentioning the typomorphological approach, the objects of design guidance are the objects of typomorphology. For example, design codes in New Urbanism are established by measuring the dimension, ratio, and spatial relationship of physical forms in a local space, and make new design contribute to the spatial definition of public spaces of that place. This process defines the types of such spaces, which are used to design, control and assess new urban spaces in the local context. Despite the New Urbanists never mention typomorphology, the approach they use is similar to the typomorphological approach, which examines the local types of urban forms and

spaces at various scales and generates similar but not identical new urban forms and spaces that are best suitable for that context.

The typomorphological approach is directly dealing with urban forms, which ought to have strong relation with urban design. It does not invent but continues traditional forms. As reviewed in Chapter 2, typomorphology has been mostly used as a tool to describe and explain the transformation of urban forms or to classify the existing types of forms and spaces, despite the New Urbanists have gone further to urban design practice. It is the time to directly link the theory with Chinese urban design practice and to test the ability of the theory in a real context.

2, The urban planning system in China

It is introduced in Chapter 1 that urban planning and design concepts have long history in traditional China. Those concepts have acted as the driving force that stably maintains Chinese traditional urban forms. These concepts firstly received influences from the western world in the period around the Opium War (1840s), when colonial towns and cities were built in the north and east coast of China, however, not at large scales. During that period, western concepts of urban planning and design were imposed to Chinese cities. Since the Republic of China, Chinese urban planners and designers started to actively adopt the western concepts into Chinese practices. However, the integration of the western concepts and the Chinese traditional concepts was interrupted by the Civic War and Anti-Japanese War (1937-1949).

The urban planning system in China was established in the 1950s when the PR China had been founded. The system was blindly following the Soviet planning system[1] at

[1] Chinese initial planning system followed the Soviet ideology because the central government intended to apply a socialist social system to China, which learnt from the Soviet Union. According to Xie and Costa, the principles of the Soviet urban planning are four: (1)Urban planning is an important component of the nation's economic development programme (the national five-year plan);(2)Urban planning should assist in educating the new socialist man and fostering a strong community spirit for the socialist city; (3)Urban planning should convey the principle of uniformity; (4)Urban planning,

that time. Therefore, urban planning and design was part of the economic planning in the country which was set out by the central government. During the following period, the Cultural Revolution (1966-76) regarded urban planning and design was unnecessary for the country and banned it. As a result, limited construction works during that period serving for national defences and political purposes were carried on (Wu, 1999). The Chinese urban planning system began to run smoothly only since the last three decades, thanks to a developed political system even though some problems existed as explained below.

The first urban planning regulation in China was the 'Chengshi Guihua Tiaoli' (Urban Planning Byelaw) launched by the central government in 1984. The bylaw was replaced by 'Zhonghua Renmin Gonghe Guo Chengshi Guihua Fa' (The urban planning law of the People's Republic of China, 1989), which was the first constitutional law of urban planning in China. Since the 1st January 2008, a new urban planning law—'Zhonghua Renmin Gonghe Guo Chengxiang Guihua Fa' (The urban and rural planning law of the People's Republic of China, URPL) replaced the previous one to legislate urban planning actions all over the country (The Central Government of P.R. China, 2008). The law regulates how local urban plans and policies should be established, implemented, amended, monitored, and the legal responsibility of all levels of local governments in urban planning processes.

The current urban planning system in China consists of the URPL, administration policies and urban plans. According to the URPL law, urban plans of a city contain regional-level plans (Chengzheng tixi guihua), city master plans (Chengshi zongti guihua), district-level plans (Fenqu guihua), and detailed plans (Xiangxi guihua). The detailed plans consist of regulatory detailed plans (Kongzhi xing xiangxi guihua) and implementary detailed plans (Xiujian xing xiangxi guihua) (Figure III.1). A city master plan and regulatory detailed plans of different areas in the city are usually the most important ones (Zou, 2002). According to the law, a city master plan should indicate the strategic development pattern, functional zones, land use pattern,

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especially neighbourhood or district planning, should promote the principle of self-reliance or self-containment. XIE, Y. & COSTA, F. J. (1993) Urban Planning in Socialist China. Cities, 10, p103-114.

transportation system, potential constructive areas of the city and plans on specific topics. A regulatory detailed plan of certain important areas of a city focuses on the issues of land uses, height control, building density, set-backs of buildings from street-lines, street networks, layouts of building mass and open spaces and infrastructures, which is the basis of the relevant implementary detailed plan of this area.

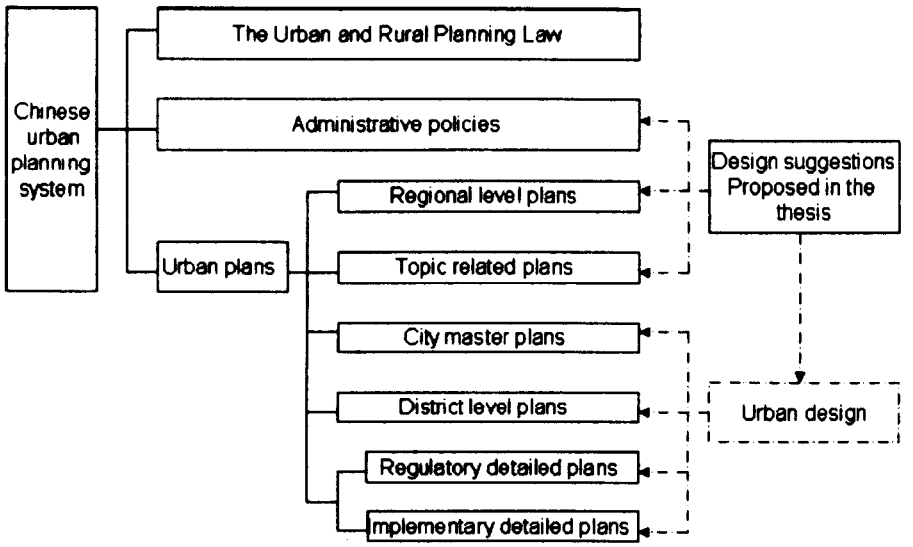

Figure III.1 The current Chinese urban planning system, and the relationship with the design suggestions proposed in the thesis (by the author)

The conservation of historical urban forms and heritages began to be emphasised in the urban planning system as topic-related urban plans in 1982, when the central government listed the first 24 Historical and Cultural Cities of China (Lishi wenhua mingcheng). The Historical and Cultural Cities began to be legally preserved and renewed. During 1986, the central government published the second list of further 38 Historical and Cultural Cities. By 2009, there are 114 Historical and Cultural Cities in the nation's conservation lists [2] (Wang, 1994, Ruan, 2000). Accordingly, conservation and renew plans have been produced by the local governments of these cities, which usually indicate various areas where different degrees of building control need to be applied, for instance, the 'Conservation Plan of the Historical and Cultural City of Nanjing', which is included in the following chapter.

[2] The detailed information on the historical and cultural cities in China has been reviewed in Chapter 3. The criteria of historical and cultural cities selection influence the selection of the case study city in this thesis.

Urban design is absent in the aforementioned various tiers of urban plans defined in the constitutional law. It has not been granted a legal position in the planning system of China so far (Wu, 1999, Zhang, 2003). As a result, despite urban design is conducted in most of the urban planning process of Chinese cities, they have not been sufficiently implemented due to the lack of strong legal support (Wu, 1999). However, the term of 'urban design' is defined in China in the *Chengshi guihua jiben shuyu biaozhun* (The definitions of terms in urban planning, GB/T50280-98, 1998) published by the central government. Urban design is a conceptual layout of the urban spaces and forms of a city as an entity, which should be conducted in every stages of urban planning. The urban spaces and forms of a city include buildings, streets, green lands, natural settings and etc (The Department of Construction the Central Government of China, 1998).

Apart from the lack of legal position of urban design in the current planning system, some Chinese scholars point out some other problems in the current planning system as well. Firstly, the administration process[3] of the approval of urban master plans or project proposals is so complicated and inefficient, while the urban transformation process of Chinese cities is extremely rapid at present. Therefore, an approved plan is usually out-of-date by the time the city is ready to implement it. Another problem lies on the passive administrative position of the local authorities in dealing with various investments. Detailed plans are often altered under the pressures of investors and other interest groups, which causes undesirable planning consequences and problems. The uncritical implementation of urban plans and policies is a common phenomenon in many Chinese cities, which also attributes to the 'nature of leadership[4]' and 'unstable urban development policy' (Rodríguez et al., 2006, p139). For instance, the policies on the set-back distances of buildings from the street-lines

[3] The current administrative institution of approving design proposals is so called 'One letter two certificates' (Yishu liangzheng), which has been illustrated in Yu's paper. YU, L. (2005) Zhongguo chengshi guihua guanli de gaige fangxiang yu mubiao tansuo (Way forward and objectives of urban planning management in China). *Chengshi Guihua Xuekan*, 160, p64-8.

[4] The 'natural of leadership' refers to the preference of individual high-ranking leaders outmatches the legal regulations for design choices in practices.

of Nanjing have been altered several times since the 1990s. As a result, buildings built in different years have different set-back distances from the street-lines. Thirdly, in most Chinese cities, regulatory detailed plans, which are the basis of development in relevant areas, do not cover most of urban areas of a city, but merely some important areas such as the central business district, historical areas or potential developing areas. As a result, constructions taking place in the areas which are not covered in the regulatory detailed plans have no specific references (Zou, 2002). Fourthly, local urban planning is usually produced by several planners in the local urban planning bureau without the participation of the general public and a wide range of experts (Zhang, 2001). Finally, the theoretic foundation of generating urban plans and local policies is not well established. Therefore, urban plans and policies are not always appropriate (Moule and Polyzoides, 1994).

Compared to the reviewed western patterns of design guidance, regional-level urban plans, city master plans and topic related urban plans within the Chinese urban planning system are similar to that of the western countries. Detailed plans of certain areas (including regulatory detailed plans and implementary detailed plans) of the Chinese system indicate some compulsory requirements of design in specific areas. However, a regulatory plan is much less exhaustive and comprehensive than western design codes. For instance, the regulatory plan of the traditional residential district—Nanbu Ting in Nanjing does not offer enough information for designers on how to define a plot, lay a street, build a house, and make the surrounding buildings respond to the traditional fabric (Figure III.2). Design recommendations as optional or preferable design possibilities are almost absent in China.

In sum, not only Chinese cities, but also the current planning system in China, are facing great challenges in the period of rapid urbanisation and globalisation. The following chapter of design suggestions on the seven elements of the urban forms of Nanjing intends to make contributions to the urban plans and local policies of Nanjing in terms of sustaining its traditional identity, as well as guiding design practices of individual designers. The theory of typomorphology can be an important part of the theoretical foundation of urban design. Furthermore, urban designs should be legally supported by the urban policies. Within the legal framework, some of the

design suggestions should be adopted into the relevant regulatory plans or policies to become compulsory requirements, while some of them are recommendations for designers.

Figure III.2 The regulatory plan of the Nanbu Ting area, Nanjing (prepared by the City Planning Bureau of Nanjing, 2004)

CHAPTER 11 URBAN DESIGN SUGGESTIONS FOR NANJING

11.1 Introduction

In the previous section, the transformation of the seven elements of Nanjing's urban forms has been addressed in detail, discussing the synchronic types of each element in each stage of the development of the city. Some of the typological processes have been clearly perceived in the transformation of series synchronic types of certain elements. Characteristics that remain through typological processes are important for the local culture, because they have been remained through changes driven by economical, political and cultural forces. The vitality and longevity of these unchanged characteristics of these synchronic types are the best evidence of their robustness and significance for the local built environment. Therefore, they are rationales for design suggestions proposed in this chapter.

There are two ways to maintain the traditional identity of Nanjing in urban design: one is the preservation of the historical remains which are included in several urban policies and plans of Nanjing; the other is about sustaining the traditional types of urban forms through new development in the future. The objective of design suggestions proposed here is on how to apply traditional types of Nanjing to new forms in the city, in particular, the physical dimensions, proportions of appropriate forms and the spatial relationship between building mass and urban void. The proposed design suggestions, which derive directly from typomorphology, do not solve all problems in urban designs, but acknowledge other issues of urban designs such as functional and environmental issues. Typomorphology is a theoretical starting point for contextually related urban designs, which allows other theories covering issues such as mixed use, transportation design, energy and resource arrangements, landscapes to complete these design suggestions proposed in this chapter.

Design suggestions for Nanjing fall into the same category of the seven city elements as examined before. Relevant suggestions for each city element are proposed with explanations, illustrations and examples referring to the characteristics of each element revealed in the previous analyses. The current urban policies and plans of the city in relation to the control of urban forms are listed first to provide a political framework. The relevant rules and drawings of those policies and urban plans are cited in detail either in support of or to be the base of such design suggestions. The theoretical foundation of design suggestions and findings from the analysis of each urban element of Nanjing are summarised at the beginning of each section of this chapter to appropriately ground design suggestions on the typomorphological theory and analysis, followed by detailed explanations. Each suggestion for each city element is numbered[1] and in **bold font**. Since each suggestion should not be implemented as a single rule, but connect to one another, the links between suggestions are indicated in *Italic font* at the end of each suggestion. The discussion on how to use the design suggestions is in the last section of this chapter.

The choice of the seven elements is discussed in the last section as well, because the seven elements have, in terms of urban identity, different degrees of importance for Nanjing. The suggestions proposed in this thesis leave large space in design for designers' creativity and personal preference according to specific circumstances and clients' requirements. Suggestions also focus on the improvement of the current political environment for sustaining the identity of the city. Moreover, Table 12.2 at the end summaries those suggestions, their contributions to urban qualities, objects and links with each other.

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[1] General plan design suggestions are numbered as G1, G2, G3 and etc. Silhouette design suggestions are listed as Si1, Si2, Si3 and etc. Streets design suggestions are listed as St1, St2, St3 and etc. Urban block design suggestions are listed as Bl1, Bl2 and etc. Urban public spaces design suggestions are listed as P1, P2 and etc. Public building design suggestions are listed as Bu1, Bu2 and etc. Housing design suggestions are listed as H1, H2 and etc.

11.2 Urban policies and plans

In relation to urban planning and design, the municipal government of Nanjing has launched and updated numerous policies since 1949. These policies cover issues such as control of urban forms, requirements of urban plans, planning management in specific areas, and responsibilities of public sectors such as the City Planning Bureau (CPB), district-level governments etc in urban planning and management, the procedure of building applications and the legal penalty for anti-rule activities. These policies provide legal guidelines for urban development and management in Nanjing.

Based on these policies, the City Planning Bureau of Nanjing (CPB) takes charge of urban planning on specific subjects such as the master plan of the region, public transportation plans, district-level urban plans and so forth. The bureau is also responsible for the assessment and approval of building projects in Nanjing. Since 1949, the bureau has conducted master planning of Nanjing seven times, which are 'Chengshi fenqu jihua chubu guihua cao'an, 1950' (The preliminary plan on the functional division of the city, 1950); 'Nanjing chengshi chubu guihua caotu, 1957' (The preliminary master plan of Nanjing, 1957); 'Nanjing diqu quyu guihua, 1960' (The regional plan of Nanjing, 1960); 'Nanjing chengshi lunkuo guihua, 1975' (The plan on the city profile of Nanjing, 1975); 'Nanjing shi chengshi zongti guihua 1981-2000, 1980' (The master plan of Nanjing 1981-2000, 1980); 'Nanjing shi chengshi zongti guihua 1991-2010, 1992' (The master plan of Nanjing 1991-2010, 1992) and 'Nanjing shi zongti guihua tiaozheng 1991-2010, 2001' (The adjustment of the master plan of Nanjing 1991-2010, 2001). The last three master plans have fundamentally influenced the urban form of Nanjing, of which the relevant details are cited in this chapter. The three master plans focus on regional developments, the land use pattern of the main city area, inner-city industrial relocation, infrastructures, transportation, the city environment and public spaces (The City Planning Bureau of Nanjing, 2005b). Apart from those, there are several topic-related urban plans and regulatory detailed plans on industrial distribution, development of industrial and science parks, conservation of historical districts etc produced by the CPB.

Six policies and ten urban plans are selected among those master plans, topic-related plans and regulatory detailed plans in relation to the design suggestions on specific city elements (Table 11.1). Urban policies and plans are labelled with Latin numbers in order to be referred easily in this chapter.

Urban regulations launched by the municipal government of Nanjing	Relation to the suggestions	Year	Tier
I, Nanjing shi chengshi guihua tiaoli (The urban planning regulation of Nanjing)	General plan; urban blocks; public spaces; housing	2004	Urban policy
II, Nanjing shi chengshi guihua tiaoli shishi xize (The implementation of the urban planning regulation of Nanjing)	Silhouette; street networks and streets; urban blocks; housing;	2007	Urban policy
III, Nanjing shi shiqu geren jianfang guihua guanli zanxing guiding (The temporal regulation on individual-built houses in Nanjing)	Urban blocks; housing	2004	Urban policy
IV, Nanjing shi zhongyao jin xiandai jianzhu he jin xiandai fengmao qu baohu tiaoli (The preservation of modern important buildings and districts of Nanjing)	Public buildings	2006	Urban policy
V, Nanjing shi kongzhi xing xiangxi guihua bianzhi jishu guiding (The regulation of making district-level regulatory plannings of Nanjing)	Silhouettes; public buildings; housing	2005	Urban policy
VI, Chengshi zixian guanli banfa (The regulation on the management of purple lines in Nanjing)	Urban blocks; public buildings; housing	2004	Urban policy
Urban plans launched by the City Planning Bureau of Nanjing	**Relation to the suggestions**	**Year**	**Urban Plans**
VII, Nanjing shi chengshi zongti guihua 1991-2010 (The regional-level master plan of Nanjing 1991-2010) (amended version in 2001)	General plan; street networks and streets; urban blocks	2001	Urban master plan
VIII, Nanjing shi shangye wangdian guihua (The planning of commercial centres in Nanjing)	Urban blocks; housing	2005	Topic-related plan
IX, Nanjing shi lishi wenhua mingcheng baohu guihua (The urban conservation plan of the historical and cultural city of Nanjing)	All elements	2002	Topic-related plan
X, Nanjing laocheng baohu yu gengxin (The conservation and renovation plan of the old city of Nanjing)	All elements	2004	Topic-related plan
XI, Nanjing Chaotian gong diqu baohu gengxin guihua sheji (The conservation plan of the Chaotian Palace area)	Urban blocks, Public buildings	1998, 2004	Regulatory detailed plan

XII, Yihe Lu minguo shiqi gongguan qu lishi fengmao baohu guihua (The conservation plan of the Gongguan qu area)	Urban blocks, Public buildings, housing	2002	Regulatory detailed plan
XIII, Nanbu ting jiequ lishi fengmao baohu yu gengxin xiangxi guihua (The conservation plan of the Nanbu Ting traditional residential area)	Public buildings, housing	2004	Regulatory detailed plan
IXV, Menxi diqu baohu yu gengxin guihua (The conservation plan of the Western Gate area)	Urban blocks, Housing	2003	Regulatory detailed plan
XV, Nanjing Ming chengqiang fengguang dai guihua (The landscape planning of the city wall of the Ming Dynasty)	General plan; silhouettes, public buildings;	1999	Regulatory detailed plan
XVI, Wai Qinghuai he yanxian huanjing zonghe zhengzhi guihua (The regeneration of Outer Qinghuai River)	General plan	2002	Regulatory detailed plan

Table 11.1 Related urban policies and urban plans of Nanjing to design suggestions (by the author)

11.3 Design suggestions for the general plan

'Type' is defined as the structural principle of an object, and the application of a type is to apply the structural principle to new object in its context (Chapter 2).

The general plan type of Nanjing indicates (1) the shape (boundaries) of the city, (2) the relationship between the city and its surrounding natural settings, (3) the axes, and (4) the general fabric (texture) of urban forms (Chapter 4). Suggestion G1 is related to the shape of the general plan, and Suggestion G2 focuses on the general fabric of forms in the metropolitan area of Nanjing (including the old city area and the expansion areas). The relationship with the surrounding natural settings and the axes of the city have already been emphasised in current urban policies and plans, which are also explained with several recommendations on how to implement such urban policies and plans.

G1, regarding the plan shape of the old city of Nanjing, define the old city region with a clear visual boundary–linear public urban green lands to connect the existing scattered traditional city wall and moats, in order to complete the original boundary of the old city.

The city area surrounded by scattered city walls and moats of the Ming Dynasty is the oldest part among the metropolitan region of Nanjing (Chapter 4). Residents have been living in this place for several generations and thus have strong emotional connection with the built environment. There is a mixture of building forms such as splendid palaces, temples and modern high-rises, in the old city which date to different periods of the development of Nanjing. The expansion areas to the east and north of the old city have mainly been built since the 1960s and 1970s, while the expansion areas to the west and south of the old city have been constructed over the 1990s. There are very few historical remains in those areas where contemporary buildings including high-rise blocks are the most common building types.

Urban forms in the old city are largely different from those in expansion areas. The separation between the old and the new pays respect to the tradition, and benefits the identity of Nanjing. Otherwise, a homogeneous place would cause confusion in people's perception of the environment. With a clear visual boundary, people would know where the old is and where the new is. Furthermore, a clear boundary would benefit the management of city development, because different emphasises of development in the old city and in the new areas can be placed in urban policies, for instance, paying more attention on conservation and regeneration of the old city, and being more flexible in morphological control of the new areas.

The current boundary needs to be improved for two reasons. First, the preservation of the city wall is still insufficient, although the government's urban plan IX[2] has mentioned it. According to Huang (2003), there are too many fragments of the city wall distributing on the edge of the old city, and many of the half-broken walls are hidden in trees and shelters. Furthermore, the management of conservation is chaotic, and responsibilities in conservation are not clear among public sectors such as street offices and district-level governments. Second, temporal structures and shelters are built by locals at the place where portions of the city wall or moats have been

2 The conservation objects in IX include the four-fold city walls of the Ming Dynasty and the historical rivers and bridges.

demolished. There is not always a clear landmark or sign to indicate the edge of the old city. Highways and homogenous buildings spread all over the space.

In order to make the boundary recognisable and respect the plan type of Nanjing, firstly, the city wall and moats should be strictly protected; secondly, linear urban green lands could be developed on the original sites of the demolished portions of the city wall and moats, as well as beside the scattered city wall and moats. The existing fragmental city walls or moats can be shown by leaving open spaces parallel to them. The width of the open space should be about one or two times of the height of the adjacent city wall (14-21 meters) to allow the city wall to be perceived appropriately. An example of such place is the park near the Zhonghua Gate in the south of the city (Figure 11.1). On the original sites of the demolished city walls and moat, the width of linear public spaces should match the width of the original wall (8-10 meters) to mark the boundary and prevent the place to be occupied by buildings. Green lands as public parks could be for leisure or public education (such as open exhibitions on the history of the city wall) to celebrate the value of society. Such linear green spaces should be connected where possible, while let main transport paths get through to connect the old city with the new expansions.

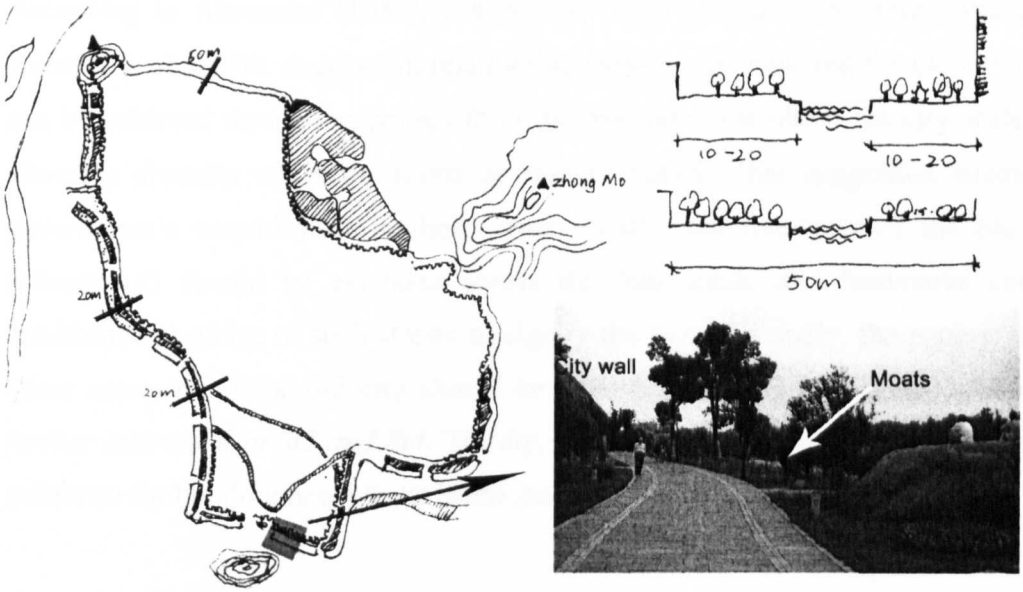

Figure 11.1 In order to maintain the shape of the old city, a visual boundary created by linear urban green lands should be adopted at the place where some portions of the original city wall and moats have been demolished. The existing parts of the city wall and moats should be shown. (by the author)

New development areas should respect the boundary between the old and the new, while correspond to the old city fabric at the city scale (G2). Public squares and parks would better to connect with public buildings (P2).

G2, in order to create coherent urban forms and respect the urban fabric of the general plan of Nanjing, urban fabrics in newly developed areas outside the old city should carry on the axes and street networks of the old city, and follow the block dimensions of the old city at the city scale.

Despite the fact that differences should be celebrated between the old city and the newly developed four areas (east extension, south extension, north extension and west extension, Figure II.2), it is important to maintain a degree of continuity between different urban forms in the main metropolitan area of Nanjing[3] (Figure II.2). The spatial relationship between the new and the old should be clear, coherent and harmonious, because the four areas and the old city area are geographically connected and embraced by the surrounding natural settings.

According to Alexander (1987), a good city form should be an entity and grow piecemeal, bit by bit. A coherent relationship between the new and the old city areas can be achieved through responses from the new upon the old at the city scale and allowing diversity of urban forms at smaller scales. This suggestion needs the government's commitment in those areas. Firstly, the five axes of the old city (Chapter 4) should be extended across the four areas, and landmarks can be established at nodes of such streets to signify the axes. Secondly, the pattern of the street networks of the old city should be extended into the new areas, *which are further addressed in St3 and St4.* Thirdly, block types of the old city should be the reference for building new blocks in the new areas *(Bl3)* (Figure 11.2).

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3 In the urban policies of Nanjing, the metropolitan area of Nanjing is defined as the old city plus the aforementioned four newly developed areas (figure II.2).

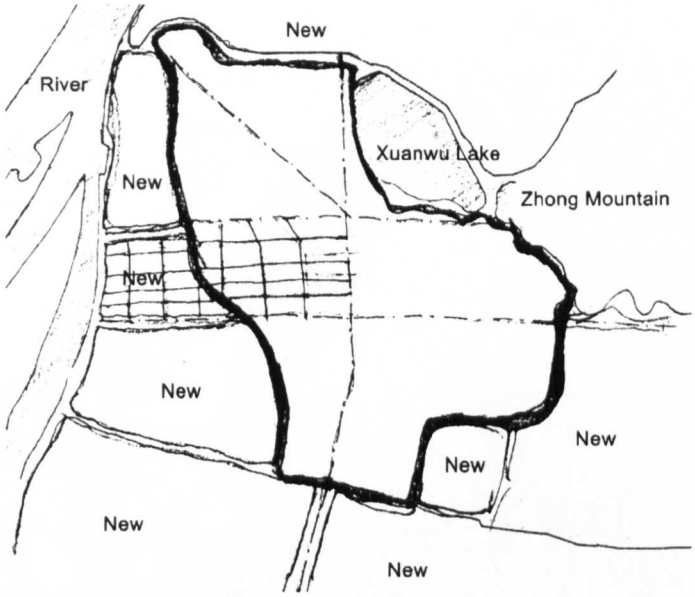

Figure 11.2 Urban fabrics in the expansion areas of the old city should correspond to the fabric of the old city by extending axes, following street patterns and block types at the city scale, while allowing diversity in those areas at smaller scales (by the author)

Regarding the relationship between the city and the natural settings, urban plan IX discouraged any development that would damage the surrounding mountains and water system: Zhang Mountain, Shizi Mountain and Jubao Mountain, and Qinghuai River, Jinchuan River, city moats, Xuanwu Lake, Mochou Lake, Qian Lake (Chapter 4, Figure 11. 3). The regeneration of Outer Qinghuai River bank in urban plan XVI is an example to show how to enhance the natural settings of Nanjing. In the plan, the regeneration of water bank is combined with the development of public parks and open spaces. Boat tours are proposed in the plan to facilitate the use of Qinghuai River.

Furthermore, the government's urban plan VII has proposed three visual corridors where the volumes and heights of buildings are controlled to be small compared to common contemporary buildings and low-rise to allow the natural settings to be perceived by people from within the city. The visual corridors are Jiuhua Shan—Beiji Ge—The Drum Tower (1); Shizi Mountain—Bazi Shan—Huayan Gang—the TV tower (2); The Zhonghua Gate—Yuhua Tai (3) (Figure 11.4). In addition to the three corridors, the study of silhouettes in this thesis (Chapter 5) further proposes another two important viewpoints which also form a visual corridor, which is the

Xuanwu Lake—the Drum tower—Xinjie Kou (4) (Figure 11.4). This visual corridor is worth preserving since it also makes the natural settings visible for people.

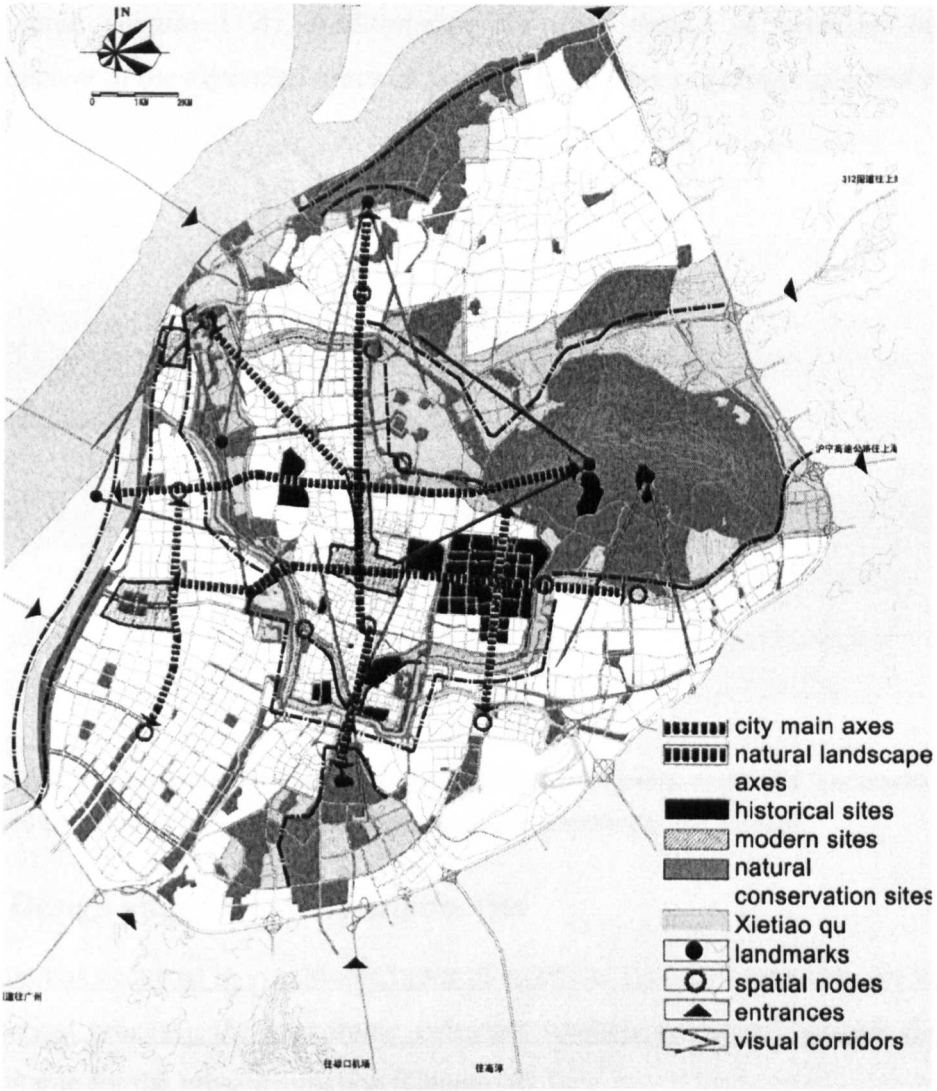

Figure 11.3 The axes, historical sites, Xietiao qu, natural landscapes, landmarks, spatial nodes and visual corridors of Nanjing proposed in the master plans prepared by the City Planning Bureau of Nanjing (CPB), 2001.

Urban policies and plan VII and IX also paid great attention to the preservation of the city axes: the Zhonghua Road, Yudao Street, Zhongshan Road, Northern Zhongshan Road and Eastern Zhongshan Road (Figure 11.3). However, there is no statement in the urban plans on how to visually highlight the relevance of such axes. Apart from the preservation of those axial streets, the Xinjie Kou Square and Drum Tower Square that are located in the meeting points of the axial streets at the present are

recognised as landmarks, thus they should be preserved as well. Furthermore, more landmarks could be built at the ends of axial streets where possible to reinforce their axial sense (Figure 11.4). Additionally, *the axes should be extended into the development of the expanded areas of Nanjing (G2). This suggestion also links to St5.*

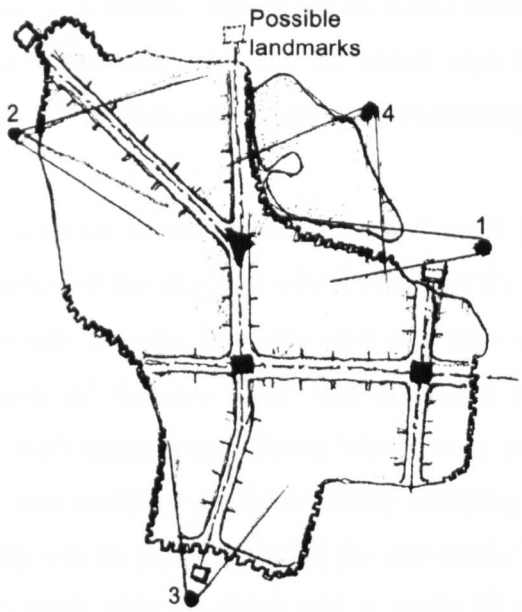

Figure 11.4 Maintain the five axes by preserving the axial streets, and build landmarks on the ends and the meeting points of the axial streets where possible (by the author)

11.4 Design suggestions for silhouettes

If mutations occurred in synchronic types of an object (which means they are not in a typological process), the synchronic types are unlikely preserved because they are not suitable for the present situation (Chapter 2, 3).

Silhouettes of Nanjing can be perceived in whole from five major view points on the periphery of the city, and can also be perceived at a small scale when people move around the city. (1) At the city scale, the type of silhouettes of Nanjing is not in a typological process over time. (2) At the building scale, traditional roofs generate small scaled silhouette types that still exist at present. Therefore, Si1 is not on applying the traditional type at the city scale, but on visual qualities that benefit the imageability of Nanjing and create contemporary new identity for the city, and Si2 is on how to achieve the traditional small scaled silhouette types through new buildings (Chapter 5).

Si1, since the transformation of silhouettes of Nanjing at the city scale do not follow a typological process, no traditional type should be followed at this scale. In order to enhance the visual quality of silhouettes that contribute to the contemporary identity and imageability of the city, the silhouettes, which are perceived from the five viewpoints—the Xuanwu Lake bank, the Yangtze River bank, Zhong Mountain, the City Wall on the south and the Xinjie kou area, should have the quality of rhythm, punctuation and harmony.

The five viewpoints indicated below are the best and most popular locations for appreciating the silhouettes of the city as a whole (Chapter 5). The two water banks are where people approach the city from the northeast (the main Train station of Nanjing is near the bank of Xuanwu Lake) and northwest (the Yangtze Bridges connecting the old city with expansions). Zhong Mountain is the highest and biggest mountain near the city, and a popular place for hiking, camping and other recreations. The overview of the city can be perceived from the mountain. The city wall and the Zhonghua Gate on the south play the same role in terms of over viewing the city from its edges. Xinjie Kou area is the centre of the city where the majority of high-rises are located, from which the city can be perceived from the tops of those high-rises.

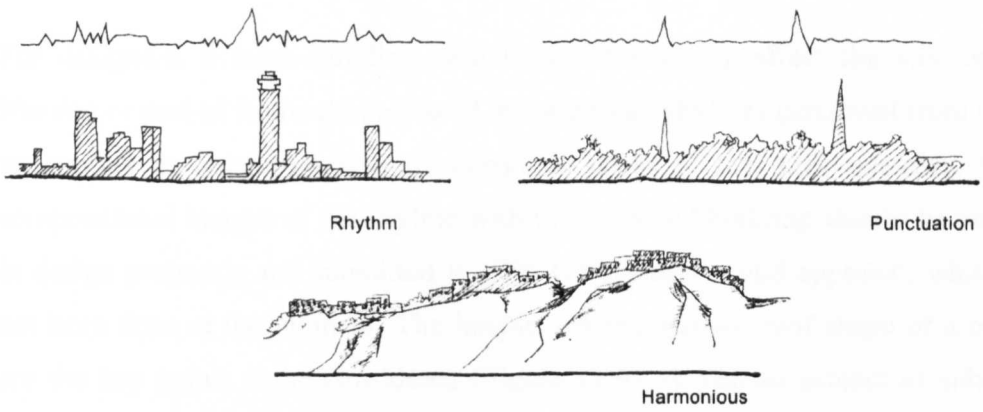

Figure 11.5 The three aesthetic qualities of skylines: rhythm, punctuation and harmony (by the author)

The visual qualities of rhythm, punctuation and harmony in silhouettes of a city are mentioned by Attoe (1981). 'Rhythm' refers to the patterned, recurring alternations

of contrasting elements of images in a silhouette. In order to achieve rhythmic silhouette, building forms as an entity should have certain ordered patterns and recur alternations of contrasting heights in their image of a silhouette. 'Punctuation' refers to repeated and regular interruptions or divisions within an approximately even image to add energy to it. The number of breaks and the distance between them are crucial to make it as 'punctuations' rather than chaos. Forms of punctuations in a silhouette should seek relation to surrounding objects in terms of shape, volume or even colour. Harmony of forms refers to the sense of familiarity, orderliness of forms, and a pleasant combination of components of forms. Relevant research on the relationship between the sense of harmony and architectural forms is conducted by Peter F. Smith (1987). According to him, the sense of harmony is grounded in 'an intuitive code' with the 'elimination of clash and tension' (Smith, 1987, p67). There are two levels of orderliness related to the sense of harmony; the first orderliness concerns 'the harmonic potential which lies behind the clash between wholeness and partness, or the forces of unity and complexity', and the second is extracted by human brains 'between two opposite but related classes of information to reduce complexity', which is usually related to proportions of forms (Smith, 1987p69-71). Objects in the skylines should have harmonious relation with both the natural elements and the surrounding built forms (Figure 11.5).

For designers, a large building, which would possibly affect the silhouettes of Nanjing or part of it, should be placed in the exiting skylines perceived from the five viewpoints in order to assess its impact in terms of the three qualities. Several compositional images of the skyline with the proposed building should be produced in design proposals and submitted to CPB for evaluation and approval, which have not been done at the moment. The height, volume and the roof shape of a building are the key points to be considered (Figure 11.6). A Similar project of silhouettes design has taken place in Portland, which can be a practical example for designing the silhouettes of Nanjing (City of Portland. Oregon, 2007).

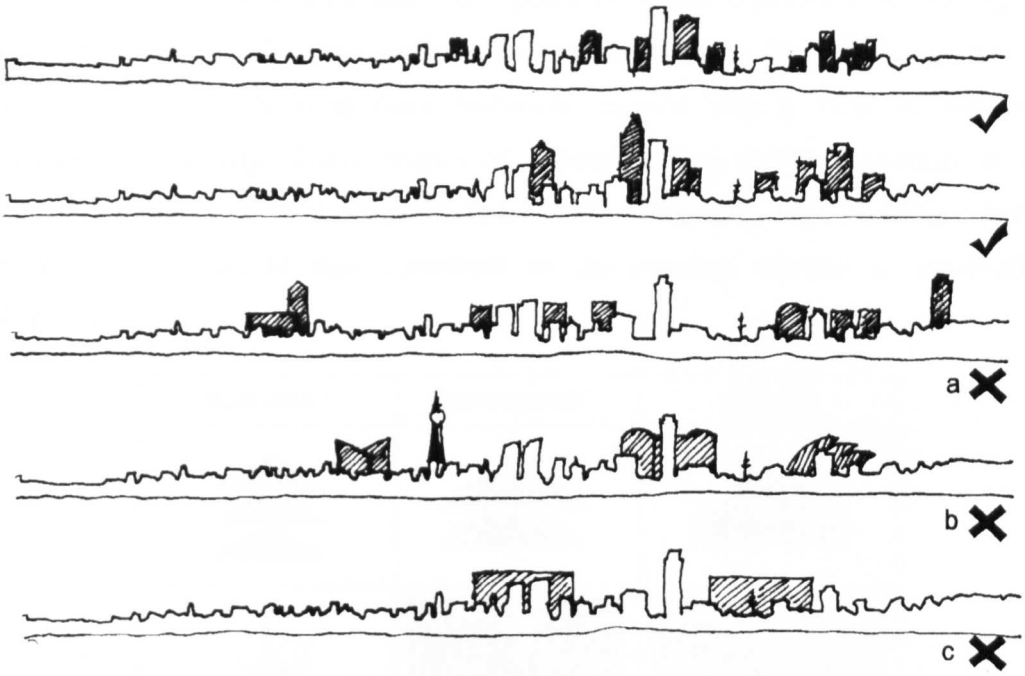

Figure 11.6 Place potential buildings (hatched) in the existing skylines, avoid that a) a building (left) has vast volume, and buildings (right) have identical height standing together that makes the silhouette monotonous without punctuation; b) buildings have grotesque shapes that are not harmonious with the existing forms; c) buildings have vast volumes and dull shape which are not rhythmic and harmonious with the surroundings (by the author)

Si2, traditional types of silhouette at small scales have a strong presence in contemporary Nanjing (Chapter 5), therefore new buildings near traditional ones should achieve similar visual effects to the traditional types of silhouettes where possible. The traditional types of silhouettes are 'multi-cone', 'multi-trapezoid' and 'stepped'.

Traditional building roofs generate small scaled silhouettes of Nanjing, which contribute to the distinctive image of the city. The shape of multi-cone is abstracted from silhouettes formed by traditional towers, while the shape of multi-trapezoid is distilled from silhouettes formed by traditional temples and halls. Traditional courtyard houses in Nanjing have tall end walls, which form silhouettes in the stepped shape (Figure 11.7). Silhouettes are closely related to buildings roofs. Roofs are essential elements of Chinese traditional architecture, which represent functions and social status of buildings (Liu, 1989). In a traditional building complex, different

roof types showed different degrees of importance of individual buildings among the group (Chapter 9). The small-scale silhouettes formed by these buildings have a strong presence in Nanjing since historical remains largely exist in numerous locations of the city. These shapes of silhouettes are deeply imprinted in the collective memory of local people, thus are worth preserving. New buildings built in those locations should also contribute to the existing identity of small-scale silhouettes.

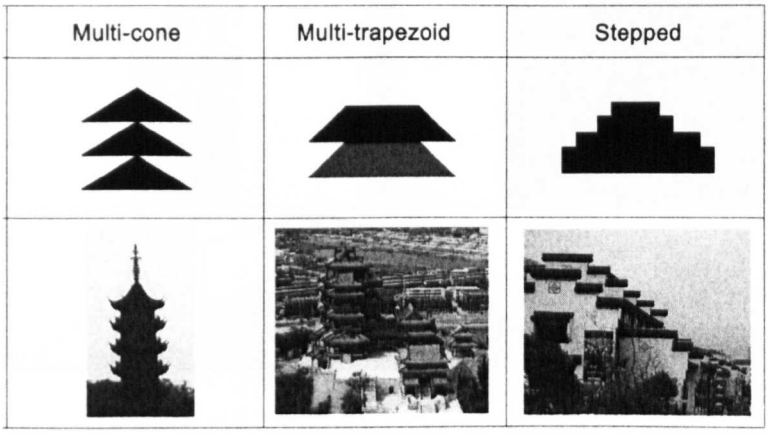

Figure 11.7 The types of small-scale silhouettes formed by traditional building roofs at small scales (by the author)

Buildings which form 'multi-cone' and 'multi-trapezoid' types of silhouettes are mainly traditional public buildings. Buildings which form the 'stepped' type of silhouettes are usually houses. New buildings in nearby locations of traditional buildings should form silhouettes with similar visual effect of the three types. For instance, the multi-cone type of silhouette can be achieved by using a number of pitch roofs at different heights of a public building or a group of public buildings, such as exhibition halls, community centres and so forth. The Liuyuan Hotel in Nanjing is an example, which is designed by Qi Kang (Figure 11.8). The top of the building has been broken down into four attached wings with different heights to form a roof-hill, each of which has 'trapezoid' end walls. But the interior space is kept as an entity.

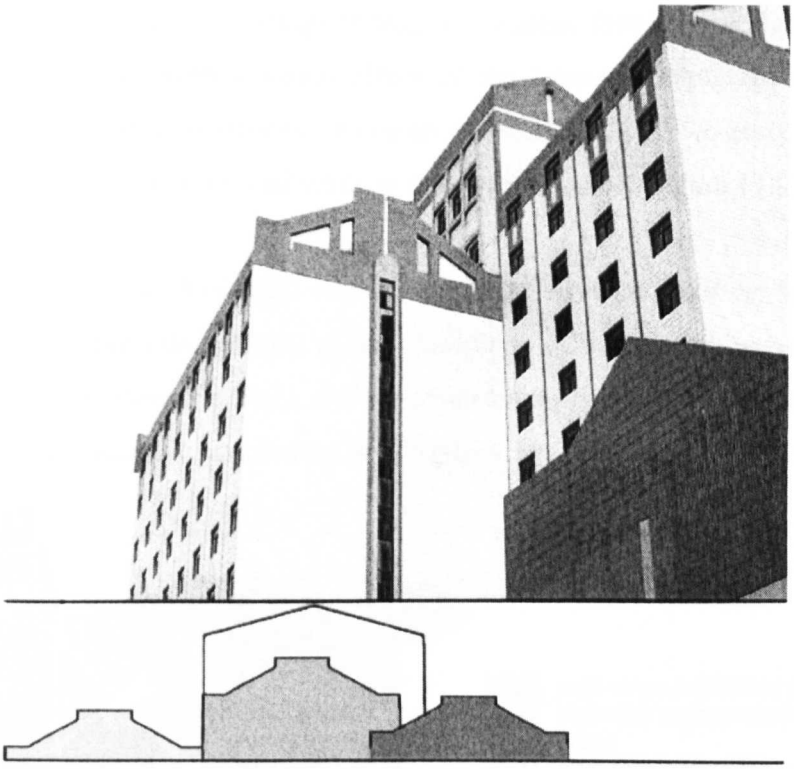

Figure 11.8 The Liuyuan Hotel has four attached wings of different heights to visually archive the effect of a 'multi-trapezoid' silhouette at a small scale (by the author)

Figure 11.9 An example of new houses in traditional areas forming the 'stepped' type of silhouettes to enhance the local identity (by the author)

The top parts of residential buildings in traditional areas should be designed to form small-scale silhouettes with a visual effect of the 'stepped' type. An undergoing housing project in the southern city can be an example of this. Two-story houses are attached to each other with mutual walls in the stepped shape (Figure 11.9).

In *order to make new buildings visually harmonious with existing buildings in traditional areas, the total volume of new buildings in traditional areas should be broken down where possible (Bu1), and the traditional types of building details could be applied to new buildings according to designers' preference (Bu2, H9).*

Figure 11.10 The height control of buildings in the old city as shown in the urban plan X (Wang, 2006, p53)

Apart from the above two suggestions, the height control of buildings is important for silhouettes of the city, because the height limits for new buildings in different areas could make them stay harmoniously with existing buildings. The height control has already been imposed in the current urban policies, for instance, the different degrees of strictness of control are applied to different areas: the 'Jianshe kongzhi qu' and 'Xietiao qu' of specific historical buildings as mentioned before. Furthermore, Chapter 2, rule 3 of the urban policy V indicated that the height control of buildings should be allocated to each urban block, and there should be six levels of heights—lower than 12 meters, 12-24 meters, 24-35 meters, 35-50 meters, 50-100 meters and taller than 100 meters (The City Planning Bureau of Nanjing, 2005a).

The governmental city-level urban plan X (2004), which is based on the research of the Southeast University (Wang, 2006), regulated four levels of height controls in the city as shown in Figure 11.10. The plan of height control is determined by the locations of historical buildings[4], the land values, the accessibility and landscape evaluation of each area of the city. Therefore, high-rises are allowed in Xinjie Kou area and the areas alongside the Eastern Zhongshan Road and Northern Zhongshan Road. In the 'high-rise controlled areas', buildings should be less than 35 meters tall. In the 'high-rise strictly controlled areas', buildings should not exceed 24 meters, while there should not be high-rises in the 'high-rise prohibited areas', which are in the southern city. This policy not only determines that the silhouettes of Nanjing at the large scale are high in the centre and low in the south, but also insures the proposed suggestions for street types, block types and building types in the southern part of the city feasible, because new buildings in that area have to be low-rise. In addition, the several current regulatory urban plans of some of those historical sites published by the CPB (XI, XII, XIII and IXV) on height control can be additional references for making silhouettes of the city, which will not be shown in details here.

4 For instance, the current urban plan XV suggests that no high-rise buildings within 50 meters distance from the city wall are allowed, while the heights of buildings within 100 meters distance from the city wall should be strictly controlled.

The two suggestions proposed in this thesis are complements of the current policies and plans.

11.5 Design suggestions for streets and street networks

A type is grounded in a particular morphological region. An existing traditional type which has gone through a typological process can be applied to objects in that region (Chapter 2). For street networks, a type refers to the pattern and distance among streets in a network; for streets, a type refers to the layout, width/height ratio and approximate width of a street.

(1) The current street network is a composition of four types of networks. Two types of networks formed in the historical period, which are the *network responding to the topography (type A)* and the *north-south oriented grid network (type B)*. The first type can be identified in the Eastern Gate and Western Gate areas in the south part of the city, near Qinghuai River, where individual streets follow the path of the river, either upright or parallel to it. This type exists mostly in the traditional residential quarters, which is the densest compared to other types. The *north-south oriented grid network* can be found near the previous palace of the Ming Dynasty in the east part of the city. This type consists of north-south oriented axial streets and other regular, symmetrical streets. The other two types of networks date to the Republic of China era, which are the *boulevard system (type C)* throughout the city and the *geometrically regular network (type D)* in the modern residential neighbourhood (Figure 11.11). (2) Street types in the city are the traditional type of Guanjie (commercial streets, type a), the traditional residential type (type b), the boulevard type (type c) and the new contemporary type (type d). Since these types of street networks and streets are in different morphological areas, the design suggestions for different areas are proposed separately: suggestions for the **'southern city'** which is the 'U' area on the south (the walled area from Zhonghua Gate to the Jianye and Baixia Road); and suggestions for the rest of the city.

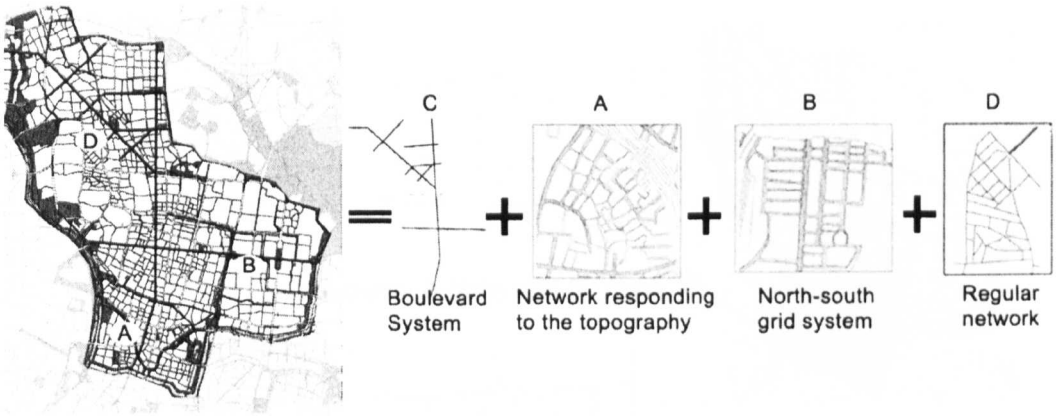

Figure 11. 11 The current street network of Nanjing consists of four types of street networks. The diagram shows their configurations and locations (by the author)

St1, new streets in the southern city should follow either type A of street network near Qinghuai River or type B of street network in the flat land, in terms of a) distance between streets and b) street pattern, in order to improve the current street networks of the southern city.

Street networks of specific cities are the 'skeletons' of their urban forms (Qi, 1982), determining the transport organisation of a city. In order to maintain the original image of the traditional southern city of Nanjing, the two traditional types are the references for not only preserving the existing street networks, but also building new streets in the existing networks. The definition of a street network type is based on the distance among streets and orientations of streets (street pattern) (Chapter 6). Streets in type A--*network responding to the topography* follow the path of the river, while streets in type B--*geometric grid network* are north-south oriented. The distances between streets of type A are between 50 and 100 meters, while the distances between streets of type B are mainly between 150 and 200 meters, which is related to the dimensions of traditional urban blocks (Chapter 7).

Street networks in the southern city have been developed relatively well during a long time, so that only a few new streets are required to improve the networks and connect existing cul-de-sacs. Two examples for such purposes are given in Figure 11.12. New streets in the examples maintain the distances from other streets and the existing patterns, in order to follow the two types of street networks.

Figure 11. 12 Two examples of how to follow the type A and B of street networks in two chosen areas in the southern city: a) follow the pattern of type A (left); b) follow the grid pattern (right). This suggestion intends to improve the current street networks and avoid cul-de-sacs (by the author)

Furthermore, traditional street networks are facing the challenge of carrying cars nowadays because they have been designed for pedestrians only in the past. Despite the use of automobile has created urban problems such as noise, pollution, danger, congestion, parking needs and etc, volumes of cars has increased considerably in the city at present: the number of civil vehicles in Jiangsu Province reached 2.96 million in 2007, which is approximate ten times of that in 1990 (Department of Transport, the Central government of P.R.C). However, an investigation conducted by students from the Southeast University revealed that although more than 50% of households in expanded areas of Nanjing had cars, less than 1% of households in the southern city had cars (Liu et al., 2003). Moreover, people in the southern city who are willing

to buy cars in the future (20%) are much less than that of the expanded areas (40%)[5] (Liu et al., 2003). Street networks in the southern city are much denser (street-distances are between 50 and 200 meters) than other parts of the city (Chapter 6). Therefore, even though the regeneration of street networks should consider both vehicular use and pedestrian, it is possible to maintain the traditional types of networks in the southern city, but expanding traditional streets for vehicles and pedestrians. *The strategies for that are addressed in St2.*

This suggestion is also related to suggestion Bl1: Street networks in the southern city are related to the Post-Lifang block type in this area.

St2, traditional streets should be expanded to carry vehicles, while maintain traditional features. Two different widths (10 meters and 6-8 meters) for expanded streets are proposed by the author to accommodate different types of traffic, which are explained as following. In order to maintain the traditional street type b in the southern city, the width/height ratio of type b and tortuous street-lines should be created and defined by buildings alongside the streets of 6-8 meters.

Vehicular streets nowadays are largely absent in the southern city with the exception of two axial streets, which can be seen in the transportation plan of the urban plan VII (Figure 11.13). Expansion of streets is necessary for the using of private cars. As addressed in Chapter 6, type b of traditional streets has a width/height ratio of about 1, and is between 3.5 and 6 meters wide. This width needs to be adjusted slightly, and the ratio should be maintained. In order to keep the expansion project minimum to cut down the cost, a hierarchy of two widths of streets are proposed here to carry

[5] This is mainly for three reasons: firstly, streets in the southern city are not suitable for everyday vehicles and there is almost no parking space in the southern city; secondly, jobs in the old city are greatly concentrated so that travel demand is relatively low; thirdly, people who live in the southern city have comparatively lower income than that of other parts of the city, thus they unlikely to afford cars (Reasons for the last point refer to Chapter 10).

different types of traffic: large vehicles such as bus and small vehicles such as private cars (Figure 11.14).

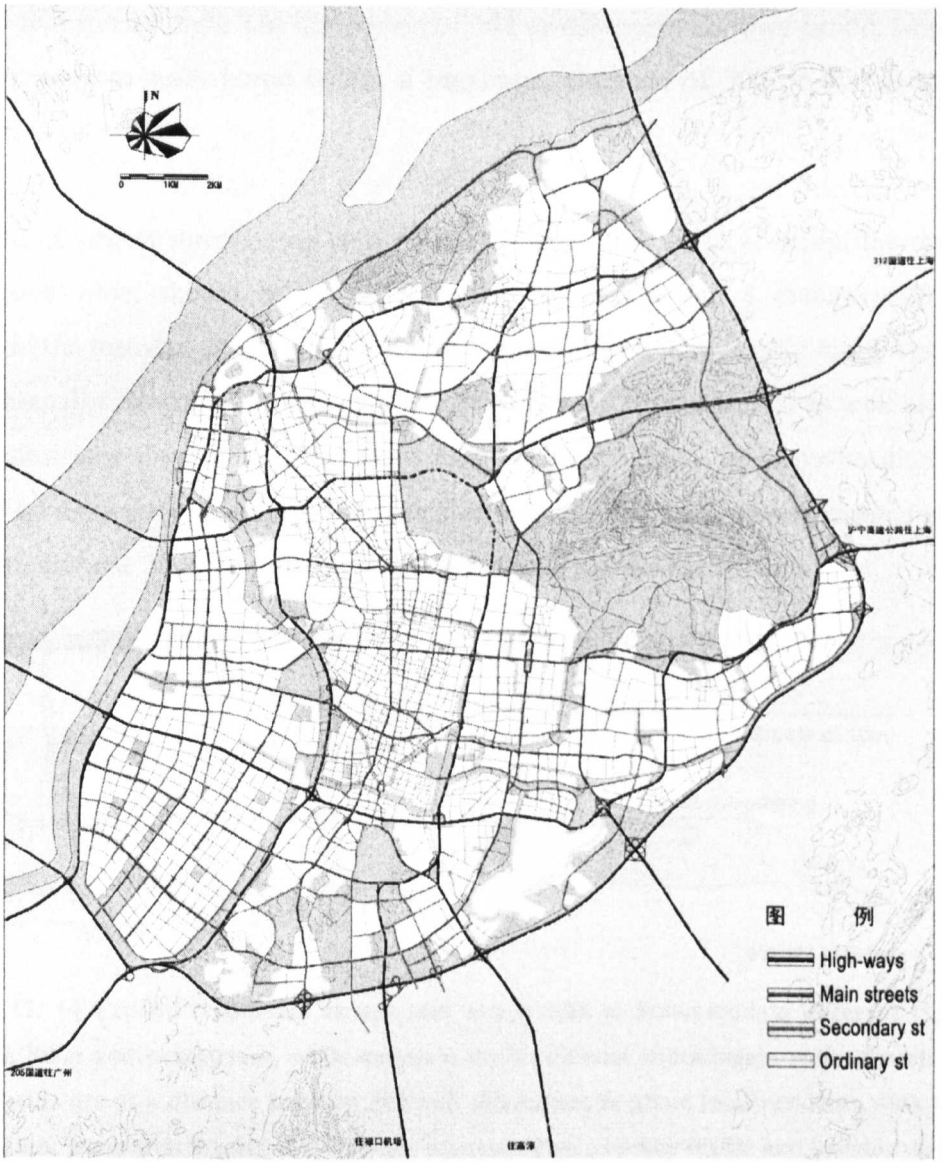

Figure 11. 13 The transportation system in the master plan of Nanjing prepared by the City Planning Bureau (CPB), 2001.

At a distance between 300 and 400 meters (two or three urban blocks), streets should be expanded to be about 10 meters. Since local people's major transport methods are by bus, bike and foot due to the low degree of car ownership (refers to St1), the width of such streets should be suitable for one bus (3 meters) plus one private car (2 meters) (Department for Transport and Communities and Local government, 2007), as well as bikes and pedestrians (2 meters at each side at least). Therefore, the

dimension of 10 meters is the minimum width for streets carrying large vehicles, and still able to achieve the width/height ratio of 1 since buildings in the southern city are mainly two stories high. The dimension of 300 or 400 meters allows people who take bus everyday to walk home within a maximum distance of 300 or 400 meters (5 minutes walk).

The rest of streets surrounding urban blocks of the southern city, except the ones of 10 meters wide, should be expanded to be between 6 and 8 meters wide, and maintain the tortuous street-line. The dimension of 6 or 8 meters only allow one-way private small cars going through and on-street parking for such cars, as well as bikes and pedestrians (Figure 11.14). Streets carrying traffic from the opposite directions should be arranged alternately. This dimension is also the minimum to expand streets for vehicular use and maintain the width/height ratio at the mean time.

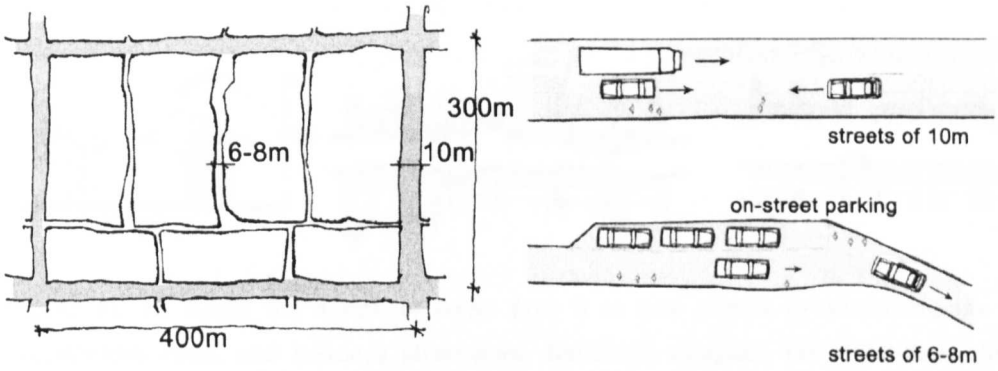

Figure 11. 14 Expand traditional streets into two widths to accommodate different types of vehicles, bikes and pedestrians, while maintain the traditional width/height ratio. Streets of 10 meters wide are at a distance between 300 and 400 meters to allow local residents walk to bus stops within 5 minutes. Streets of 6-8 meters accommodate one-way traffic and provide on-street parking space (by the author)

Another important feature of type b of streets is that the street lines are not straight, but uneven, forming diverse spaces and vistas. Streets can be narrow for passing through, and can be broad for staying and performing social activities. The slight curves in streets can calm traffic to ensure safety for local people, provide privacy for them and enhance visual diversity of streets. This street type contributes significantly to the traditional identity of the southern city. Therefore, in the regeneration of the southern city, street-lines of those streets of 6-8 meters wide should be kept tortuous

by placing buildings in slightly different angles against the street-lines (Figure 11.15). Streets of 10 meters wide are likely to have comparatively straight street-lines because they must let buses going through in a normal speed—between 12 and 16 km/h as the situation in the current city (Liu et al., 2003)

Wider portions of the streets of 6 or 8 meters can perform as activity nodes in every 30 to 50 meters (Figure 11.16). Vehicles are not encouraged in such streets, in order to leave space for pedestrian and children's play. Furthermore, trees should not be placed alongside the streets because of the small sections of the streets. However, a small number of trees can be placed in courtyards of houses and activity nodes of the streets. This suggestion needs support from the urban detailed plan of this area by CPB, and to be implemented by individual builders. The current urban plan on streets of this area that prepared by the CPB does not cater for this quality.

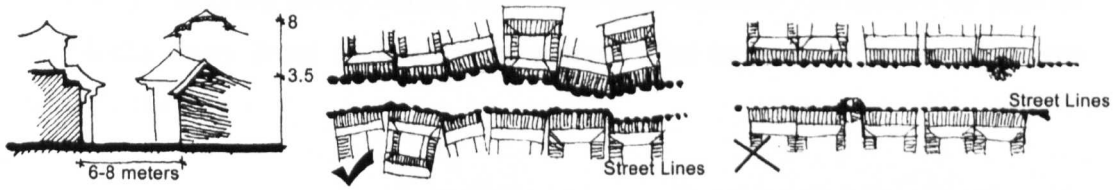

Figure 11. 15 Apply the design of street type b to new streets by sustaining the widths, height/width ratio, and tortuous street-lines. Buildings alongside the street-lines should be placed in slightly angles against street lines (by the author).

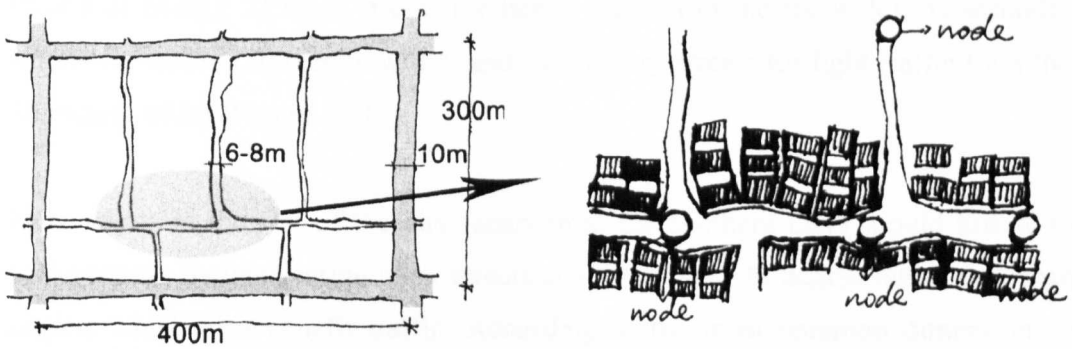

Figure 11. 16 Activity nodes every 30 to 50 meters in the streets of 6-8 meters (by the author)

This suggestion (St2) discourages the using of vehicles in the local area and encourages the using of public transportation. The improvement of public

transportation is one of the aims of the local government. Along with the completion of the subway line passing through the area in 2008, the transportation pressure can be slightly released. Beside local residents, other people who would work in the old city and would be willing to use public transports could be attracted into the southern city area after the regeneration. In addition, highways and main streets (defined in St3) that serve for heavy traffic connecting the inner city to new expanded areas of Nanjing have already been indicated in the government's urban plan (Figure 11.13).

This suggestion is closely related to St1. The layout of streets of 10 meters follows the type d of streets in Nanjing (St5). The streets can be activated by shops, if necessary, in the first roofed-buildings of houses facing the streets (H3).

St3, following the type B of street networks in the rest of the city (apart from the southern city), the distance between main and secondary streets (defined as following) carrying heavy traffic should be approximate 750 meters or four or five blocks away from each other to increase the capacity of carrying heavy traffic in the city.

Type B of street network is the most common type in the city—the *north-south geometric networks* (Chapter 6). According to the urban policy II, there are four levels of streets in Nanjing: 1) highways or ring roads mainly being outside the old city (except one street crossing through the city from the north to the south near the Palace of Ming); 2) main streets for heavy traffic (40 meters wide); 3) secondary streets for traffic (30 meters wide); and 4) ordinary streets for light traffic (less than 30 meters wide) (Figure 11.13).

New streets in the rest of the city (apart from the southern city) should follow the grid network by intersecting other streets at approximate 90 degree rather than sharp angles, which also benefit traffic. According to the most common dimensions of urban blocks in this area (Chapter 7), the distances between ordinary streets, which define those urban blocks, ranges between 100 meters and 200 meters. New ordinary streets should follow such distances, because streets in large distance create super blocks, which have been criticised in many scholars' works, such as Jane Jacobs

(1961), the Krier brothers (Krier, 1998) and New Urbanists (Duany et al., 2001). Furthermore, super blocks which exceed 200 meters have negative impact on permeability (Bentley et al., 1985).

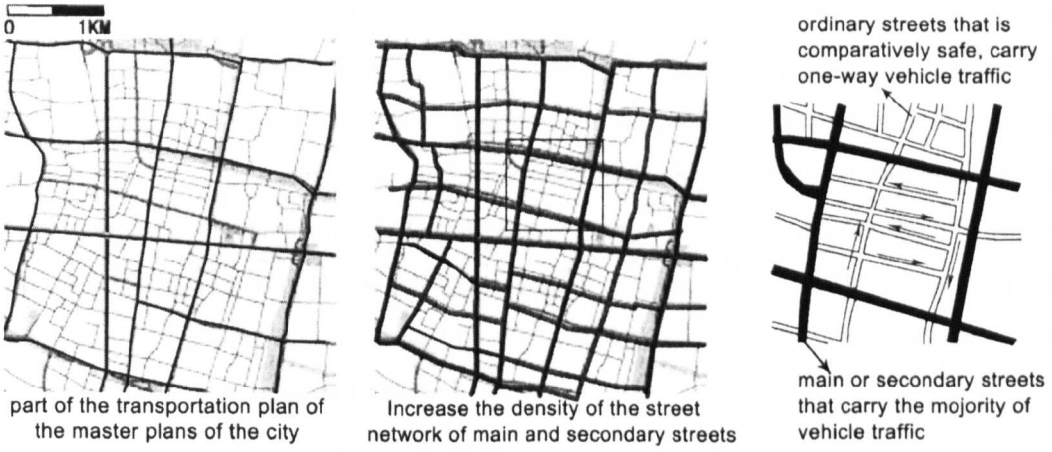

Figure 11. 17 Based on the type B of street networks, increase the density of street network consisting of the main and secondary streets; Expand some existing ordinary streets to become new main or secondary streets that carry heavy traffic. The rest of ordinary streets should be controlled to carry one-way vehicular traffic only, and be activated to accommodate more street activities (by the author).

Currently, the main and secondary streets are in an average distance between 1,000 and 2,000 meters, which is too far to efficiently accommodate heavy traffic in the city. As a result, ordinary streets which are less than 30 meters wide are also used for heavy traffic, especially in rush hours. There is no difference between main, secondary streets and ordinary streets in terms of volume of traffic carried. Heavy traffic everywhere greatly disturbs people who live in those nearby urban blocks. To differentiate the main and secondary streets from the ordinary streets, and establish a street hierarchy means to allocate different pedestrian and vehicular loads in those streets, leaving comparatively quiet ordinary streets for bikes, pedestrians and on-street parking.

According to 'Zhongguo chengshi daolu sheji guifan CJJ 37-90' (Design regulations of urban streets in China, CJJ 37-90, 1995), for a city whose population is over 2 million, the density of highways, main streets, secondary streets and ordinary streets should be at least 0.4, 1.2, 1.4 and 3-4 km/km2 respectively. Based on this regulation,

in a grid pattern of street network of Nanjing, the distance between main and secondary streets in total in average should be at last 750 meters, while the distance between ordinary streets should be 330 meters (Figure 11.17). As mentioned before, common block sizes in this area are between 100 and 200 meters, thus four or five blocks should be surrounded by main and secondary streets. In order to densify the current network of main and secondary streets, certain ordinary streets should be expanded to become main or secondary streets, and the capacity of carrying heavy traffic could be increased. Consequently, the rest of ordinary streets can be safer, with appropriate management strategies such as one-way traffic allowance or limitation of vehicular access hours in a day, and can provide on-street parking space for local residents or visitors (Figure 11.17).

Within the street networks, the design of individual streets should employ type c and d (St4). The pattern of this network should be used to subdivide super blocks (Bl4). Moreover, pedestrian commercial streets, if necessary, can be developed based on ordinary streets (details refer to P1).

St4, employ either street type c or d for street design in the rest of the old city (apart from the southern city), where the design of type B of street network is applied.

The proposed new main streets and secondary streets in St3 should all follow type c—boulevard type, while new ordinary streets should follow type d—three lanes type of streets, except for their widths. The original boulevards (type c) have already been adapted to fulfil the contemporary requirements of traffic in the city: the original width of the high-speed lane has been increased to carry all kinds of vehicles and the width of the low-speed lane originally for rickshaws have been decreased to accommodate bikes in the contemporary period (Chapter 6). This type of streets functions very well in Nanjing nowadays. Following the street type c, the main streets and secondary streets should have five lanes: the middle lane is for vehicles, the side lanes near the middle one are for bikes and the side lanes on the edges are for pedestrians. Vegetations are used to separate different lanes (Figure 11.18). The existing boulevards—the Zhongshan Road, Northern Zhongshan Road, and Eastern

Zhongshan Road are the main streets in the city, which are, according to the urban policy IX, preservation sites as historical remaining of the Republic of China. The boulevards greatly contribute to the identity of the city..

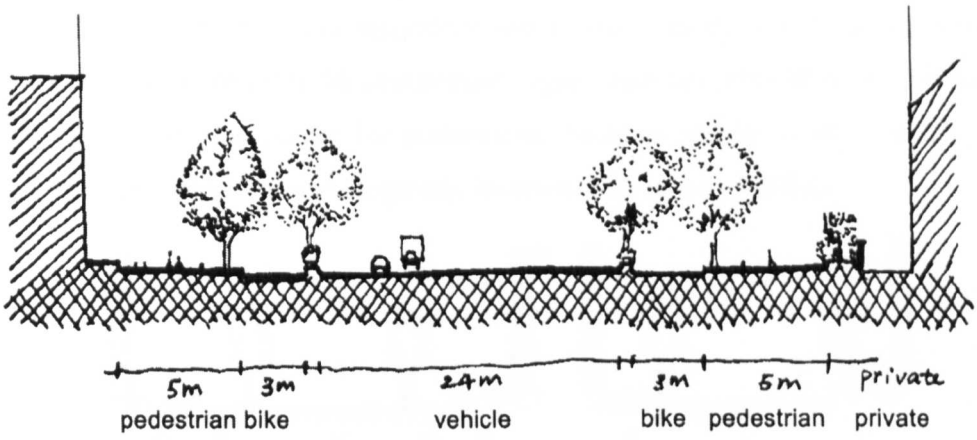

Figure 11. 18 Preserve and apply the design of street type c to new main or secondary streets by adopting the section of type c (by the author).

Because the contemporary ordinary streets of type d mainly carry light vehicles and pedestrians, the new ordinary streets having the same function should have at least three lanes, in which the middle one is for vehicles and the side ones are for bikes or pedestrians. The dimension of side lanes should be between 5 and 8 meters wide. Since ordinary streets are less than 30 meters wide (urban policy II), the ordinary streets that are 20-30 meters wide are possible to follow type c and two bike lanes can be set up separated from pedestrian lanes (Figure 11.19). Bike lanes should be marked clearly with an easily recognisable surface or separated from the vehicular lane by fences or vegetations. The running of bicycle has been a popular transportation mean in current Chinese cities, which consumes much less resources, energy, and does not produce air pollution and noise pollution. The use of bicycles should be encouraged[6] by building specific lanes for bicycles in every street to form a comprehensive network. Moreover, for ordinary streets whose widths are less than 20 meters, bike lanes can be shared with pedestrian lanes, and on-street parking

[6] The urban policy II has a rule about building bicycle storage places in every residential building, which implies the encouragement of using bicycles from the government. The rule is as following: Chapter 5, rule 59: ... residential buildings should have bicycle parking spaces, which shall be half-underground, underground or on the ground but underneath buildings.

space can be provided. On such streets, traffic could be controlled as one-way or only allowed in certain hours.

Pedestrian lanes in main and secondary streets and ordinary streets of more than 20 meters wide could be 20 to 60 centimetres higher than the other lanes and paved with stone to provide safe places for pedestrians, because people on the sidewalks can overview traffic which psychologically increases the sense of safety.

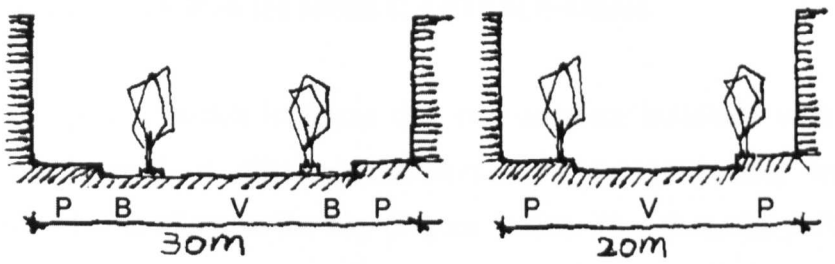

Figure 11. 19 In order to follow the design of type c and d of streets, 20-30 meters wide ordinary streets should have bike lanes, while ordinary streets that are less than 20 meters follow the type d of streets, which has three lanes. The side lanes should be 5 to 8 meters wide (by the author, P=pedestrian lane; B=bike lane; V=Vehicular lane)

Streets of type b constitute the street network of type B (St3). The relationship between buildings and streets of type c or d refers to St5. Streets should have active edges (Bl5). If necessary, some ordinary streets can become pedestrian commercial streets (details refer to P1).

St5, in order to apply type c to new main and secondary streets, especially those axial streets, buildings alongside such streets should visually define straight street-lines. In case large set-backs are needed for a building, a porch, canopy or an annexe accommodating the entrance of the building can be used as a buffer area between streets and the building, and maintain continuous straight street-lines.

Well-defined street-lines increase the legibility of a street, and continuous building-lines can provide better enclosure (English Partnerships, 2000). Well-defined street spaces can be found in the New York City where high-rises line-up along the street-lines no matter the height difference of those buildings. Such legible streets benefit

people's sense of direction, sense of safety when they are walking on the street (Lynch, 1960, Jacobs, 1993). Axial streets mean to emphasis the sense of axes within the city, thus they should be perfectly straight and well defined by alongside buildings. Other main and secondary streets should also be well defined to be legible and provide enclosure. Ordinary streets could be more flexible and diverse. As examined in Chapter 6, not all the axial boulevards and secondary streets in Nanjing is well-defined, because the urban policy II[7] determine that buildings with different heights should set-back from the streets at different distances.

The set-back policy, which indicates that two adjacent buildings with different heights should stand at different distances from the street-line, leads to a discontinuity of street-lines in the city (Figure 11.20). Therefore, the policy should change to regulate that the main bodies of buildings are set the same distance from their street-lines. In another word, the main bodies of buildings which have visual impact on people should follow the same line with their neighbour buildings. Where a break is needed to access the inside space of a block, trees or other landscape features should be used to close the gap. In case large set-back distance is required to accommodate large amount of traffic everyday at the entrance of an important building, a porch, a canopy or an annexe can be used to cover the entrance and visually maintain the continuous street-line. These structures should have comparatively sufficient volume to visually provide the sense of enclosure of the street (Figure 11.21). Furthermore, the porch, canopy and annexe of a building should be as similar height as possible to that of adjacent buildings. However, if a

[10] The following is Chapter 5, rule 42 of the urban policy II: 'Buildings alongside main streets should set-back from the street lines at the distances as following: 1) buildings alongside main streets: should set-back for 6 meters or above if the building is 24 meters high or below; should set-back for 15 meters or above if the building is 24-100 meters high; should set-back for 25 meters if the buildings is 100 meters high or above. 2) Buildings alongside secondary streets: should set-back for 4 meters if the building is 24 meters or below; should set-back for 12 meters if the building is 24-100 meters high; should set-back for 18 meters if the building is 100 meters high or above... 6) The line of overhanging structure and steps should be counted as the outer line of a building which should obey the set-back rules'. Ibid.

node or landmark is need to emphasis streets, for instance, a landmark at the end of an axial street, projections or set-backs from street-lines are allowed.

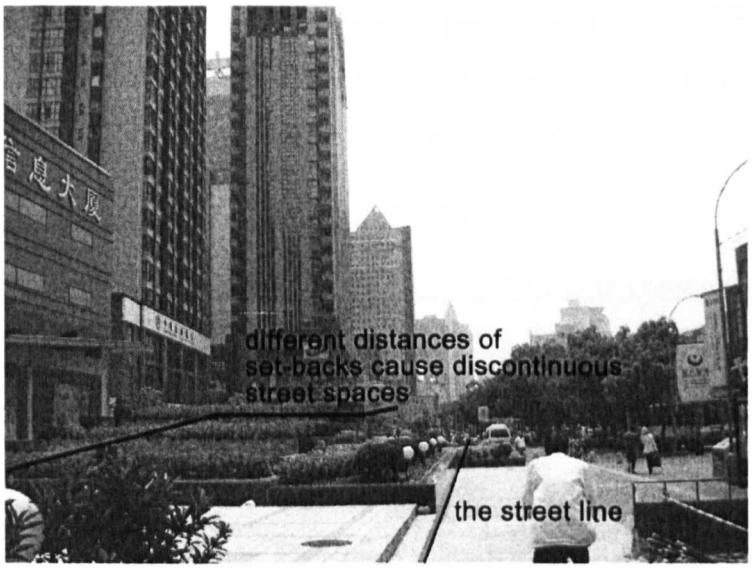

Figure 11. 20 The main bodies of buildings do not line-up with their neighbours, and therefore buildings are not able to give the street space the sense of straightness and enclosure, which is important for an axial street or a main or secondary street. Projections or set-backs are allowed if a landmark is needed (by the author)

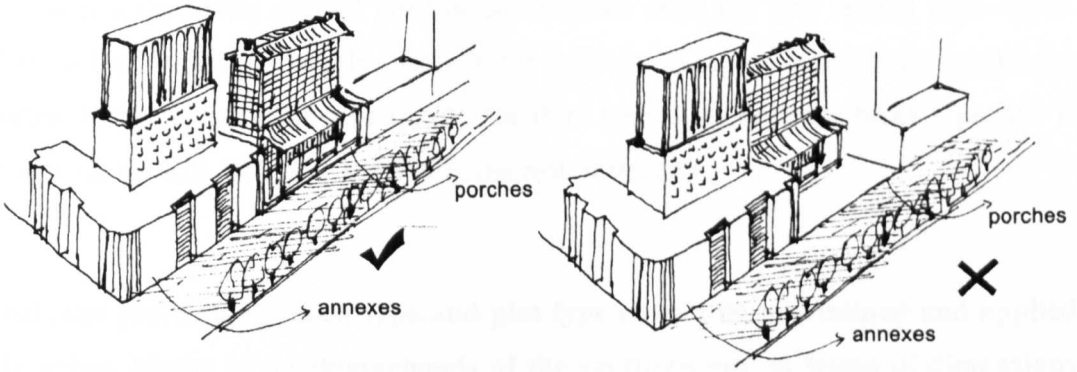

Figure 11. 21 Create enclosure street spaces by line-up buildings or their porches and annexes according to their street-lines of axial streets or main and secondary streets. Porches, canopies and annexes should be in similar volume with their neighbours where possible to maintain the continuity of street lines (by the author)

Buildings alongside blocks and plots of the ordinary type (Bl2) should contribute to activity of the edges of urban blocks (Bl5). Public buildings facing streets in traditional areas should employ Chinese traditional features (Bu2).

In addition to the above five suggestions on street designs, the current urban policies and urban plans have already mentioned the preservation of the boulevard system (street network type C), the boulevards (street type c), and the street network type D in the 'Gongguan qu' in the north of the city as historical remains from the Republic of China era (The City Planning Bureau of Nanjing, 2002).

11.6 Design suggestions for urban blocks

Within a typological process, a traditional type over time is constantly adapting to new needs and sustaining its original characteristics. This type is important for the local culture and worth continuing in new developments. Every new development should fit into its context, and make coherent and culturally relative city images.

Three main types of urban blocks have been identified through time (Chapter 7). (1) The 'special blocks' have been already preserved along with the conservation of several historical buildings in the government's policies[8] (such as policy II, IV, VI, VIII, IX). The traditional characteristics of these blocks—big, walled and low-density, are maintained by those policies, Buildings inside the blocks are located symmetrically along several north-south oriented axes. (2) The second type—post-Lifang type of blocks largely exists in the southern city, and is the basis for Bl1 for urban blocks in the southern city. (3) The third type is the ordinary block type, and is the basis for Bl2, Bl3, Bl4 and Bl5 in the rest of the city.

Bl1, the post-Lifang block type and plot type should be maintained and applied to urban blocks in neighbourhoods of the southern city in terms of dimensions and arrangement patterns of blocks and plots, since they derive from tradition and survived changes.

The post-Lifang block type was the most common one of residential blocks from the historical period (Chapter 7). The post-Lifang block type is developed from the

[8] Historical buildings contained in special blocks listed in the government's conservation policies are the Palace of Ming, the Chaotian Palace, the Presidential Palace and the Confucian Temple.

Lifang block type: a walled, small and highly dense type. Walls have disappeared in the late 12th Century, but the size, density, and orientation of the blocks have been maintained. Some urban blocks and their plots near Qinghuai River, follow the path of the river, while the majority of urban blocks and plots are arranged following the grid pattern and in a north-south orientation. Plots in the post-Lifang blocks are narrow and long. The short side of each plot is facing street-lines, and plots are arranged in rows.

The future regeneration of the southern city should respect this block and plot type. A post-Lifang block is about 150 to 200 meters long, within which the short side of a plot is 15 to 20 meters, while the long side of a plot can vary, because during the evolution of the post-Lifang blocks, the width (short side) of a plot has been maintained, but the length (long side) of a plot has changed along with changes of buildings types (from the Tianjing courtyard house type to the compact house type, Chapter 10). Buildings in any two adjacent post-Lifang plots are attached to each other or placed at a very short distance (less than 1 meter) (Figure 11.22).

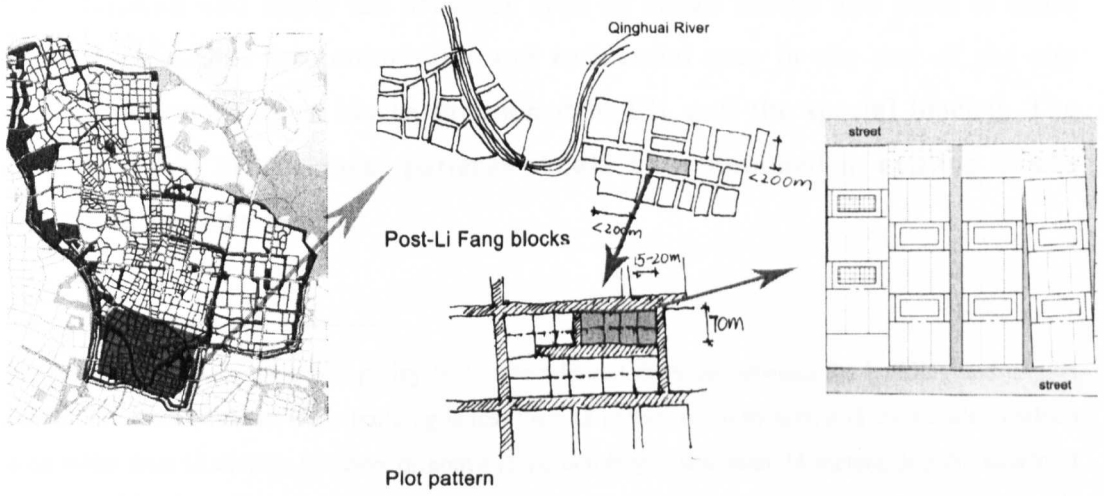

Figure 11. 22 Sustain the post-Lifang block type and plot type in terms of dimensions and arrangement patterns of blocks and plots as shown above in new blocks in the southern city (by the author)

The current policy II has relevant regulations[9] on the distances between buildings and their plot lines in Nanjing. Since buildings in Post-Lifang blocks are less than 24 meters (Chapter 7), according to the urban policy II, the distance between buildings and plot lines in those blocks should be at least between 4 and 6 meters (Footnote 9 of this chapter). The policy does not maintain the post-Lifang block type and plot type, since it changes the building arrangement pattern from row buildings to detached buildings in these plots. Therefore, instead, buildings in these plots should be built as close as possible to their east and west plot-lines, and should set back for 4 or 6 meters from their north or south plot-lines if there are buildings on its north or south side *(H4)*. This suggestion also facilitates the high density of housing in this area. The block-lines (also can be seen as street-lines) should be defined by buildings.

In the southern city, buildings in post-Lifang blocks define street lines in the southern city (St1, St2). The plot type should be maintained by appropriately arranging new houses in the areas (H4, H6).

Bl2, maintain and apply the ordinary type of urban blocks and plots to those urban blocks that for commercial and residential uses in the rest of the city (except the post-Lifang blocks mentioned in Bl1 and the special blocks). The dimension and arrangement patterns should be maintained in existing blocks and applied to new blocks.

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[9] Chapter 5, rule 44 of the urban policy II: '...the minimal distance between the building and its plot lines is: 4 meters or above if the building is less than 12 meters or 24 meters, and the facade of which is no wider than 15 meters; 6 meters or above if the building is less than 24 meters, and the facade of which is wider than 15 meters; 8 meters or above if the building is 24-35 meters high, and the facade of which is no wider than 20 meters; 10 meters or above if the building is 24-35 meters high, and the facade of which is wider than 20 meters; 10 meters or above if the building is more than 24 meters high, and the facade of which is no wider than 25 meters; 15 meters or above if the building is more than 24 meters high, and the facade of which is wider than 25 meters. 3) Buildings which are directly facing city streets, rivers or public green land should follow the rule 42' (which has been cited in the suggestions for designing streets and street-networks). THE GOVERNMENT OF NANJING (2007) Nanjing shi chengshi guihua tiaoli shishi xize (The implementation of the urban planning regulations of Nanjing). The Government of Nanjing.

The ordinary blocks are perimeter development and have mixed commercial and residential uses. The continuity of this type is important for the city for three reasons. First, the perimeter buildings are able to face the streets directly with their longer sides and maximise their commercial potentials. Second, the continuous perimeter buildings form continuous street-lines which benefit the enclosure of street spaces. Third, the perimeter development enables relative freedom of developments inside the blocks themselves: protected car park spaces for residential use; protected playgrounds or community public squares.

In order to follow the ordinary type, the block sizes should be kept between 100 and 200 meters long. The exiting super blocks should be subdivided according to this dimension *(Bl4)*. Blocks should be arranged in an approximate gird pattern *(St3)*. Plots in an ordinary block should be arranged along the perimeter, and in case the inside space of comparatively large blocks is for residential use, relevant plots should be in a grid pattern according to the ordinary block type (Figure 11.23). The length of plots along the perimeters should be able to accommodate diverse building types and adapt changes over time. According to the common sizes of commercial and residential buildings in Nanjing, the length of perimeter plots are around 30 meters, which functions well in terms of creating rich street vista and diversity. The government should encourage developers build diverse types of buildings and active frontages alongside ordinary blocks. The government could either allocate plots of an ordinary block to different developers or ensure the diversity of buildings in submitted building proposals from developers.

Currently, no relevant policy ensures that developers would maintain the ordinary block type and apply it to new blocks for commercial and residential uses. In case the function of such block had changed to accommodate civic buildings or public open spaces, the block design should follow the suggestions for urban public space design *(P1, P2 and P3)*.

Block lines alongside axial and main or secondary streets should be continuous (St5). Buildings in perimeter plots should have positive relationship with buildings inside

their blocks (Bl3). After subdivision of super blocks, new blocks for commercial and residential uses should also follow this type (Bl4). Active edges of this kind of blocks are essential (Bl5).

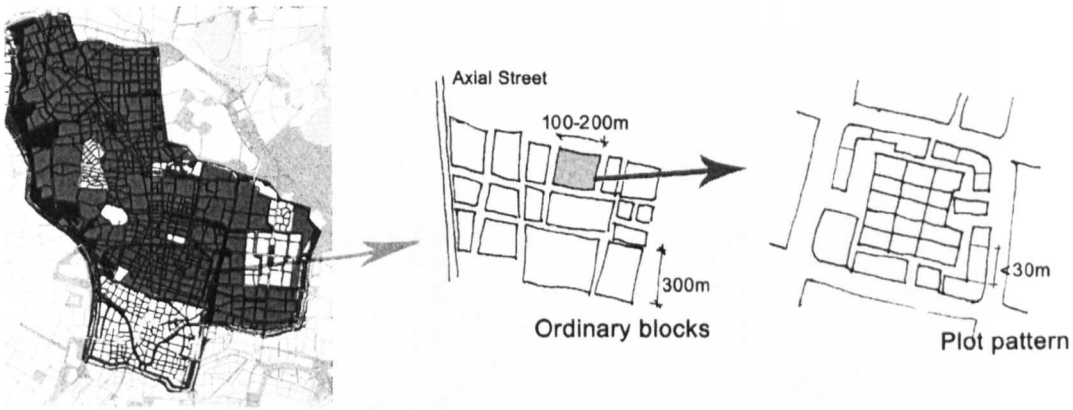

Figure 11. 23 Apply the ordinary block type and plot type to those urban blocks that are for commercial and residential uses except the post-Lifang blocks in the southern city and the special blocks, in terms of dimensions and arrangement pattern of blocks and plots (by the author)

Bl3, in order to make coherent city image, buildings in perimeter plots should have harmonious relationship, in terms of dimensions, heights and appearances, with other buildings inside their blocks.

During the transformation process of urban blocks in the city, perimeters plots of urban blocks have been renewed and rebuilt many times, while plots inside such urban blocks have transformed much more slowly (Chapter 7). This is because perimeter plots often have higher land value than inner ones. Therefore buildings in perimeter plots are upgraded faster to meet the increasing commercial requirements (Figure 11.24). The heights of buildings on the perimeter, especially in the city centre are increasing dramatically from six stories (the 1960s) to over 100 meters (the 2000s). Those new buildings have no relation with existing buildings inside their blocks. In some blocks containing historical buildings, new buildings obstruct the historical buildings from being seen. In order to create harmonious city images, the urban form of the city needs to be coherent. Buildings should have certain relations such as dimensions, heights, and appearances with their surrounding ones (Figure

11.25). The positive relationship between buildings could be also embodied in the positive open spaces that they formed *(Bl5)*.

Figure 11. 24 Current buildings in the perimeter have no relation with buildings inside the block. Buildings should have similar heights, volumes and appearances and contribute to coherent city images. Building heights follow the height control policy (refer to Figure 10.11) (by the author)

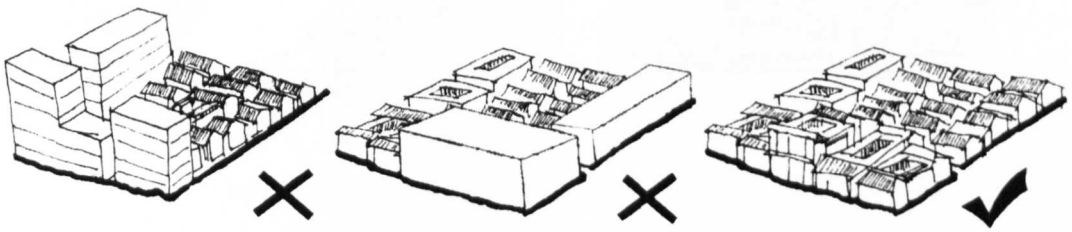

Figure 11. 25 Buildings in the perimeters should have positive relationship with buildings inside the block in terms of height, volume and appearances where possible (by the author)

This does not mean buildings are not allowed to exceed six stories, but should be comparable with their neighbours in height. The height limits of different areas in the city have already been mentioned in this chapter (refer to Figure 11.10). In the blocks containing historical buildings, the height of other buildings on the perimeter should not exceed the height of the historical buildings, as indicated in the urban policies XI, XII, XIII and etc. The volume of perimeter buildings should be broken down into the

similar volume of the historical ones or smaller volume than the historical ones, *which will be further discussed in Bu1*. A relevant research on how to build a building which contributes to the city as a whole has been carried out by Alexander. According to him, 'every building increment must help to form at least one larger whole in the city, which is both larger and more significant than itself'. 'Everyone managing a project must clearly identify which of the larger emerging wholes this project is trying to help, and how it will help to generate them' (Alexander et al., 1987, p39).

Furthermore, heights of buildings should decrease gradually from the north to the south in a block, because a tall building on the south would obstruct sunlight towards the lower building in the north (Figure 11.26). There are several specific technical regulations [10] published by the central government about the suitable distances between buildings in China, according to building heights, the angle of the sunlight, and relative positions of buildings, which ensure that every building is able to get sufficient sunlight and ventilations.

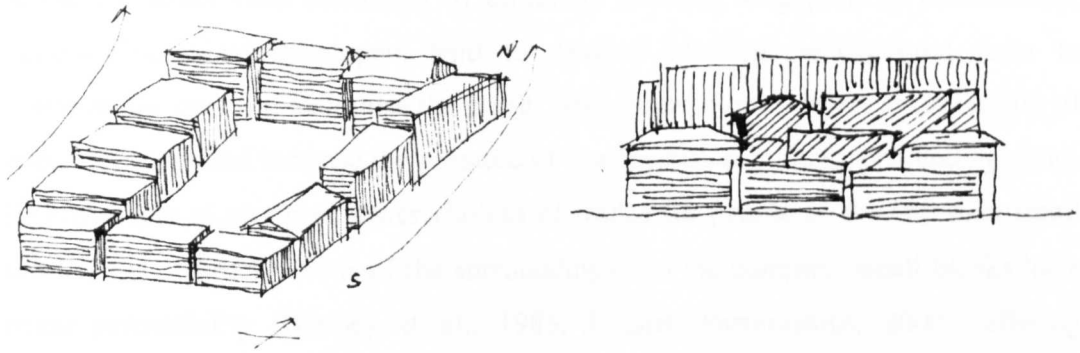

Figure 11. 26 The heights of buildings should be lower and lower from the north to the south of a block (by the author)

[10] The distances between buildings with different functions are different. There are specific regulations on buildings of specific functions, for instance, the 'Chengshi juzhu qu guihua sheji guifan GB50180-93, 2002' (the design regulations of residential districts, 2002), the 'Laonian ren juzhu jianzhu sheji biaozhun GB/T 50340, 2003' (The regulations on residential buildings for elders, 2003), the 'Zhongxiao xuexiao jianzhu sheji guifan GBJ99-86' (the regulation on school building design, 1986) and so forth. The detailed distances between buildings will not be listed in this thesis.

Buildings in perimeter plots are important for maintaining the ordinary block type and plot type (Bl2), and should form positive open spaces with their surroundings (Bl5). Harmony between buildings in perimeters and buildings inside their blocks is discussed in Bu1 and Bu2.

Bl4, according to the ordinary block type, super blocks should be subdivided into approximate 200 meters long, and super plots that are at perimeters should be subdivided into less than 30 meters wide. New streets created by the subdivision should blend into the grid street network, and follow either the street type c as the main or secondary streets or the street type d as ordinary streets.

Currently, there are two kinds of super blocks in the city: Danwei blocks and Juzhu Xiaoqu blocks (seen in Chapter 7). These blocks are longer than 700 meters, and normally surrounded by walls or fences, hence there is no interaction between people inside these blocks and people on streets. Super blocks usually have long plots. As a result, the street vista consisting of buildings in those long plots is monotonous, because individual developers tend to develop identical architectural form to minimise the cost and maximise the profit. Also, super blocks decrease the density of street networks and increase the pressure of transportation in their surrounding areas. Finally, super blocks give fewer choices of routes for people in the city than small blocks, and obstruct visions of the surroundings. On the contrary, small blocks have better permeability (Bentley et al., 1985, English Partnerships, 2000), offering greater diversity and activity.

Super blocks should be subdivided into small blocks of around 200 meters as each side in accordance to the most common size of blocks (ordinary blocks) in the city. Long plots of super blocks should also be subdivided to be less than 30 meters wide when they are facing the streets, so that there would be at least five buildings in one block alongside streets, increasing the diversity of urban forms (Figure 11.27). New streets should be built to subdivide these super blocks and blend into existing street networks. If new streets connect the main and secondary streets of the city, they should also follow the type c—boulevard streets to have five lanes and be 40 meters

wide. Otherwise, they should be ordinary streets, which follow the type d of streets with three lanes and be less than 30 meters wide.

The physical forms of Danweis are usually super blocks (refer to Chapter 1 and 7). Since the Economic Reform in 1978, the self-sufficient pattern of Danweis as the way of social organisation has been broken down: housings entering the market; service facilities being shared with general public and so forth. This transformation shows the renovation of the super blocks of Danweis possible. For the super blocks—Juzhu Xiaoqu (Chapter 7), inner-super-block streets should be open for public rather than being used merely by residents who live there. Such streets are ordinary streets accommodating light traffic *(St3)*. Furthermore, small blocks should be ensured by the local government in the land allocation process[11], and diverse building types should be ensured in each block through the proposal approval process.

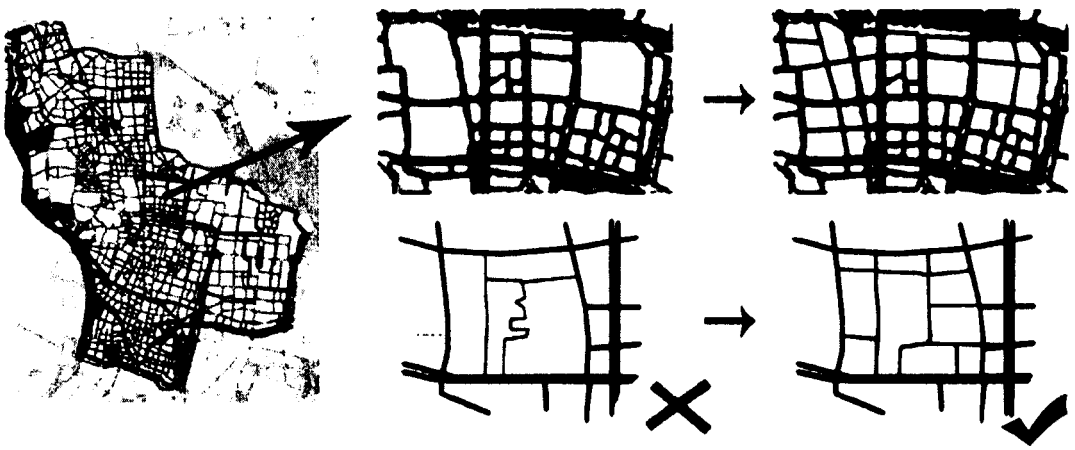

Figure 11. 27 Subdivide super blocks to be less than 200 meters long, subdivide super plots to be less than 30 meters long, and apply the ordinary block type and plot type as mentioned in BI2 to the new commercial and residential blocks (by the author)

[11] The current land policy in China is that the state is the owner of all the urban land in China, who sell the land utilisation right to developers with tenure of 50 years or 70 years JIANGSU SHENG CEHUI JU (THE MAPPING BUREAU OF JIANGSU PROVINCE) (2005) *Nanjing yingxiang ditu ji (The photographic maps of Nanjing)*, Chengdu, Chengdu Ditu Press (Chengdu Map Press) . In this case, the government is able to determine the size and shape of pieces of land.

New streets created by the subdivision of super blocks should follow the previous suggestions on streets (St3, St4 and St5). New blocks and plots for commercial and residential use should follow the ordinary types (Bl2,) and edges of new blocks should be activated (Bl5).

Bl5, like traditional ordinary block type, urban blocks of this type should have active edges facing streets, for instance, buildings at blocks edges should have ground floor shops or direct doorways on streets. Buildings should also define regular and usable spaces with other buildings in the block for community activities or parking.

Each building should contribute to positive open spaces, which are regular and easily usable by people (Katz, 1994). As examined in Chapter 7, there are various types of fences on the edges of urban blocks in Nanjing, which isolate buildings inside and generate dull street spaces, although they have been built for security purposes. In the aforementioned super blocks, fences and walls also largely exist.

Fences and walls in ordinary blocks (for commercial and residential use) should be gradually demolished to give ways to either ground floor shops or doorways [12] (Figure 11.28). The access of perimeter buildings should be directly from streets. The current situation is the opposite that the doorways of perimeter buildings are hidden at the back because of those fences. Both ground floor shops and doorways are able to facilitate street interactions between people, for instance, people drop by small shops; people inside those shops watch the streets; and people make conversations on their doorways. The suitable number of doorways, shops or windows to activate various kinds of streets has been studied by Jan Gehl (2001), which can be the reference for Nanjing as well. This is not discussed in detail here since it has little relation with typomorphology.

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[12] Rule 56 of the urban policy II indicates that: 'residential buildings should not be built alongside the main streets of the city. In case of indispensability, the facade of residential buildings should have positive relation to the street landscape...' therefore, most residential buildings are located either inside urban blocks or facing the ordinary streets.

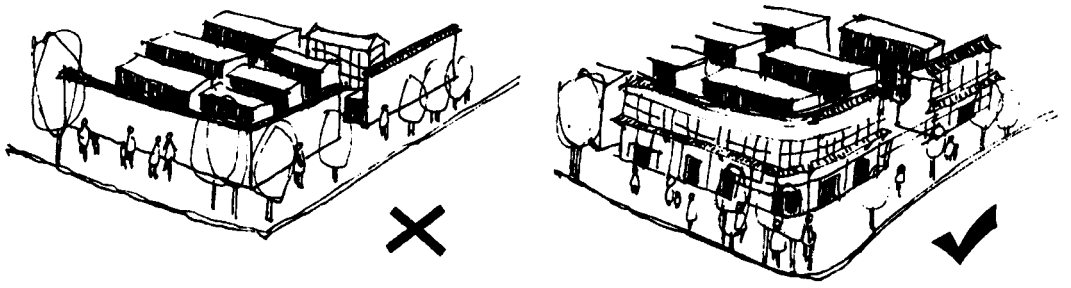


Figure 11. 28 Urban blocks should have active frontage facing streets. Perimeter buildings could have ground floor shops or door ways on streets (by the author)

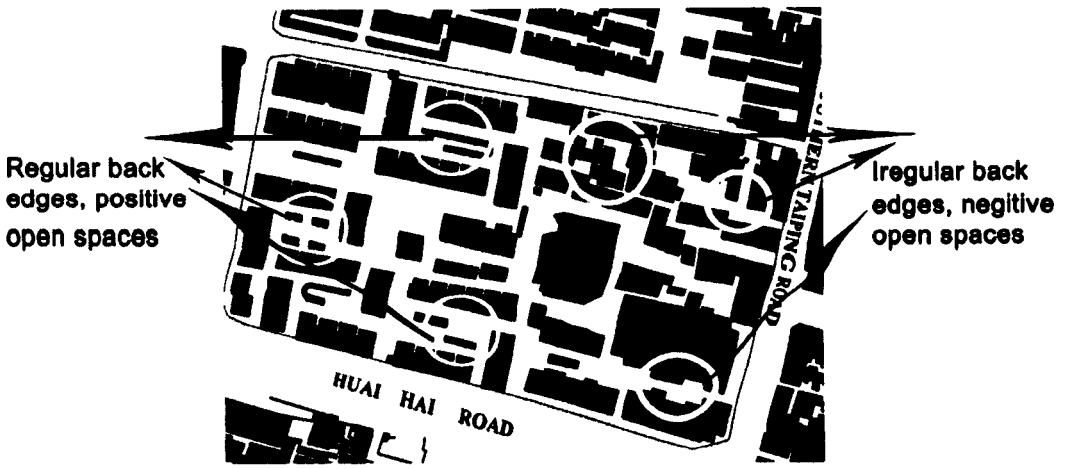


Figure 11. 29 Buildings should have regular back edges to form regular open space to accommodate defined functions such as community playgrounds, parking or closures of access to allow residents stay in, but not only pass by or leftover (by the author)

Buildings in perimeter plots are upgraded faster than that inside blocks (Bl3). They create fragmental outer spaces on their backs due to their irregular back edges (Figure 11.29). Compared to a regular enclosed space like an outdoor courtyard, those spaces without clearly defined function are not preferable for residents. Such lost spaces have received criticism in literature (Trancik, 1986). The fragmental leftover outer spaces inside an ordinary block are different from the proposed irregular street spaces in the southern city (refer to St2), because the irregular street spaces are continuous and with clear function of accommodating movement flows. Plots in every block should have regular edges, and buildings should also have regular edges to define positive open spaces with allocated functions. In order to make the function of an open space inside a block clear, relevant furniture or

landscape features such as vegetations, sculptures and facilities for the function should be set in the space.

In order to build safe doorways of buildings, porches can be employed to provide buffer areas between public and private realms. *Suggestions on streets as the edges of urban blocks are proposed in St4 and St5. Buildings in the perimeters of blocks should not only have active frontages but also have harmonious relationship with buildings inside (Bl3).*

11.7 Design suggestions for urban public spaces

An existing traditional type shows what can be learnt from the past, and guides how to maintain the morphological continuity. If an object had no past in the local tradition, the theory of typomorphology is not able to give references for its design, which must refer to other design theories. A type of an open space indicates its dimension, proportion and relations with surrounding buildings.

There are only two types of public spaces in Nanjing that derive from the local tradition: the street type 'a' of commercial streets and the civic square type (market place in the historical period, Chapter 8). These two types can only give references for contemporary commercial pedestrian streets and civic squares. Thus other kinds of public spaces such as plazas, neighbourhood squares, parks, and underground plazas that emerge in recent decades are not emphasised in the following paragraphs. The two traditional types of public spaces are the basis for the design suggestion P1, P2 and P3.

P1, employ traditional street type 'a' in the current design of pedestrian streets in Nanjing where needed. Arrange buildings so that they form street type 'a' of commercial pedestrian streets. Pedestrian streets should be developed from ordinary streets.

The existing shopping streets in the city, not all of which are pedestrian streets, include Hunan Road, Shanxi Road, streets in the Xinjie Kou area, streets near the Presidential Palace, and streets in the Confucian Temple area. They are some of the

most popular public spaces in Nanjing. Pedestrian streets facilitate outdoor activities, where people stay, wander and chat with each other (Gehl, 2001).

The traditional street type 'a' is a suitable reference for current commercial pedestrian streets, because this type was designated for street markets in the traditional period. This type of streets is surrounded by buildings with two or four stories, and its width is between 10 and 18 meters. The width/height ratio of this type of streets is 1 or less than 1, giving good sense of enclosure for people (Chapter 8). Other research on comfortable height/width ratios of streets has been done by researchers such as Gordon Cullen(1971) and Yoshinobu Ashihara (1983). Sometimes there are some temporal extensions such as flags or commodity-stands on such streets to attract people, and sometimes buildings alongside streets of this type have porches to prevent the space from hot sunlight or rains. Streets in the Confucian Temple area are of this type and function very well nowadays.

Where new commercial pedestrian streets are needed, they should not occupy any main or secondary streets, and would not give pressures on the current vehicular transportation system (Figure 11.30). If possible, pedestrian streets could form a pedestrian network within an area surrounded by main and secondary streets (Figure 11.30). Since such area is approximate 750 meters long (St3), people are able to walk through it within ten minutes. Both new pedestrian streets and regenerated existing pedestrian streets should have well paved footpaths, benches, vegetations and streets lamps. Buildings alongside pedestrian streets should have front doorways with arcades or canopies, which could lead to the upper floors in some points. Entrances of shops are on the ground floor.

This suggestion is working together with St3 that the distance between main and secondary streets should be 750 meters. Pedestrian streets are parts of ordinary streets (St4).

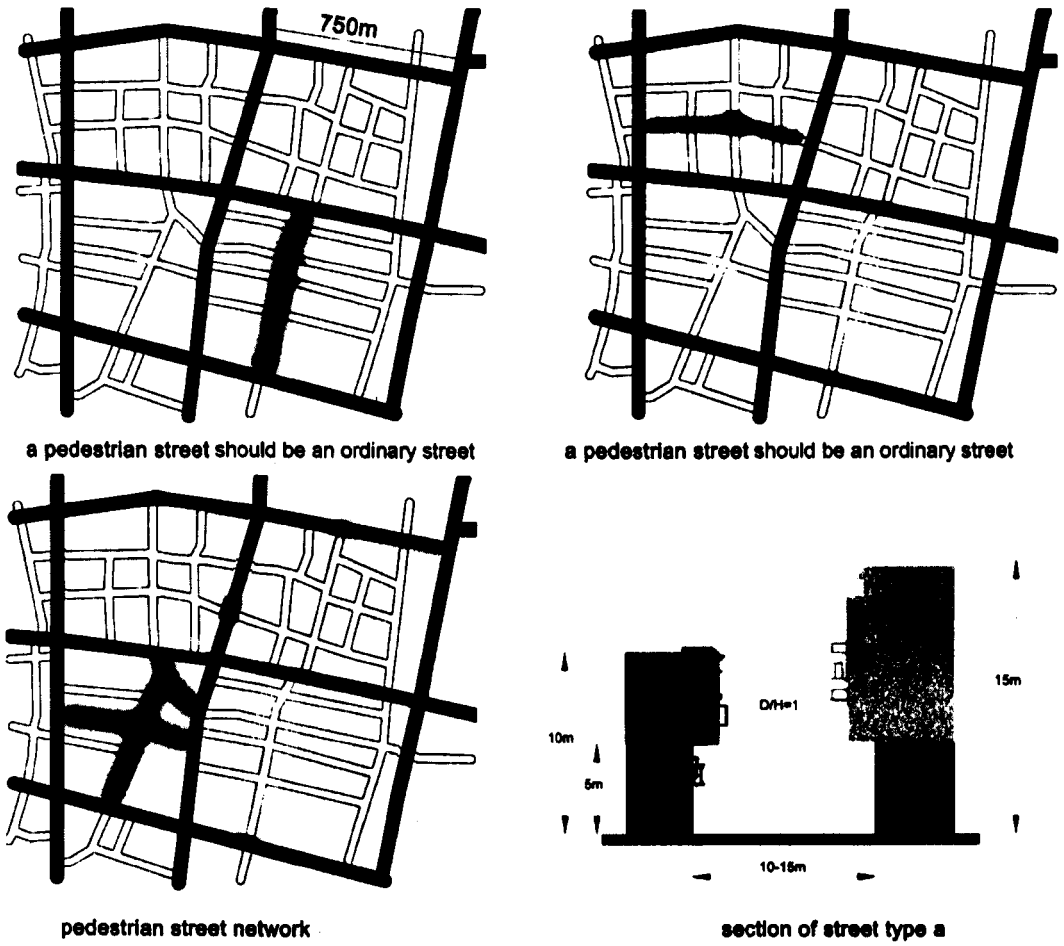


Figure 11. 30 The possible locations of a commercial pedestrian street (top); Pedestrian streets could form a network (left bottom); the section of the street type 'a' which should be followed (right bottom) (by the author)

P2, according to the traditional type of civic squares, a contemporary civic square should be located adjacent to either a contemporary or a historical public building. They should be placed on one side of public buildings, and preferably on the south side.

In western cities, public squares are where people gather and celebrate the collective values and the beauty of the city. In traditional Chinese cities, public squares were market places for trading and ritual festivals. As shown in Chapter 8, the traditional type of civic squares was generated spontaneously from the folk custom—Miaohui (market festivals), rather than was created by official design and planning. The

Miaohui were market festivals held frequently[13] near a temple, where people could bring their agricultural products or handcrafts to exchange. The difference between Miaohui places and officially designated market places was that the former was spontaneous and the latter was managed by the government. Miaohui places, the preferred public spaces for locals, are reference for contemporary civic squares that are main squares in the city.

Following the traditional type of Miaohui places (Chapter 8), a civic square should be placed on one side of a public building, in order to allow people appreciate the building as a whole (Figure 11.31). If possible, the square is likely to be placed on the south of its adjacent public building, or at least on the east or west, because the south part of a location gains more sunlight and has better ventilation due to the local climate.

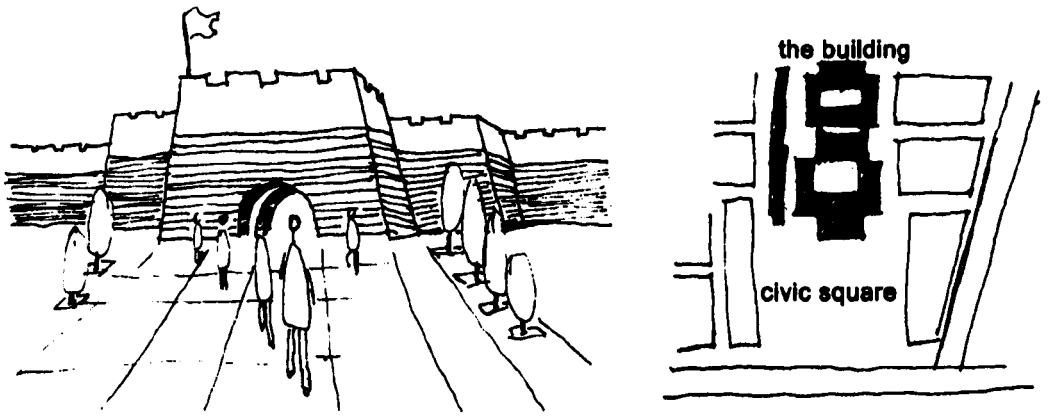


Figure 11. 31 Civic public spaces should connect with important public buildings or historical buildings. Civic public squares should be placed on one side of the public building.

More public square design suggestions are proposed in P3—the edges, enclosure and dimensions of public squares.

P3, the edges of a civic square should be clearly defined by buildings, pavement, or vegetations, and it should give people sense of enclosure. A main civic square

[13] The frequency of the Miaohui depends on the dimension of the city, the population and the demand of exchanging products. It could be once every week or more. In big cities, Miaohui places become everyday market places because the demand of exchanging products is high.

that is related to a public building (P2) should leave sufficient space for people to appreciate the building, which determines its dimension.

There are several problems of public square design in the contemporary Nanjing as shown in Chapter 8. Firstly, the majority of public squares are too large to give sense of place to people. Large-scale public squares are caused due to the consideration that they are the achievement indicators of the municipal government and expression of new forms of social interaction and national pride (Sit, 1985, Wang, 2006). The more splendid the square, the stronger expression is. Secondly, civic square design in Nanjing has very limited aesthetic considerations on shapes, edges, arrangements and enclosure of spaces since outside spaces of buildings have always been ignored in Chinese tradition (Chapter 8). As a result, many squares have random shapes, vague edges and are surrounded by heavy traffic paths, which interrupt the accessibility of them. Examples of such squares have already been illustrated in Chapter 8 (Figure 8.14, 8.15, 8.16). Thirdly, many of public squares in Nanjing are characterless because they are built according to some successful models from other cities, and they are not always combined with local public buildings.

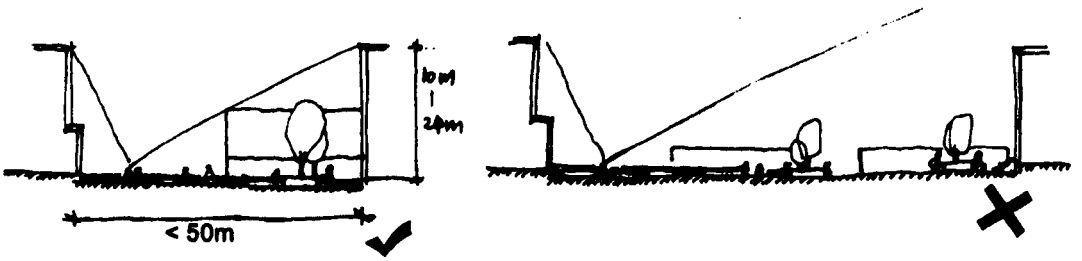


Figure 11. 32 A civic public square should not exceed 50 meters wide or long (less than 2 times of the height of surrounding buildings) to make people inside be able to feel the edges of the square (by the author)

Clearly defined edges make urban forms legible, and mark borderlines between public realm and private realm. A row of continuous buildings is able to give a clear edge of spaces, while trees, grasses, low walls, steps could play the same role. Pavements in a square should be distinctively different from pavements outside to define the space. Edges defined by buildings are able to give good sense of enclosure for people inside. For a civic square where there is a public building, in case the

square is surrounded by other buildings, the height of buildings should be lower and comparable with the public building. The detail of building height is explained in the next paragraph.

Moreover, a civic public square should allow people see and feel the edge of the space (Figure 11.32), thus they feel safe and protected. According to the traditional type of Miaohui places (Chapter 8), the width of this type is comparable to the width of its connected public building, while depth of this type allows the building to be appreciated as a whole. Therefore, the dimension and proportion of a civic square depend on its public building. Normally a contemporary public building is not a high-rise building in Nanjing which is less than 24 meters high according to the Chinese standard, and a historical public building has maximal two stories tall (except towers). Therefore the depth of a civic square should range 20 to 50 meters (2 times the height of the building). The actual size of a civic square needs to be carefully considered by designers according to its proposed function, location and so forth. Relevant research on the scale of public squares has been conducted by Camillo Sitte (1965), Hegemann and Peets (1988), Cliff Moughtin (1992), and Jan Gehl (2001). Some of them propose that the dimension of a public space should be pleasant human-scales, and others consider that the minimum dimension of a square is that allowing people on the edge being able to see events in the centre properly.

Most of the current civic squares in the city are much greater than squares of the Miaohui type. Those squares should be redefined as several smaller areas by vegetations, fountains, low walls and steps. New civic square, if needed, should also cater for this quality. An example of renovating the existing civic square is shown in Figure 11.33. *The renovation of existing civic squares and construction of new civic squares should follow P2—maintain the relationship between squares and public buildings.*

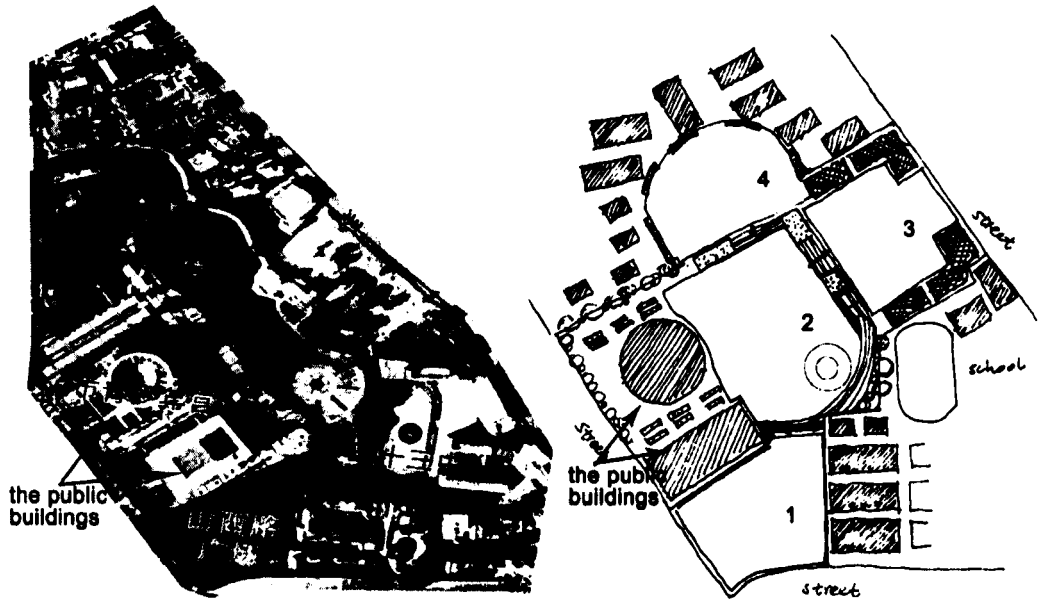


Figure 11. 33 The current vast and ill-defined civic square (left); the possible renovation proposal that subdivides and redefines the square (right) (by the author)

The three suggestions above merely focus on commercial pedestrian streets and civic public squares in the city. The design of other public spaces such as neighbourhood squares, parks and plazas can not directly refer to the local traditional types (Chapter 8). Thus their design should refer to the wide literature of public space design and particular situations such as location, population, climate and topography. There is abundant literature available for urban public space design. For example, in the book *'People places: design guidelines for urban open space'*, Marcus and Francis (1998) have produced a design review checklist for urban square design on issues of size, visual complexity, uses and activities, microclimate, boundaries, subspaces, circulation, seating, planting, level changes, public art, fountains, sculpture, paving, food, programs, vendors, information and signs, and maintenance and amenities. This research is a good reference for Chinese contemporary public space design.

In addition, the current urban policies and urban plans are trying to preserve existing urban parks and protect all kinds of public spaces in Nanjing. For instance, urban policy I, rule 35 indicates that urban green lands, public spaces, sport fields and educational lands shown in the 'land use planning of Nanjing' should not be occupied by either individuals or organisations (The Government of Nanjing, 2004b).

11.8 Design suggestions for public buildings

In a morphological region, an existing traditional building type helps new buildings in this region to fit into the context. Therefore, traditional building types need to be applied to new buildings in traditional areas rather than the entire city. Building types refer to the structural principle of buildings.

Traditional characteristics of pubic buildings in Nanjing are outlined in the following four categories (Chapter 9).

a) The plan arrangement of a building complex is symmetrical along one or several north-south oriented axes, containing buildings and courtyards, and following certain sequences according to functions;
b) The forms of single buildings are restricted by Jian and bay, columns and beam. Single buildings usually have small volume, limited height (one or two stories), regular shape and are north-south oriented;
c) The architectural components include platform, balustrade, wall and roof.
d) The architectural decorations such as colour compositions, paintings and carvings that represent the class or importance of buildings.

Therefore, the traditional type of public buildings in Nanjing implies three principles for typological design: (1) a public building should consist of a group of axially arranged single buildings; (2) single buildings in a public building complex should be small, regular and north-south oriented; (3) traditional features in Category c) and d) at a smaller scale than the building scale could be applied to new buildings according to designers' creation and preferences. The three principles are the basis for Bu1 and Bu2.

Bu1, a public building which is located in the height controlled area of 'multi-story and low-rise allowed only'[14] should contain several single buildings of small volumes that are similar to the volumes of the nearest historical buildings. Within the controlled height limits, the heights and dimensions of single

[14] The height control of buildings in the city refers to Figure 11.10. In such areas, building heights are strictly controlled because of the large existence of historical urban forms.

buildings of the public building complex can vary to allow diversity. The single buildings in the complex should be regular in plan and north-south oriented.

In order to maintain harmonious relationship with the existing historical building complexes and areas, new public buildings which are located in the height controlled areas, should also contain several single buildings with similar volumes to those roofed-buildings of historical building complexes. As examined in Chapter 9, traditional public buildings in the city usually consist of several roofed-buildings that are arranged in one or more axes and form a building complex. Each roofed-building in the traditional building complex has small dimensions: for instance, the dimensions of the main hall of the Confucian Temple are 27.3 meters in width, 20.9 meters in depth and 17.2 meters in height. Furthermore, the dimensions of roofed-buildings in a traditional building complex depend on their functions and importance. In the example of the Confucian Temple (Chapter 9), the main hall is the largest roofed-building, while the other halls are slightly smaller. However, if there is a tower in a traditional public building complex, the tower will be the highest.

The urban plan IX suggests that there are three levels of control of building forms near the historically important buildings in Nanjing, which are historical buildings themselves, 'Jianshe kongzhi qu' (the controlled area of construction near specific historical buildings), and 'Xietiao qu' (the buffer area for specific historical buildings). The control of building forms is stricter in 'Jianshe kongzhi qu' than in 'Xietiao qu' (The Government of Nanjing, 2004a). The policy intends to reinforce the harmonious relationship between buildings in 'Jianshe kongzhi qu' and 'Xietiao qu' of historical buildings. This design suggestion is an implementation of the policy.

The analysis of the dimension of the nearest historical buildings is essential for new developments. Furthermore, the diversity of dimensions in new buildings should be encouraged, because it increases the diversity of the city and traditional public buildings also have various sizes. For example, in a primary school, the library, classrooms, exercise rooms, canteen and offices could be in separate buildings with similar dimensions to nearby historical buildings. The library is the most important

building, thus it should be the tallest and largest, while the offices and canteen should be smaller (Figure 11.34). In an exhibition centre, the exhibition rooms could be in separate buildings connected by roofed-corridors following the visiting sequence, and the most important exhibition rooms could be the highest. Public buildings such as public libraries, community activity centres, youth clubs and etc are all possible to be broken down into groups of small buildings by appropriate designs. However, in case certain public buildings are not able to be broken down due to specific functional requirements, such as cinemas and stadiums, they should not be located in those controlled historical areas but in nearby areas where building control is not the strictest.

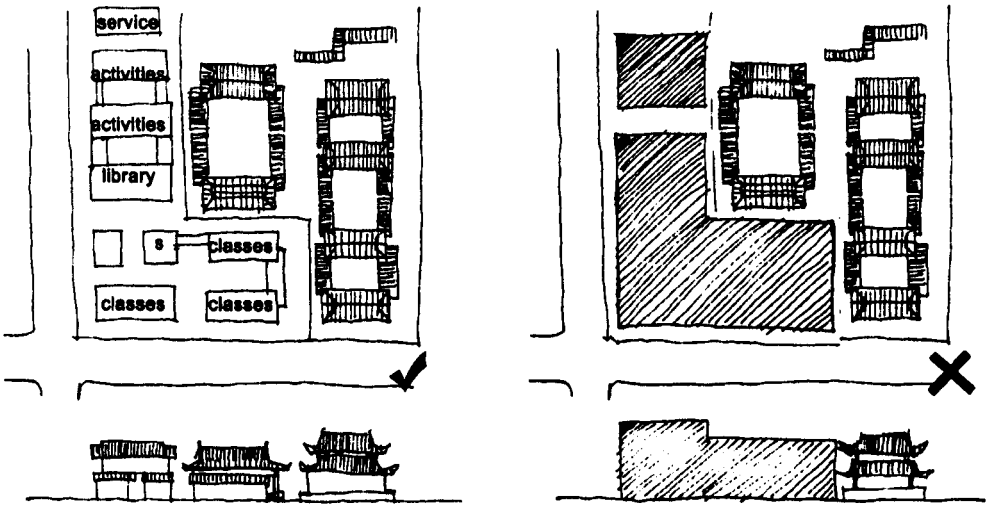


Figure 11. 34 Break down the total volume of a public building into a group of small buildings in order to sit harmoniously with existing historical buildings (by the author)

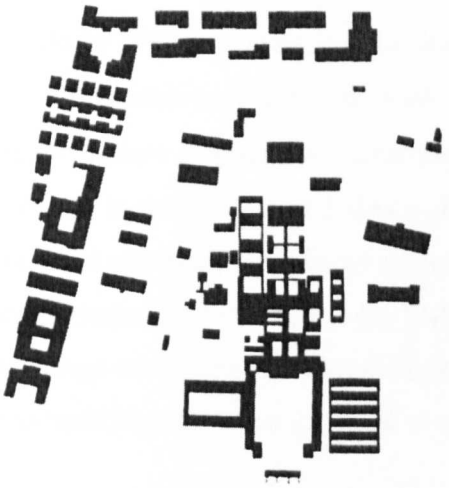
The good example of breaking down the volumes of buildings in the city is the 'Nanjing 1912' project (2005), which is located in the same urban block as the Presidential Palace[15] and funded by the municipal government. The development of 'Nanjing 1912' contains restaurants, pubs and cafes to serve tourists of the historical palace, as well as local residents. The site area is 3.5 hm2, lying on the northwest of the Presidential Palace. The designer's task is to maintain the historical fabric and spatial structure of this area on the one hand, and to bring contemporary functions of mixed entertainment on the other. In response to the Presidential Palace at a large

[15] The Presidential Palace has been examined in Chapter 9.

scale, the designers use courtyards and lanes to connect each building, and create several open squares at key sight nodes. At a small scale, each building in the project has small dimensions, for instance, 20 meters by 10 meters, and two stories high. Buildings are made of special bricks which date to the period of the Republic of China (Yang, 1993, Qi and Yang, 2006). The total appearance of buildings is in the 'Minguo style' (the style of the Republic of China), which is a mixture of Chinese tradition and western classic tradition (refer to Chapter 9) (Figure 11.35-38).

A failed example is the Municipal Library of Nanjing, 2007, which is located in the next urban block to the Presidential Palace. As addressed in Chapter 9, the library is under a giant all-in-one roof (Figure 9.17), and is approximate 90 meters by 35 meters, and 24 meters tall. This giant volume has negative impact on the nearby historical area.

This suggestion is linked with Bl3 and Bu2: new buildings should have positive relationship with historical buildings in the same urban block (Bl3); and employ traditional features (Bu2). This suggestion also contributes to achieving small-scale silhouettes (Si2).



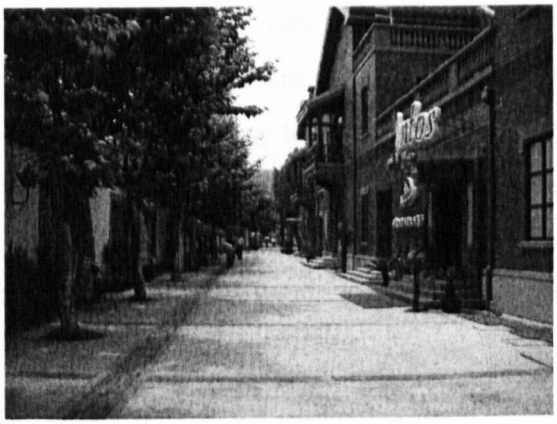


Figure 11.35 The figure-ground map of the 'Nanjing 1912' project and the Presidential Palace (left) (Yang, 1993, p85)

Figure 11.36 The pedestrian alley between 'Nanjing 1912' and the Presidential Palace (right, photography by the author)

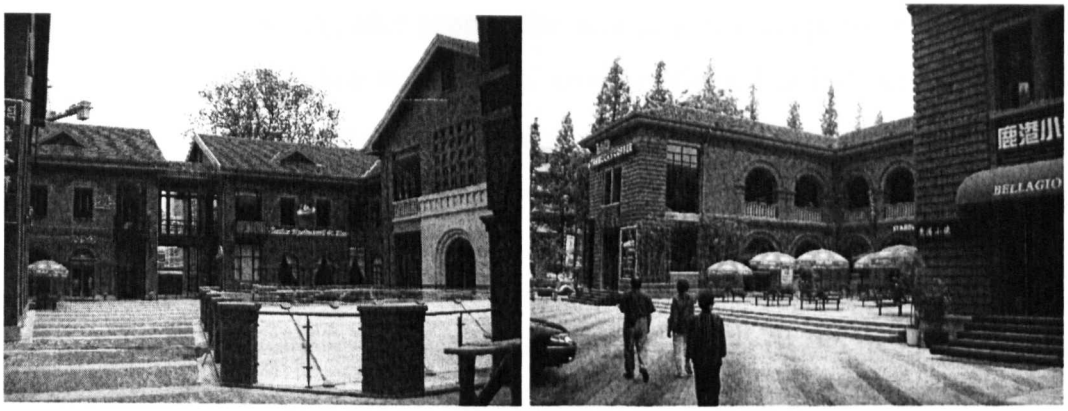


Figure 11.37 A courtyard in 'Nanjing 1912' formed by buildings of the 'Minguo style' (photography by the author)

Figure 11. 38 A half-enclosure courtyard in 'Nanjing 1912' (photography by the author)

Bu2, in 'Jianshe kongzhi qu' and 'Xietiao qu' of a historical building, arrange a group of buildings of small volumes along one or more north-south oriented axes, to form a building complex. Whether to apply traditional features in Category c) and d)—the pattern of architectural components and ornamentations to new buildings, depends on designers.

In relation to Bu1, small-volume roofed-buildings in a public building complex should be arranged along one or several axes and north-south oriented. They can be connected with each other by roofed-corridors at east and west ends. According to the dimension of traditional courtyards and buildings, the distance between buildings could be between 0.5 and 2 times of the depth of the building to form enclosure, half enclosed courtyard or open courtyards. The actual distance depends on the functional requirement of the building, for instance, the distance would be further between two buildings containing groups of classrooms in a school, and would be nearer between two buildings containing groups of offices in the school.

Each roofed-building of a building complex should have regular plan to follow the plan type of traditional buildings in Nanjing as indicated in Category b). Roofs of each building should not be flat to follow traditional building types, and the details of roofs could be flexible, which could combine with a Maotou wall (end walls) or without, or having Dougong as ornamentations or without (Figure 11.39). Building

components (Category c)), after appropriate modifications, are possible to be applied to new buildings, according to designers' considerations. For instance, Dougong is not necessarily needed in new buildings nowadays. However, a simplified or abstracted symbol of Dougong can be built as part of the bracket of the building, which largely depends on designers' preferences. A new building could be symmetrical, with a platform and balustrade. Other elements have the design vocabulary that designers can use includes the grid window pattern, the colour scheme of grey and white, and the facade ratio of the wall/roof.

Figure 11.39 Various possibilities of applying traditional building component patterns to contemporary buildings (by the author)

There are several good examples of modern buildings incorporating traditional features in Nanjing, for instance, the School for Disable People in Gutong Alley in the southern city of Nanjing (Figure 11.40). This building employs traditional Maotou walls, brackets, traditional eave, columns, and the colour scheme. It does not follow the plan arrangement and façade dimensions.

Figure 11.40 the School for Disable People in Gutong Alley of Nanjing, which incorporates the traditional end walls, windows, brackets and colours (photography by the author)

Another example is the Suzhou Museum in Suzhou (Figure 11.41-2) designed by the architect Leoh Ming Pei (traditional public building types are largely similar in Nanjing and Suzhou, since the latter is very close to Nanjing). The museum consists of three groups of courtyard buildings in different sizes following three north-south oriented axes. The central axis arranges the reception hall and the garden. The western axis crosses through three main exhibition buildings, while the eastern one connects secondary exhibition buildings and administration rooms. The sizes of those buildings vary since they have different degrees of importance in the complex. Each roofed-building is in a small volume, which is about 6 meters high (except three buildings are 16 meters tall). The building group follows traditional plan arrangement, which contains axes, a garden and outer walls. Other traditional features the architect has employed are pitch roofs, basso-relievo patterns, and the colour scheme, despite the buildings being made of steel and concrete. Buildings in the two examples have very different forms, and they employ different traditional features and serve different functions. However, both of them have distinctive identity of local places and sit harmoniously with their surroundings.

Figure 11.41 The Suzhou Museum perceived from the street (resource from www.szmuseum.com)

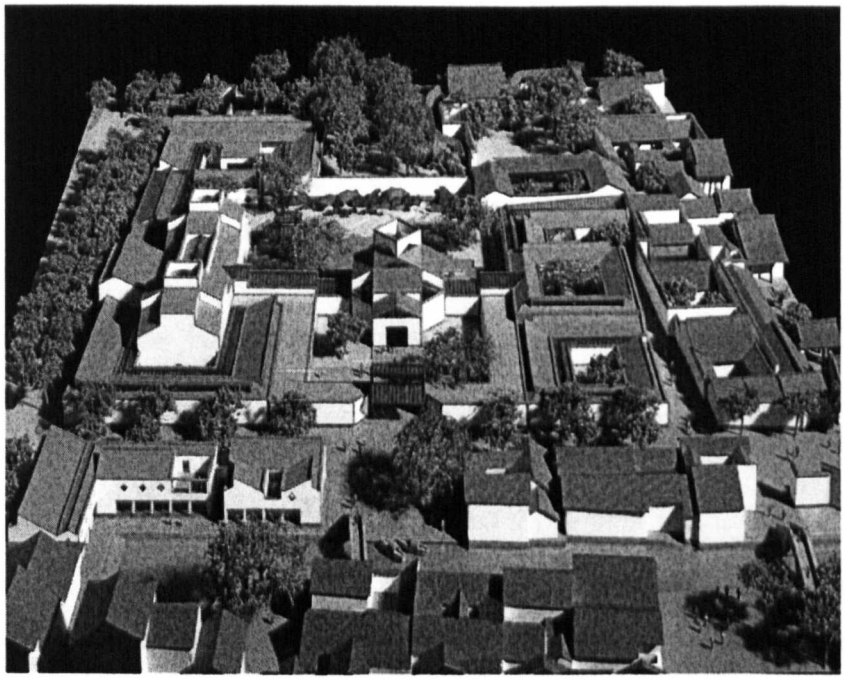


Figure 11.42 The overview of the building complex of the Suzhou Museum: courtyard buildings are arranged along north-south oriented axes (resource from Pei's Architectural Studio)

Traditional features of public buildings in Nanjing in the aforementioned four categories establish a design vocabulary for designers, and enable them to select and apply variations to new buildings in the city according to different requirements. There are great flexibilities and possibilities in the typological building design. In addition, these characteristics are not suitable for public buildings in other regions of China such as the west China and the southern China, where traditional public building types could be different.

Suggestions on public buildings have already been mentioned in the silhouette design suggestions (Si2), the street networks design suggestion (St5), urban blocks design suggestions (Bl3), and Bu1. Moreover, this suggestion (Bu2) affects new houses as well (H9).

11.9 Design suggestions for housing

A traditional house type that has been adapting to new requirements through a typological process over time is precious for the local context. The local house type roots in builders' unconscious mind before actual buildings have been built, thus it is

useful for new house design not only in traditional areas but also in the city where local people live.

Traditional house type in Nanjing is the (1) 'Tianjing courtyard house' during the historical period, which has transformed to become the 'compact house type' during the modern period. (2) The compact house type is inherited by local residents at the present. They are the basis of design suggestions in 11.9, which fall into two categories: Suggestions H1 to H6 are for renovations of traditional housing and new small houses in the traditional areas in the 'southern city'; suggestions H7 to H9 are for modern housing in the city.

H1, except those traditional houses that are in the governmental conservation list, all other not listed traditional houses should be renovated and equipped with contemporary infrastructures and facilities such as a drainage system and modern toilets. Each roofed-building in a traditional house should accommodate one or two households. The interior spaces of each roofed-building should be rearranged to fulfil specific requirements of each household without damaging the original structure of the building.

Several remaining traditional big houses in the southern city have been protected in the government's conservation list because of their comparatively well-preserved appearance. Those houses are usually large with elaborate ornaments and private gardens which greatly represent the buildings' aesthetic achievement and cultural spirits of traditional vernacular architecture. The house of Jiang Shoushan that has been mentioned as an example of traditional large houses in Chapter 10 is one of the few strictly preserved houses. Such houses are open to the general public as museums or for cultural tourism. Except those houses, there are a great number of ordinary traditional houses which have more or less been altered and rebuilt by local inhabitants. The basic structures of these houses such as roofs, columns and end walls remain, while enclosure walls and interior spatial arrangements are modified (Chapter 10).

Contemporary infrastructures such as a drainage system, garbage recycling points, gas supply etc are absent in traditional residential areas in the southern city. Social services such as waste collection, community health care etc are also absent. These issues need to be addressed in future regeneration projects, as supported by the urban plan IX and district-level detailed plans. Furthermore, each two-story roofed-building in a traditional house complex nowadays is used for one or two households. One floor of a roofed-building is about 50 square meters to 80 square meters, and two floors of a roofed-building are about 100 square meters to 160 square meters. It is possible for a household to occupy either one floor or two floors of a roofed-building, because the majority household size in contemporary Jiangsu Province is three people per family (Section 4-8, China Statistical Yearbook 2007). Therefore, the sizes of potential apartments established in traditional roofed-buildings can be various to fulfil the diverse requirements of the contemporary housing market (Figure 11.43).

Since the lifestyle of local people has changed nowadays, renewed apartments in traditional roofed-buildings should have appropriately arranged living spaces, bedrooms, kitchen and bathrooms. As discussed in Chapter 10, the layout of traditional roofed-buildings is greatly flexible and adaptable, thus those functional rooms can be arranged in different ways according to specific requirements of each family without damaging the original structure of buildings. Traditional roofed-buildings have already been altered to accommodate many contemporary families in the city (Chapter 10). However, the interior alteration made by individuals is largely disordered and nondurable, because they often do not consider the impact of self-alternation on their neighbours and use cheap and low-quality materials. Therefore, appropriate professional intervention is necessary in regenerations. Alternatively, urban policies should limit the patterns of materials used in renovations to respond to the traditional materials, such as bricks (the same size as the traditional bricks), tiles and timber.

The possible apartment layouts in each roofed-building of a house complex are shown in Figure 11.43. Since traditional roofed-buildings have column-and-beam

structures, the interior spaces are largely flexible for dividing spaces for individual requirements. There should not be a standard apartment layout like that of contemporary housing to allow diversity of household and social mixture. For instance, in the example of Figure 11.43, the traditional house complex is able to accommodate two households of four people, three households of three people, one household of two people and one single apartment. The actual ratio of different types of households in terms of numbers of people depends on housing market investigations conducted by developers in specific areas.

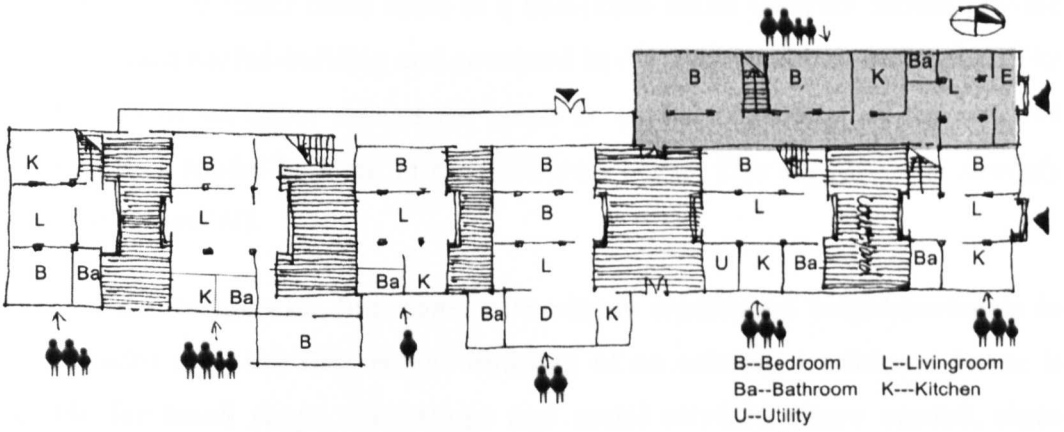


Figure 11.43 Convert traditional houses to become apartments for various sizes of contemporary families according to actual requirements (by the author)

Together with H2 and H3 on the same issue of the renovation of traditional houses, traditional house types could be competitive in current housing market. Renovated layouts of traditional houses can be reference to layouts of compact houses in the areas (H4).

H2, following the traditional house type, courtyards in traditional houses should be for communal use as semi-public areas, and provide places for outdoor activities. This can encourage social interaction between neighbours, facilitate ventilation and prevent sun-heat in traditional houses.

Currently, utilisation of courtyards in ordinary traditional houses is chaotic, because individual dwellers have built temporal extensions and shelters in courtyards in order to gain maximal living area. The temporal constructions have damaged the structural

order of traditional houses. Courtyards are important for both cultural representation and sun-heat prevention and ventilation (Chapter 10). Courtyards can greatly benefit inhabitants' everyday lives. As a semi-public space among neighbours, a courtyard can be used for pubic dining, relaxation, gardening, excising and for children's play. The close relationship between courtyards and roofed-buildings is able to facilitate interactions between neighbours and therefore enhance people's sense of community.

Referring to the current three ways of altering traditional houses in the city, a common corridor under those roofs of a traditional house complex should provide access for each roofed-building and courtyard in the traditional house complex. The corridor can be on either side of the house or curved depending on the renewed layout of each roofed-building in the traditional house. *This suggestion is strongly related to H1 and H3.*

H3, in order to increase functional diversity in traditional neighbourhoods in the southern city, the first roofed-building of an existing traditional house is possible for small shops, workshops and social services where needed, since shops had already been adopted in traditional houses in history. The actual number of such shops depends on practical surveys conducted by developers.

As shown in Chapter 10, the traditional courtyard house type can be classified into three sub-types: small, medium and big courtyard houses. Some medium and big houses have shops in their first roofed-building from the entrance. The first roofed-building is directly facing the street and spatially separated by a courtyard from the living space at the back. The shop in a first-roofed-building is easily accessible for its owner who lives in roofed-buildings at the back (Figure 11.44). This layout is worth applying to the regeneration of traditional housing, because small community shops are necessary for functional diversity in the area and convenient for local dwellers. Furthermore, these kind of small shops provide job opportunities for local inhabitants. Each shop is about 50 to 80 square meters, and do not need large amount of capital to run. Shops can be snack shops, breakfast shops, groceries, private cliniques, book stores, tea houses and so forth.

Designers should be aware that shops should be distributed evenly to serve local people in traditional neighbourhoods. The actual number of such shops depends on market investigations such as the actual population of those neighbourhoods after renovation and etc, which should be conducted by developers. *This suggestion links to St2, H1 and H2.*

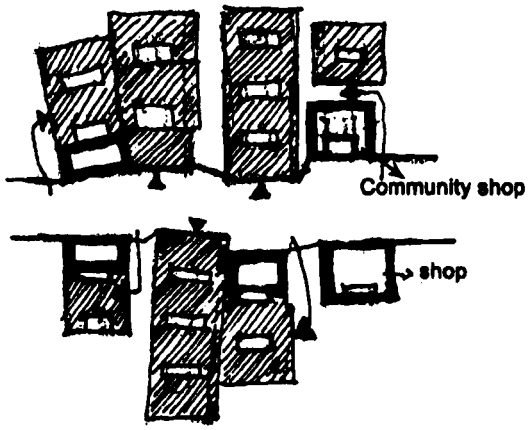


Figure 11.44 Small shops can be allocated in the first roofed-building of some house complexes where needed alongside streets (by the author)

As discussed in Chapter 2, contemporary renovation projects of traditional housing are not very successful, because they fall victim to superficial image-making of tradition and cause gentrification. Examples of this kind of projects are Tongfang Yuan projects in Suzhou, Xin Tiandi project in Shanghai and etc. Houses in those projects are new and have employed some traditional architectural features at the building scale such as the roof types and window patterns. However, they do not pay enough attention to the traditional plot types and block types of residential districts at larger scales. As a result, they become luxury detached houses or town houses (Figure 11.45), while most people in urban China are living in small apartments. The original residents are not able to afford this kind of 'traditional' houses, thus the social network in traditional areas has been interrupted, although new houses still appear to be harmonious with the surrounding environment. The above two suggestions which intend to sustain the original housing structures rather than to build modern villas with Chinese appearances are able to maintain the high-density of traditional residential areas, thus making renewed houses affordable.

Another house type called 'compact house' has emerged in traditional areas (Chapter 10), which is in a typological process of the Tianjing courtyard house type. This type should be followed in regenerations of traditional neighbourhoods where some traditional houses do not exist. They are able to maintain the traditional features while accommodating a large amount of people as well. Suggestions on how to build houses of the compact house type are proposed as following.

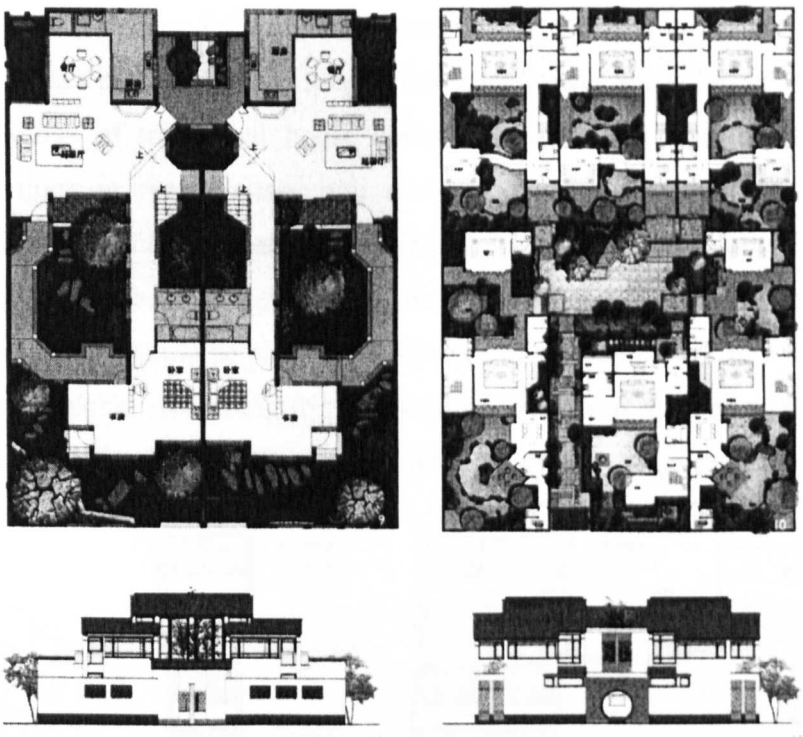


Figure 11.45 Two examples of current practices that attempt to incorporate traditional architectural characteristics, but become luxury semi-detached houses or town houses which are unaffordable for the majority of people (Fang et al., 2006, p101)

H4, in gaps between traditional houses, new houses of the compact house type should be built in traditional post-Lifang plots. They should be in the same volumes and rectangular shapes as traditional roofed-buildings: between 50 and 80 square meters for the ground floor and two stories high. The building should follow the orientation of the plot containing it and be placed at a distance of at least 4 meters from the front or back buildings in a block. New buildings could be attached to or detached from buildings at their sides. If detached, the alley

between buildings should be one or two meters. Compact houses should employ traditional building features flexibly.

The compact house type derives from the typological transformation of the Tianjing courtyard house type, while the plot type for compact houses derives from the typological transformation of the traditional post-Lifang plot type. As examined in Chapter 10, the plot type for compact houses has the same width as the post-Lifang plot type and has been split up in length. Compact houses are in the same volume as roofed-buildings of traditional house complexes. This typological transformation should continue in regenerations and renovations of traditional neighbourhoods. Compact houses should be located in between exiting traditional houses. New houses of this type should be two stories high, between 50 and 80 square meters for the ground floor. They should be placed at a distance of 4 meters from the front and back buildings in a block. According to the layout of traditional houses, compact houses can be attached to or detached from buildings on their sides (Figure 11.46).

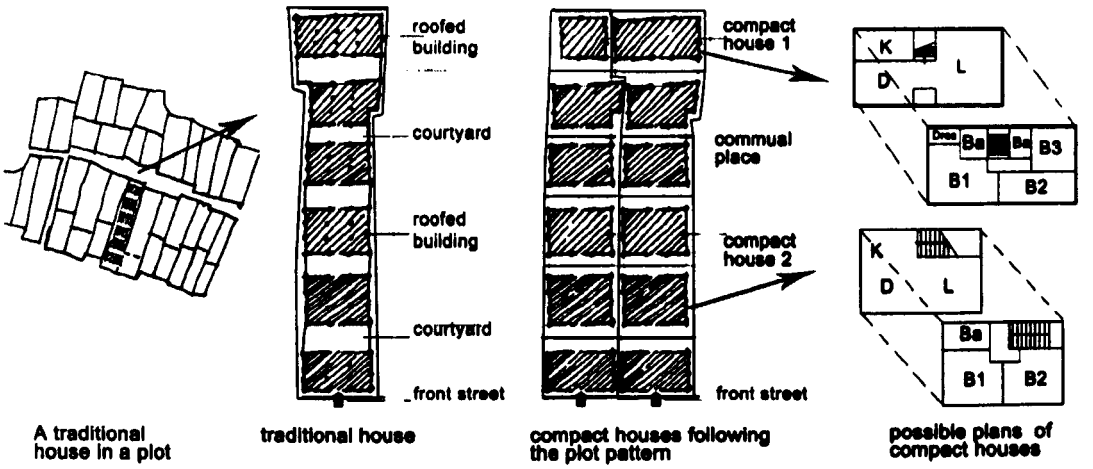


Figure 11.46 Lay new compact houses according to the plot type and block type; compact houses should form communal spaces that are similar to traditional courtyards; possible layouts of compact houses are various depending on specific requirements of households (by the author)

Compact houses should not have identical plan layouts but according to specific requirements of each household. T*he layout of compact houses refers to the suggestion on the layout of roofed-buildings in H1.* Furthermore, compact houses should also employ the traditional building features to achieve harmony with their

surrounding houses in terms of appearances. *Like Bu2 on how to incorporate traditional architectural characteristic in public building in Nanjing*, compact houses could have pitch roofs, or other traditional vocabulary of balustrades, window patterns, bracket decorations, end walls and colour schemes, according to designers' preferences and creations.

The current urban policy III provides rules for self-built houses in Nanjing[16], and mostly supports the above suggestion. However, the policy needs slight modifications to ensure the compact house type is followed by new self-built houses. In particular, according to the compact house type, a self-built house should be 50 to 80 square meters of the ground floor (rule 13). The slight variation of building heights should be allowed to enhance the diversity of housing forms in this area so that the rule 14, which regulates the total height limit should be '5.6 meters', is not appropriate. In the rule 17, the limit of distance between buildings in the north-south direction could be down to 4 meters to at last 1.25 times of the height of the building on the south in order to maintain the plot type and housing density.

Compact houses follow the post-Lifang block type and plot type (Bl1), and incorporate traditional building features (Bu2). The layouts of compact houses are

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[16] The rules are cited as below: '...Rule 13: The dimension of self-built houses should be according to the size of households that the average area per person is 20 square meters or less in the city and 30 square meters or less in suburbs. Rule 14: Self-built house should not exceed two stories high. The ground floor should not be higher than 2.8 meters while the total floor should not be higher than 5.6 meters. Rule 15: The arrangement of self-built house should be appropriate for transportation and fire prevention. Except necessary alleys, the end walls of adjacent buildings should be as close as possible. There should not be windows or other protruding structures on end walls. Rule 16: In case one's negotiation with his neighbours on attaching the new house to the neighbouring house failed, the new house should set-back from the plot line. One story house should set-back for 0.4 meters or above, while two-story house should set-back for 0.8 meters or above, and no extended balconies or porches are allowed. Rule 17: The distance between two adjacent houses in the north-south direction should be 1.25 times of the height of the house on the south, and the minimal distance is 6 meters...' THE GOVERNMENT OF NANJING (2004c) Nanjing shi shiqu geren jianfang guihua guanli zanxing guiding (The temporal regulations on individual-built houses in Nanjing). The Government of Nanjing,.

related to the layouts of renovated traditional roofed-buildings (H1). Relevant suggestions on the same issue are proposed in H5, H6 and H7.

H5, in traditional neighbourhoods of the southern city, new houses of the compact house type should be in slightly different sizes and heights. Their appearances should not be identical in order to intensify individual identity of households.

In traditional neighbourhoods of the southern city, local policies should allow diverse heights for both self-built houses and houses built by developers of the compact house type. There should not be an absolute height limit for houses, but a limit of the number of stories for houses so that different houses could have either an upper floor of 2.8 meters or an upper floor of 2.5 meters. A new house could use the pitch roof type and other traditional architectural features, depending on residents' preferences. This would benefit diversity of housing forms in the region (Figure 11.47).

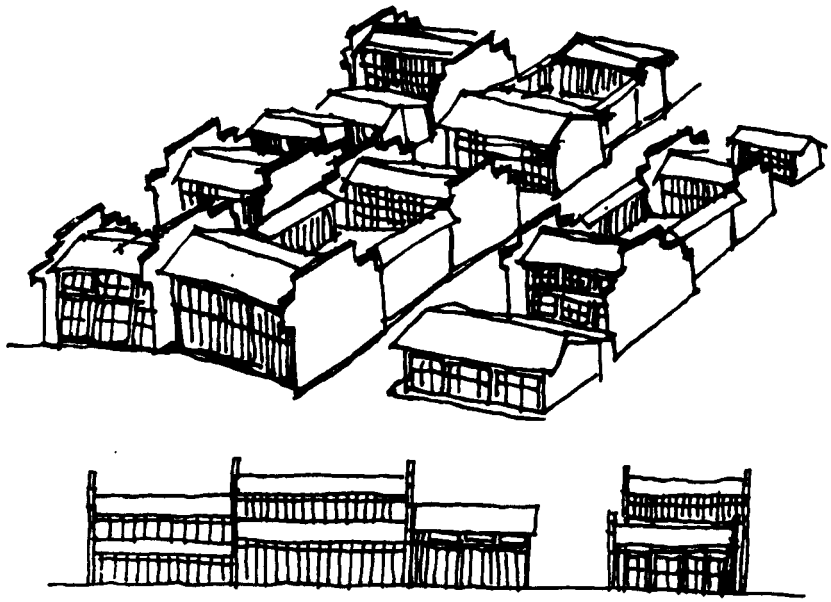

Figure 11.47 New houses should have different sizes, heights and appearances to achieve diversity of building forms in traditional areas (by the author)

Traditionally, a house expresses the owner's social status, wealth, value, self-encouragement and pride. Despite houses in the southern city are in the same Tianjing courtyard house type, each of them are slightly different in terms of sizes,

ornaments and numbers of courtyards, thus traditional houses also have strong individual identities. This quality is absent in contemporary housing, because standard layouts of apartments and building blocks are applied to housing developments over the country regardless of cultural, climate and individual differences (Chapter 10). Consequences are monotonous urban images; urban sprawl and interruptions; waste generated from refurnishing by owners after purchases of their apartments.

Self-built should be encouraged in traditional neighbourhoods but with professional aids and institutional constraints to maintain the house types, plot type and block type. There should be no standard model for new houses. Users' participation is essential and the original inhabitants' requirements should be considered. Different designers' creation of houses in the same type can be adopted. Such practice has been already advocated by the New Urbanist scholars that different building designs are generated by one design code which achieves uniformity and diversity at the same time (Leccese and McCormick, 2000, Grant, 2006). *This suggestion is related to H4 and H6.*

H6, new houses of the compact house type should form semi-public open spaces with their neighbouring buildings on their north and south sides. Such spaces can be defined with perforated walls or vegetations. These open spaces play the role of new courtyards for public activities. New houses could have arcades facing such open spaces.

Courtyards are essential in traditional houses of the Tianjing courtyard house type which are enclosed by arcades of traditional roofed-buildings on the north and south sides and arcades of end walls on the east and west sides (Figure 11.48). Courtyards are not only places for family activities, but also for ecological benefits *(H2)*. This feature can also be adopted in new houses of the compact house type in traditional neighbourhoods of the southern city.

Despite new compact houses are owned by different households, they should not be isolated in their plots. The spaces in between a house on the south and a house on the

north should be designed as traditional courtyards but for public access. *As mentioned in H4*, the distance between buildings in the north-south direction is between 4 meters and 1.25 times of the height of the building on the south. Such spaces are able to become courtyards having a certain degree of enclosure. The end walls of new buildings can be extended to connect with each other, but the walls should be low or be non-solid to let people look through the space from outside. Alternatively, fence-like vegetations can be used to define the space (Figure 11.48). Some degrees of openness show the publicity of this kind of spaces.

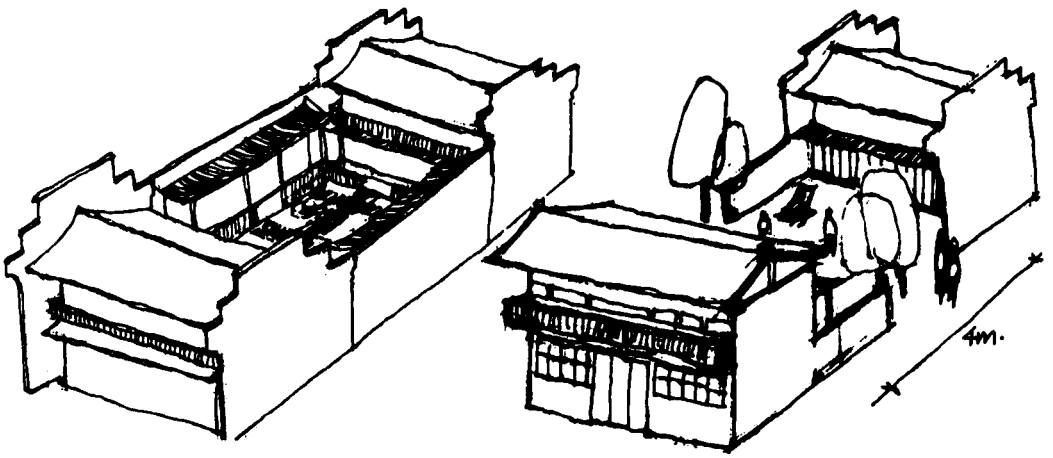

Figure 11.48 Courtyards are important for traditional houses (left); New compact houses should form communal spaces in between of buildings for public activities (by the author)

In order to activate the defined spaces in between buildings in the north-south direction, traditional roofed arcades are worth applying to compact houses. This transitional space allows inhabitants to stay, sit and watch their courtyards, as a result, this transitional space in between houses is not only for passing through, but also for activities. Arcades could combine with living rooms or kitchens within a building, or accommodate outdoor staircases leading to upper floor apartments. Meanwhile, they are also semi-public spaces and invite people from the neighbourhood to join in activities in them.

This suggestion links to H4—compact houses follow the plot types and block types (Bl1), and H5—different sizes and heights of buildings.

H7, traditional compact house type should be considered as an alternative to contemporary housing types of high-rises and slab building blocks in current housing developments to create better living spaces for people and sustain the traditional identity of the city.

The compact house type is an evolutive type of the Tianjing courtyard house type, both of which are in the same typological process. The compact house type is not only applicable in traditional neighbourhoods of the southern city as proposed before, but also a solution for contemporary housing developments in the city. Currently, large-scale housing developments usually employ high-rise types and types of slab blocks for the demand of housing market due to their economical efficiency. These types are not the only choices for contemporary housing developments. The traditional compact house type is competitive for the following reasons.

Contemporary high-rises and slab blocks are able to contain a large amount of population at limited lands which is their advantage in the current situation of high land-demand and high land-value. However, traditional housing is also highly dense and has close relationship with the ground, which psychologically benefits dwellers, and people in traditional housing have closer interactions with their neighbours. A traditional neighbourhood is more like a community rather than merely a place for living.

In order to show the capacity of the traditional house type, two land slots of 46 by 46 meters are used to compare the capacities of traditional houses, multi-story contemporary houses and high-rise houses. The dimension of 46 meters is not special for traditional houses, but determined by the dimensions of a typical traditional house, a typical unit of contemporary multi-story houses and a typical unit of modern high-rises[17].

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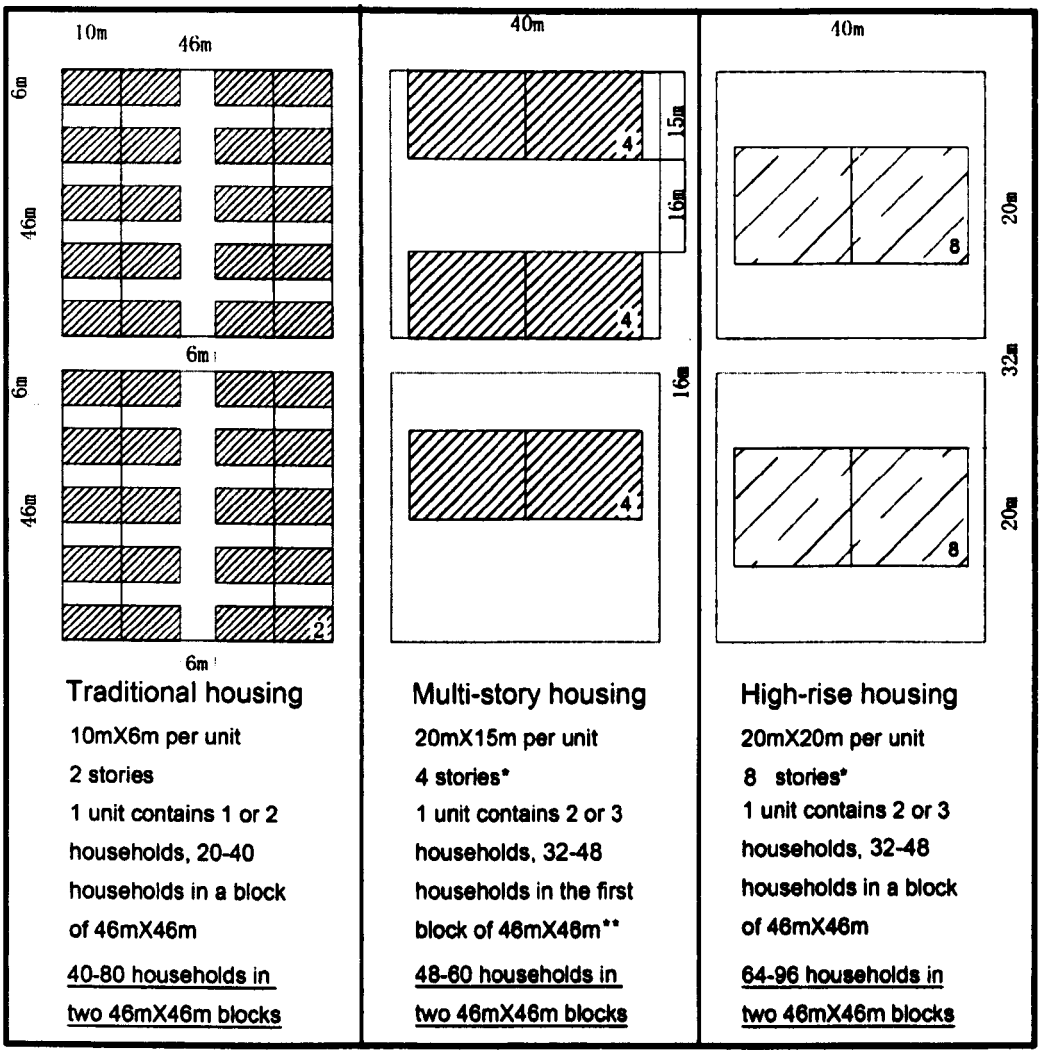
[17] A typical traditional house is 10 by 6 meters in plan, two stories high and has 4 meters distance from adjacent buildings in the north-south direction. A typical unit of a multi-story building is 20 meters wide, 15 meters deep, which could contain 2 or 3 apartments in one floor. A typical unit of



* The number of stories is determined by the height and the distance between two buildings. Since the distance is 16 meters, the height can not exceed 12.8 meters according to the regulation that the D/H ratio should be more than 1.25 in order to ensure sufficient sunlight and ventilations in each building. The stories of 8 is also deterimined by this rule.

** Only one multi-story building is allowed in the adjacent block of 46mX46m due to the limitation of D/H ratio.

Figure 11.49 Calculation and comparison of the capacities of the proposed traditional housing, multi-story contemporary housing and high-rise housing (by the author)

In the calculation (Figure 11.49), houses are placed in rows and columns in order to have maximal possible capacities. Traditional houses are distributed evenly in the land slot, while contemporary houses are located in the centre. According to the

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high-rises is 20 meters wide and 20 meters deep, which could also contain 2 or 3 apartments in one floor.

present regulation, the distance between residential buildings in the north-south direction should be 1.25 times of the height of the building on the south side in order to ensure sufficient sunlight and ventilation; the multi-story buildings are 4 stories high and at a distance of 16 meters from buildings on the south of the slot; while the high-rise buildings are 8 stories high and at a distance of 32 meters from the buildings on the south of the slot. If the height increases, the distance between buildings also increases. Therefore, in one land slot, the traditional house type can accommodate 20 to40 households, and the multi-story and high-rise housing can accommodate 32 to 48 households. In two land slots, the traditional housing can accommodate 40 to 80 households, the multi-story housing can accommodate 48-60 households, and the high-rise housing can accommodate 64-96 households. The capacity of the traditional housing is comparable with that of the multi-story housing, although, is less than that of the high rises.

Since Nanjing is an important historical city, height control of buildings is strongly required. Thus high-rise buildings are not appropriate for the future housing developments in many areas of the city, such as the southern city, areas near the city wall and etc (such areas where building heights are strictly controlled refer to Figure 11.10). The traditional house types, plot type and block type can be good alternatives. *The detailed way of applying these traditional types should refer to H4..*

H8, in order to sustain the traditional quality of houses, contemporary housing blocks should form regular and usable open spaces by defining the spaces.

Contemporary developments are numerous in the city nowadays, which is located in the central and north areas, as well as expanded areas of the city. Contemporary house types have become popular choices for developers and have accommodated a large amount of population in the city.

Contemporary housing schemes are in need of better urban places, as reviewed in Chapter 10, designs need to be improved to create better urban places. Contemporary residential high-rises and slab housing blocks are arranged in linear, grid, pinwheel, cluster patterns or free-standing in their sites. Neither of those arrangements form

positive open spaces around buildings. Instead, contemporary residential buildings should enclose open spaces with surrounding buildings to create spaces with higher portions of public active frontages and privacy in the back of buildings. Spaces with more degrees of privacy can act as large courtyards for local residents.

Since contemporary buildings are normally in bar shape, in order to form positive urban space, buildings containing more apartments should be built in the gaps between two parallel buildings and at their east ends and west ends. An example of improving the current arrangement of contemporary housing is given in Figure 11.50, using the example of Jiqing Jiayuan project. The added buildings facing the east-west direction could be lower than the existing buildings facing the north-south direction as the latter are more favourable for dwellers. The east-west oriented apartments can be designed as small studio apartments for singles, for rent or as temporal accommodations combined with the ground floor shops for people who run them. By doing so, the density of contemporary residential developments increases. This kind of improvement needs carefully designed apartment layouts to fit in.

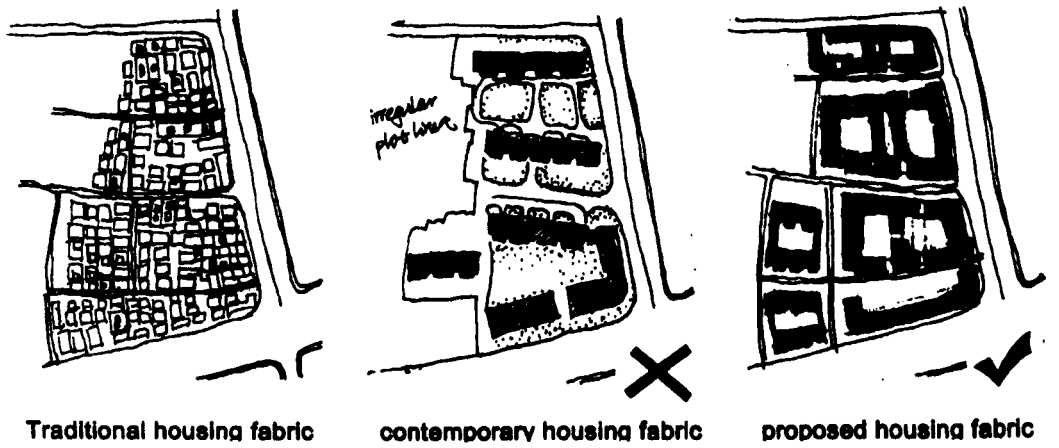

Figure 11.50 Contemporary housing blocks should form regular and usable open spaces (by the author)

This suggestion is most appropriate for the development of urban blocks of the ordinary block type (Bl2, Bl4 and Bl5). Apart from this, contemporary housing should also follow H9.

H9, contemporary residential buildings in different locations of the city should respond to traditional building features of Nanjing flexibly where possible.

Contemporary residential buildings should also respond to traditional building features of Nanjing to sit harmoniously with the surrounding environment. It depends on the distance of new buildings from nearby traditional buildings that how much degree of traditional building features should be applied. In relation to the height control of buildings, residential buildings in the 'Xietiao qu' of historical buildings should employ as many traditional features as possible or should be in traditional house types, while buildings in high-rise building allowed area could employ only a few of traditional building features or not. *The implementation details of this suggestion refer to Si2—achieve the effect of traditional small-scale silhouette types in new buildings, Bu2—apply traditional architectural features to new buildings where possible (H8).*

11.10 Discussions

11.10.1 How to use the proposed design suggestions

This typomorphological study intensifies designers' understanding of the local context, provides guidance from the past for new projects, and how to adapt the new to the local culture and existing built environment. It also helps policy-makers to produce localised regulations and urban plans. All the suggestions are based on the belief that identity of a place derives mostly from its local tradition, which can produce meaningful places and the sense of belonging for local people.

In Nanjing, although design suggestions focus on different urban elements at different scales, they are strongly connected with each other. No single suggestion should be read in isolation. For instance, if a designer intends to design several houses in an urban block in the traditional southern city of Nanjing, he/she should refer to the suggestions of block types and plot types (Bl1) in this area, and be aware of the street type (St2), house types (H4, H5, and H6) in the traditional area, and height limit as well. If a developer is willing to redevelop a site containing several urban blocks for mainly residential uses, he should consider the existing types of

streets networks and types of streets, blocks types and plot types, the distance from the nearest historical buildings and the height limit allowed for buildings. Furthermore, he should activate the edges of new blocks, as proposed in B15. In order to build one house, the builder should take the suggestion of plot type to deal with the relationship between his building and surrounding buildings, and he should consider the house type and height limit thereafter.

The design suggestions proposed in this thesis can enrich or be part of the comprehensive governmental design guidance for Nanjing, which may contains detailed mater plans, design codes, details of development phases, cost, and so forth. Furthermore, there are many other issues in the design process which designers should also consider. These issues include the technique issue (the urban structure, techniques, materials, budges), the functional issue (required activities, circulations, areas and etc), the inspirational issue (symbolic meaning, analogy, metaphor) and so forth. Any piece of design is related to all design issues as a complex system. Even though the starting point of this research project is for sustaining the cultural identity of Chinese urban forms, design suggestions proposed in this chapter in fact also contribute many other urban qualities such as imageability, legibility, continuity, permeability, diversity and etc. However, the method of typomorphology is not able to deal with all potential problems in relation to all design issues in an urban development. Thus design suggestions in this thesis should be accomplished with other design guidance for Nanjing to guide the urban development of this city.

11.10.2 The choice of the seven elements

The reasons for breaking down the urban form into the seven elements have been elaborated in Chapter 3. The productivity of the typomorphological approach in terms of generating design suggestions may be slightly different when dealing with the seven elements or in different cases.

In Nanjing, the general plan shows the spatial relationship between the human settlement and nature, the old city and the expansions, different textures of urban fabrics. The plan type of Nanjing contains important characteristics of the city, which

are embodied in the axes, boundaries, and natural settings. The plan type is very important for relevant design suggestions.

Despite silhouettes are important for identity and imageability of the city, in the case of Nanjing, the transformation of the type of silhouettes is too dramatic. Therefore, design suggestions on silhouettes of Nanjing focus on the visual impact and aesthetic considerations rather than the maintenance of a particular type. The typomorphological approach to the silhouette design in Nanjing is not as productive as to the other elements since design suggestions are not directly from the analysis. However, it is possible that silhouettes of other Chinese cities have been transforming stably over time (in a typological process), and the traditional type of silhouettes is clear. For instance, the transformation of the silhouettes of the old city of Suzhou is in a typological process (Appendix 2). In such cases, design suggestions shall emphasis the continuity of types which sustains the identity of the city.

Since the typological processes of streets and street networks have been revealed in Chapter 6, design suggestions are mainly on how to sustain these types in different morphological regions. For instance, the types of street networks and streets in the southern city are different from that of the rest of the city, so the suggestions on different regions are separated.

Urban blocks and plots represent the city's physical characteristics very well and are the most direct objects for urban designers to deal with, because many design projects take place at this scale. The typological processes of block and plot types are also obvious in different morphological regions of Nanjing, so design suggestions on them focus on how to sustain them and keep the future transformation in the typological processes.

Public spaces in traditional Nanjing emerged spontaneously in the traditional period and are welcome at the present time. In Nanjing, most of the existing public spaces are built in the modern period and less rooted in the local tradition than other elements. Therefore design suggestions directly from the typomorphological analysis

are limited. This situation may exist in other big Chinese cities such as Xi'an, Beijing, Luoyang, Suzhou and etc, because they are established according to the traditional official city planning concepts which have greatly ignored public space design as explained in Chapter 8. Therefore, in those Chinese cities, like Nanjing, the typomorphological approach on this element would not be very productive. However, this element is important because there are large amount of Chinese cities that are established not according to the traditional official planning concept, such as Jingde Zhen, Quanzhou and etc. The typomorphological approach to public spaces would be more productive in such cities, which are also facing the identity crisis.

The transformation of public buildings and houses in Nanjing are the most dramatic ones among that of the seven elements, but clear typological processes have been observed. Public buildings and houses at the lowest scale in this research are the determinants of urban forms. Their ways of grouping and relationships with the urban void form the spatial structure of the urban tissue of Nanjing. Typomorphology gives direct guidance on building design[18] in relation to urban spaces of Nanjing. It would be most productive in dealing with these two elements because of diversity of building forms. The analysis on these two elements of Nanjing can be developed in more depth so that local building types are able to fully benefit building designs in Nanjing. There may be some similarities between building types in different Chinese cities in the same region, because building types are determined by regional climates, culture and technical constraints in history. For example, the Tianjing courtyard house type exists not only in Nanjing, but also in Suzhou, and other cities in Jiangsu and Zhejiang Provinces in the eastern region of China. The typomorphological examination of house types in Suzhou is in Appendix 2.

To sum up, in Nanjing, despite the typomorphological approach is more productive in terms of offering design suggestions on the elements of general plan, street

[18] The typomorphological examination on public buildings and houses in this thesis emphasises on building types in relation to urban spaces rather than interior spaces, because this study focus on urban design rather than building design. Otherwise, building types could be analysed in more depth, such as the interior spaces, facades, decorations and so forth.

networks and streets, urban blocks, and buildings, the approach has been proved to be useful for the purpose of sustaining a city's cultural identity through urban design. Typomorphological approach can be valuable in dealing with the elements of silhouettes and public spaces in other Chinese cities, which needs further proofs in future study. An attempt has been made in the analysis of the urban form of Suzhou (Appendix 2). A summary of this approach and its adaptability is concluded in the next chapter.

11. 11 Summary

	Design suggestions	Basis	Objective	Contributions	Links
G1	Define the boundary of the old city	The plan type	For city master plans	Identity,legibility, imageability, public realm	G2, P2
G2	New urban fabrics correspond to the fabric of the old city at the city scale	The plan type	For regional level plans; administrative policies	Identity, legibility	G1, Bl3
*	Natural settings are preserved	The plan type	NA	Identity,legibility, imageability,	NA
*	Preserve the five city axes	The plan type	NA	Identity,legibility, imageability,	NA
Sil	The visual qualities of silhouettes	Visual impact of forms	For height control and designers	Identity, imageability	NA
Si2	Achieve effects of traditional small-scale silhouettes	Traditional types of small-scale skylines	For designers	Identity, harmony, imageability	Bu1, Bu2, H9
*	Different height limits	NA	NA	Identity, harmony	NA
St1	Type A and B of the street network in the southern city	Type A and B networks	For district level plans	Identity, harmony, fit, legibility	St2, Bl1,
St2	Type b of streets in the southern city	Type b of streets	For regulatory detailed plans and designers	Identity, safety,	St1, St5, H3
St3	Type B street networks in the rest of the city	Type B of networks	For district level plans and designers	Identity, legibility, permeability,	St4, Bl4, P1
St4	The street type c or d for street design in the rest of the city	Type c and d of streets, sustainability	For regulatory detailed plans of the areas	Identity, legibility, fit	St3, St5, Bl5, P1
St5	No set-back from street-lines axial and main streets	Type c and d of streets	For administrative policies and designers	Identity, legibility,	St4, Bl2, Bl5, Bu2
*	Preserve the boulevard system	Type C& D of	NA	Identity, legibility,	NA

	(C), and the boulevards (c)	networks, type c of streets			
Bl1	Maintain the post-Lifang block type and plot type	Post-Lifang block and plot types	For regulatory detailed plans and designers	Identity, density, harmony	St1, St2, H4, H6
Bl2	Maintain and apply ordinary type of urban blocks and plots	Ordinary block type	For regulatory detailed plans and designers	Identity, harmony, imageability	St5, Bl3, Bl4, Bl5, H8
Bl3	Harmonious relationship between buildings in one block	Visual impact of forms	For designers	Identity, harmony, imageability	Bl2, Bl5, Bu1, Bu2
Bl4	Subdivide super blocks and plots	Ordinary block types and plot types	For regulatory detailed plans and designers	Identity, permeability,	St3, St4, St5, Bl2,Bl5, H8,
Bl5	Active edges of ordinary urban blocks	Traditional ordinary block type	For designers	Diversity	St4, St5, Bl2, Bl3, Bl4, H8
P1	Employ traditional street type 'a' in current pedestrian streets	Traditional street type 'a'	For designers	Identity, safety,	St3, St4
P2	Civic squares connect to public buildings	Traditional square type	For designers	Identity, imageability	G1, P3
P3	Define the edges of civic public spaces	Traditional square type	For designers	Identity, legibility	P2
Bu1	Break down the total volume of public buildings in traditional areas	Traditional building types	For designers	Identity, harmony, permeability	Si2, Bl3, Bu2
Bu2	Apply traditional features to new buildings	Traditional building types	For designers	Identity, harmony,	Si2, St5, Bl3, Bu1, H4, H9
H1	Renovate existing traditional housing	Courtyard house type	For designers	Identity, harmony, density	H2, H3, H4
H2	Courtyards for communal use	Courtyard house type	For designers	Identity, harmony,	H1, H3
H3	The first roofed-building for commercial or service use	Courtyard house type	For regulatory detailed plans and designers	Identity, harmony, diversity,	St2, H1, H2
H4	Follow the compact house type	Compact house type	For designers	Identity, harmony, density	Bl1, Bu2, H1,

					H5, H6, H7
H5	Different sizes and heights of new houses	Diversity	For regulatory detailed plans and designers	Identity, diversity	H4, H6
H6	Define the spaces between new houses	Courtyard house type	For designers	Activate the space	Bl1, H4, H5
H7	Consider traditional house type as an alternative to modern housing types	Courtyard house type	For regulatory detailed plans and designers	Identity, harmony	H4
H8	Modern housing blocks should form regular and usable open spaces	Ordinary block and plot types	For designers	Identity, legibility, permeability	Bl2, Bl4, Bl5, H9,
H9	Modern residential buildings respond to traditional building features	Visual impact of forms	For designers	Identity, harmony, imageability	Si2, Bu2, H8,

* Subjects which have been already included in the current urban policies and plans

CHAPTER 12 CONCLUSION

The research project in this thesis has involved a detailed examination of the urban forms of the old city of Nanjing. The examination has been undertaken in such a way that the traditional environment and its transformation have received as much attention as the current situation. Socioeconomic, political and cultural forces have been studied to explain the transformations in each period of the development of Nanjing. The research project has also proposed detailed recommendations on the development of urban forms of Nanjing in the future based on the exanimation, as means to maintain a degree of cultural continuity and city identity. The proposals have focused on the actions of urban design and have been placed in the current political framework, although some proposals intend to modify specific urban policies.

In this final chapter three main contributions of the research are summarised in response to the two research questions and objectives established in Chapter 1: how do Chinese physical urban forms develop and transform over time? (12.1); how do architects make new designs fit into the existing built environment and therefore to maintain the cultural identity and traditional urban qualities? (12.2). Particularly, the methodology of typomorphology, which has been developed and adapted to the Chinese context through this research, is emphasised and delivered to be applicable to other Chinese cities and guide urban designs in different Chinese contexts (12.3). Future researches could also be relevant to the exploration of the theory of typomorphology in China at a wider range to sustain their identities.

12.1 Understanding the traditional urban form

The current crisis of loss of cultural identity that Chinese cities are experiencing is directly related to the poor understanding and lack of respect for traditional urban forms that largely exist in numerous historical Chinese cities. The separation of local cultural representation from local urban forms and the separation of urban architecture from urban morphology are the manifestations for it. The contemporary models of urban forms are irrelevant to local contexts and are borrowed from around

the world. They interrupt traditional built fabrics in a city and break down the coherent inter-relation between those long-lasting urban forms at different scales. The first research question addressed in relation to this phenomenon in Chapter 1 is: how do Chinese physical urban forms develop and transform over time? The answer of this question is the key to understand the characteristics of the local traditional built environment and its adaptability and robustness over time.

The case study city of Nanjing is carefully selected to represent a large amount of Chinese cities with splendid history and traditional urban forms. Furthermore, the transformation of Nanjing is not exclusive, but in a national-wide background of rapid urbanisation, modernisation and globalisation. The urban transformation among all Chinese historical cities has been driven by similar forces to that of Nanjing (Chapter 3), although the characteristics of transformation are different. The identification of those characteristics at a particular scale, involving the recognition of the important organising features and elements and their relative disposition, is based on a thorough study of that environment.

The urban forms of Nanjing have been described and analysed comprehensively from Chapter 4 to 10. Particular attention has been paid to the types and typological processes of urban forms at each scale, as introduced in Chapter 3. It is not intended here to repeat those descriptions, but to summarise a more general survey of the findings of Nanjing to answer the first research question in general.

Despite the old city of Nanjing contained several ancient military establishments that were built in different sites of the region, the city attained its overall basic structure during the Ming Dynasty, as can be seen today. The basic characteristics of the general plan of Nanjing are embodied in the plan type of the city, which consists of the shape, boundary (city walls and moats), five axes and relationship between natural settings and manmade artefacts. The preservation and presence of those characteristics ensure the identity of the city to be perceived at the city scale. These characteristics need prior considerations during the future development of the city, for instance, the preservation and restoration of the city walls and moats; the show

case of the natural settings and five axes (Chapter 11). Other Chinese cities also have general plan types, which can be defined by the shape, boundary, axes and spatial disposition of the city. The characteristics of general plan types usually survive from changes over time. For example, the location of a city and its natural environment is unlikely to change, and its boundary and shape can be marked by historical remains such as city walls and moats or linear public spaces.

The overall silhouettes of Nanjing that are perceived from four major view points have not undergone a constant typological process. The dramatic changes of the silhouettes at a large scale occurred during the development of the city. However, silhouettes at a small scale which can be perceived inside the city are showing the historical features to give visual impact of traditional identity to observers. For other Chinese cities, the silhouettes may be in a constant typological process, so that they are useful for the future development of the cities (seen the case of Suzhou in Appendix 2).

The street system and streets of Nanjing have been classified into several categories by types, which contribute greatly to the identity of the urban forms. The type A, B, C and D of street networks and type a, b, c and d of streets in Nanjing summarise the characteristics of this element. Similarly, types of streets and street networks in other Chinese cities can be defined and outlined according to the same principles (Chapter 3 and 6), which help to document the morphological features of their urban forms at the district scale. Designers can bear in mind the typology of the existing street networks and streets and reflect it in their designs.

The types of blocks and plots of Nanjing in each period of its development have been defined based on the size, density, volumes, and spatial relations (orientation and access) of blocks and plots established in those periods. Particular attention has been paid to the historical types since they are more valuable for the cultural identity of the city. The types and typological processes of urban blocks and plots of other cities may also be discovered according to the above criteria. These features then become

the implicit rules of the creation of new urban blocks and plots that are relevant to contexts.

Urban public spaces of Nanjing (except the streets) are fairly special among all the elements, because types of them do not have a long tradition. The characteristics of them are not very much vernacular to be sustained to achieve cultural continuity. Urban public spaces in other Chinese cities are not necessarily the same as those of Nanjing. As mentioned in Chapter 8, spontaneous public spaces existed in small Chinese towns and villages during the ancient time. Therefore, their types can be precious for future designs in those places at the block scale. The definition of types is based on the physical properties and spatial relations of public spaces.

At the building scale, the examination of public buildings and houses of Nanjing reveals the variety of vernacular and traditional building types, which are the fundamental components of urban forms. The typological processes of building types are the fastest among all the types of urban forms (Chapter 9 and 10), while buildings are changing dramatically to adapt to functional, cultural and economical changes. Building types in other Chinese cities also represent the characteristics of their urban forms, and types in typological processes express the local identity of urban forms at the building scale.

In relation to the first question, the transformation of Chinese urban forms can be outlined by the types and typological processes undergone by the general plan, silhouettes, street networks and streets, urban blocks and plots, urban public spaces, public buildings and houses in a city in the hierarchical framework. The exploration of the typomorphology of particular urban forms in terms of these elements can give designers deep understanding of the local context. The comprehensive analysis of the urban forms of Nanjing enriches the documentary information of urban morphology of Nanjing, which most design projects in Nanjing could refer to. Only by understanding the traditional urban forms of a city and referring to the traditional types at certain levels, designs in that context could be contextually relevant and maintain the cultural continuity.

12.2 Cultural identity and continuity through urban design in China

The information database of the urban typomorphology of a city, types and typological processes of urban forms in particular, provides useful foundation to guide local urban planning, urban design and judge whether proposals for new developments would be appropriate in a particular location. Despite urban planning and design has long tradition in ancient China (Chapter 1), the modern and contemporary urban planning and design approaches are largely influenced by various western theories, such as the Beaux-Art tradition, functionalism in the modernism, formalism, and the post-modernism (such as nationalism and critical regionalism), which can be seen from the urban planning of Nanjing over time. Furthermore, currently, the search for identity of Chinese cities is largely based on rather limited and simplified ideas that employ a few symbolic building elements of the past at a level of ornament and romanticist imagery, or preserve cultural heritages from pure picturesque point of view (Chapter 2). The underpinning of traditional architecture and urban forms are largely ignored and disregarded. The second research question then asks: how do architects make new design fit into the existing built environment and therefore to maintain the cultural identity and traditional urban qualities?

In order to answer this question, it has to come back to the fundamentalism of the theory of typomorphology and the attitude of 'operational history'. Every new development in Chinese historical cities at the present time should be based on previous urban forms. As revealed in the answer of the first research question, morphology refers to the physical properties of urban forms and their relationship with the surroundings at various scales, while typology refers to the progressive transformation of urban forms (types) over time (typological process). The compositional word of typomorphology implies the past, present, and future. Urban forms in the past can be imitated, interpreted or concretised in new presences through their types, which indicate the compositional or structural organisation of their components in a hierarchy. In such sense, the relationship between urban forms of the present and of the past is progressive based on the same meaning (cultural representation) of forms, with acceptable small changes. In a typological process,

sudden mutations do not occur in the transformative process of a particular urban form. Urban forms in the future, if follow a typomorphological approach, are modifications of small parts rather than the whole systems of pre-existing forms. Therefore, the continuity of urban forms in the past, present and future can be achieved, and the past urban forms are the operational references for the future ones.

The typomorphological approach outlines all the conditions of a given situation and its history, and suggests that new forms are born out of those conditions and in connection to the pre-existing reality. This approach affects the possible design actions as the producers of new urban forms. Therefore, new development can fit well into the existing built environment. This has been proved in the case study of Nanjing. The design suggestions for the urban design of Nanjing clearly propose how to interpret and concretise the traditional types of each of the seven elements in new forms in different morphological regions. Since suggestions are from the types and typological processes gained through the analysis of urban forms, they translate the characteristics embodied in types and those remained in typological processes into new presences.

In order to maintain the general plan type of the city, the way of maintaining the boundary of the old city and how new urban developments can respond to the old are proposed for the general plan of Nanjing, which are some complements of the current urban regulations. Suggestions on silhouettes of Nanjing, on the one hand, focus on the visual qualities of rhythm, punctuation and harmony at a large scale; on the other hand, emphasise the visibility of traditional roof-features at a small scale. The relevant suggestions (Si1 and Si2) complement the current policy of height control in the old city. Suggestions on street networks and streets are various in different morphological regions in terms of the existing types of street networks and streets. Each of them focuses on how to lay out a new street and control the street lines, widths, proportions and layouts of it in the existing networks. Suggestions for urban blocks also depend on various morphological regions of blocks. Attention is paid to the dimension and patterns of new blocks and plots in a region. In order to achieve a particular block type and activate blocks, buildings in such blocks are

signified. Suggestions on urban public spaces basically follow the western experiences of public space design to solve the problems of public spaces in Nanjing, because vernacular types of public spaces almost lack in the city. Regarding the physical properties of public buildings, suggestions emphasise on the volumes and heights of new buildings. Furthermore, the characteristics of traditional types are outlined and reinterpreted in new forms. Suggestions for housing in different morphological regions focus on not only the renovation of existing traditional houses, but also building new ones. Additional suggestions are made to deal with modern residential developments.

Furthermore, design suggestions are connecting with each other to give a direction for a possible new development (11.11). Suggestions are carefully placed into the current urban policies and also involve particular modifications to the policies. Moreover, each suggestion considers the current lifestyles and customs of the inhabitants and adapts forms to them. In the case of Nanjing, sixteen urban policies and plans are mentioned since they are relevant to the urban forms of the city (Table 11.1). Similar analysis can be carried out and corresponding design suggestions can be established in other Chinese cities to fit new forms into existing contexts.

12.3 The typomorphological approach

12.3.1 The seven elements and scales of study

The research project in this thesis analyses the urban forms of a Chinese city as seven elements: the general plan, silhouettes, street networks and streets, urban blocks and plots, public spaces, public buildings and houses. These elements of urban forms have been shown to be crucial to describe the evolution of the case study city. Each of them has developed in the cultural tradition, and is popular in other scholars' research on urban form (Chapter 3). Furthermore, the seven elements fall precisely in a hierarchical framework of scales as emphasised in both typology and morphology research (Chapter 2). At those scales, characteristics of each element are studied in various details.

Even though the urban form of a city can be described through seven elements, these elements are closely related to each other and constitute a system. Urban forms at the smallest scale often determine urban forms at a larger scale. For instance, the form of a house determines the form of a plot, which in turn determines the form of its relevant block. If changes occur in the form of the house, they would likely occur in the form of the block and of the city as a result. Therefore, the seven elements do not play independent roles in urban study and design. Hence links among suggestions of the seven elements are shown in 11.11. Further exploration of typomorphology in other Chinese cities should also follow the seven elements in order to gain a deep understanding of their urban forms and transformations.

Focuses on elements and scales will depend on the nature of the future urban design challenges or problems. For example, if a design project deals with a house, it should focus on elements at the plot scale, building scale and even smaller scales such as the material scale. In sum, the first step of the typomorphological analysis of a Chinese city is to set up the seven elements or the scales of study.

12.3.2 Time phases of a development

The transformation of urban forms is a temporal process, which is driven by diverse forces. As mentioned in Chapter 3, generally speaking, in China, urban forms during the feudal society were very stable, whilst they changed comparatively more during the late 19th century and the first World War. They then changed dramatically after the P.R China was founded and once again in the Post-reform period (after 1978). The development of various Chinese cities may follow slightly different time phases, which need to be considered according to specific situations. Thus the second step proposed by this typomorphological study is to clarify the time phases in relation to the urban form development of a Chinese city.

12.3.3 Morphological regions

The concept of morphological region is important for the typomorphological study since it classifies urban forms into several categories according to their characteristics and allows those characteristics in each category to be examined in detail. The concept of morphological region developed in this research is based on

variations of the seven elements rather than merely on plan types, building types and land-use types in Conzen's definition. In the study of the general plan of Nanjing, the old city is a particular morphological region from its surrounding new developments due to its different plan type. In the study of street networks, four morphological regions in the old city are revealed to accommodate four types of street networks. Morphological regions for other elements can be deducted by analogy.

A morphological region usually accommodates one of the types of a particular urban element. By defining morphological regions for each urban element, detailed research can be conducted on a particular urban form in each morphological region as the representative of the urban form of that region. Therefore, the third step of the typomorphological analysis of a city is to define its morphological regions according to each of the seven elements in that city.

12.3.4 Types and typological processes

In the morphological regions of a certain urban element, urban forms can be studied to identify their synchronic types during a particular period. By comparing a series of synchronic types through different periods within a morphological region, it is possible to identify typological processes. A typological process implies that some characteristics of urban forms common in their synchronic types have been maintained and have been adapting to changes and needs over time. It is also possible that in some cases, mutations occur and typological processes can not be found.

The type of an urban form is defined according to its physical properties and its relationship with others in the surrounding areas (relationship of part-to-whole and part-to-part, Chapter 3). The physical properties refer to size, height, width, proportion, density and volume, while the relationship with the surroundings refers to spatial or structural relationships, such as orientation and access. A typological process is the gradual and slow transformation of a series of types. To sum up, the fourth step of the typomorphological study is to define types in each morphological region and to connect these types in order to find the possible typological processes over time.

12.3.5 Design suggestions

Types and typological processes can be the bases of design suggestions. If a typological process is observed in one of the morphological regions of a city, new forms (one of the seven elements) in this region, which usually the historical parts of the city, should follow the latest synchronic type of this element in principle. If a typological process does not exist in a morphological region, which is possible and usually in both historical and new parts of the city, new forms should respond to the existing types of urban forms in this region in order to make a coherent built environment. The suggestions following these principles give design possibilities, which need political commitments and economic feasibility. Therefore, the existing urban policies and urban plans should be taken into account, as well as the socioeconomic context of a particular city for the typomorphological study. Reciprocal benefits can be obtained from a combination of new suggestions and existing political frameworks. Design suggestions proposed in Chapter 11 of this thesis have shown such benefits.

The fifth step of the typomorphological study is to generate design suggestions according to the types and typological processes of urban elements in study. However, designers should bear in mind that the suggestions in relation to the typomorphological study do not solve all problems in urban development or design. The typomorphological approach is only a form-based design method that is powerful in the aspect of maintaining cultural continuity of urban forms.

The typomorphological approach, including the interrelation of the seven elements (scales of study), morphological regions, types, typological processes (time phases) and design suggestions are outlined in Table 12.1 in relation to Nanjing, but can be applied to other Chinese cities in the future.

Elements	Morphological regions	Synchronic types phase 1	phase 2	phase 3 …	Typological process phase 1 phase 2 phase 3	Design suggestions
General plan	Region A: Walled area (old area); Region B: new developments	Type A …	Type A' …	Type A'' …	→	Follow the type A''; others
Silhouettes	Entire city; small scaled silhouettes	Type A …	Type B …	Type B' or C …	‖ ‖ ‖ or →	Follow type B' or pay attention to the visual quality; others
Street networks	Region A, B, C…according to the types of street networks	Type A; Type B; Type C; …	Type A'; Type B'; Type D; …	Type A''; Type E; Type D' …	→ → ‖ ‖ →	Follow type A'' in Region A; Follow type D' in Region C; Respond to type E in Region B; others
streets	The same as that of street networks	Type a; Type b; Type c;	Type a'; Type b'; Type d	Type a''; Type e; Type d'	The same as that of street networks	Follow type a'' in Region A; Respond to type e in Region B; Follow type d' in Region C; others
Urban blocks	Region A, B, C… according to the block types	Type A; Type B; Type C; …	Type A'; Type B'; Type D; …	Type A''; Type E; Type D' …	→ → ‖ ‖ →	Follow type A'' in Region A; Respond to type E in Region B; Follow type D' in Region C; others
plots	The same as that of blocks	Type a; Type b; Type c;	Type a'; Type b'; Type d	Type a''; Type e; Type d'	The same as that of blocks	Follow type a'' in Region A; Respond to type e in Region B; Follow type d' in Region C; others
Public spaces	Individuals, not necessarily in certain regions	Type A Type B …	Type C Type D …	Type E Type D' …	‖ ‖ ‖ or →	Follow the type D or focus on spatial qualities;
Public buildings	Individuals, not necessarily in certain regions	Type A Type B …	Type A' Type C …	Type A'' Type D …	→ ‖ ‖ ‖	Follow the type A''; Respond to type D
Houses	Region A, B, C…according to house types	Type A; Type B; Type C; …	Type A'; Type B'; Type D; …	Type A''; Type E; Type F; …	→ → ‖ ‖ ‖ ‖	Follow type A'' in Region A; Respond to type E in Region B; Respond to type F in Region C; others

Table 12.1 The typomorphological approach and the method of generating design suggestions (by the author). '‖' indicates the end of a typological process, and '—>' indicates the continuity of a typological process

12.3.6 Contributions to the methodology

Apart from the contributions to the study of Chinese urban morphology (12.1) and the urban design in Nanjing (12.2), this research also contributes to the development of typomorphology as a methodology, which can be summarised as four points.

Firstly, the research has integrated typology and morphology theories, defined and tested the typomorphology theory within a real Chinese context. As shown in Chapter 2, a widely acknowledged definition of typomorphology is yet absent. Typomorphology is a form-based theory that employs the terms and methods from both typology and morphology theories, and can be of benefit to urban study, urban planning, designing and landscape management. The theory shares the fundaments of both typology and morphology: the continuity of history, urban forms as organisms and morphogenesis. Terms and methods applied in this research include plan analysis, morphological regions, synchronic types of urban elements and typological processes.

Secondly, this research has applied the results of typomorphological analysis into design suggestions for a particular context. Despite scholars in the Italian School, the British School and the French School claimed that the theory is able to benefit design (Caniggia, Cataldi, Castex...) and landscape management (Conzen, Whitehand, Samuel...), they offered limited suggestions on how to do so as shown in Conzen's research of Alnwick, Newcastle and Judlow, Caniggia's analysis of Venice, Castex's examination of Versailles, Whitehand's study of Glasgow and Pingyao (Chapter 2). Neo-rationalists such as Durand and Rossi employed the theory of typology to design, but merely at the building scale (Chapter 2).

Thirdly, the research in this thesis has dealt with urban plans as well as urban images in three dimensions. For urban morphologists, urban plans are the most fruitful objects of study in urban morphology (Whitehand and Gu, 2007). For instance, their definition of morphological regions is based merely upon plan types, building types and land-use patterns (Chapter 2). Caniggia's research normally considers urban tissues (streets), lots and buildings (Chapter 2). The study in this thesis has covered

more urban elements comprehensively: plan types, silhouette types (urban images), street network types, street types, block types, plot types, public space types, public building types and house types. Although urban plans play a vital role in this study, the three dimensional exanimation of urban forms has enriched the scope of urban typomorphology, making both analyses and results closer to the reality and more reliable for future design. Previous research in literature did not do so, because scholars did employ the theory of typomorphology to sustain the cultural identity of a particular city, which is largely related to its city images.

Fourthly, the methodology used in this thesis has been outlined clearly for the possible utilisation in other contexts—Chinese cities in particular. This attempt of summarising the methodology makes the typomorphological approach a handy tool for other researchers and easily applicable. As reviewed in Chapter 2, Muratori, Caniggia and Canzen proposed many terms and concepts in typology and morphology, and their followers developed and tested such terms and concepts through individual contributions (such as Whitehand). However, there is no clearly outlined and presented methodological framework in literature for other researchers or designers to follow easily. This research outlines five steps of a typomorphological study. Table 12.1 clearly shows how to define types and typological processes of urban elements in morphological regions and over different periods, and how they could benefit design.

12.3.7 An application of the typomorphological approach in Suzhou

In order to ascertain whether it is possible to use the typomorphological approach in other Chinese cities, aside from the selected case of Nanjing, the research also attempts to apply the above outlined methodology to Suzhou, one of the Cultural and Historical Cities on the eastern coast of China. The city is also facing challenges of modernisation and globalisation, and the old city area of Suzhou fulfils the criteria for case selection of this research.

Suzhou is located in the south alluvial plain of Yangtze River, southeast of Jiangsu Province, east-central China, with 1,650 square kilometres urban land area. The surrounding area of the city was once the most fertile land of the country. There are

numerous rivers throughout the region and the currently most developed Chinese city—Shanghai, sits to its east. Suzhou has been lauded for centuries by Chinese and foreigners as 'a true, revelatory symbol of Chinese society and culture', and its material transformation illustrates the social, intellectual and cultural relations typical of the traditional and modern civilization of China (Carroll, 2006, p7).

The urban development of Suzhou can be divided into three periods following the most unstable changes the city underwent throughout its history. The city was founded as the capital of the state of the Wu Kingdom in 514 B.C, while it flourished during the Northern Song Dynasty (960-1126), when the city was initially commercialised and its basic morphological configuration was established. Through the late Qing Dynasty (1850s) and the Republic of China era (1911-1948), the city experienced modernisation and absorbed external influences. During the People's Republic of China era (1949-present), Suzhou's urban form changed dramatically because of the national-wide industrialisation, urbanisation and globalisation.

Since the study of Suzhou is a demonstration of the applicability of the typomorphological approach, not all its urban elements but the street networks, canal networks, streets and canals; urban blocks & plots have been focused. The detailed analysis of types and typological processes of street networks and canal networks can be found in Appendix 2.1, and the examination of blocks and plots in Appendix 2.2. The results of analysis are summarised briefly as following.

The typological process of the street network is very clear in Suzhou, because the grid pattern has been steady over thousands of years, and has influenced the later development of the inner city area as seen from its pattern of street network. The northeast and south parts of the city have also been divided into grids. The typological process of the canal network is less obvious due to its demolishment in the early period of P.R China. Furthermore, there are five types of street-canal interrelations, which have survived over time (Appendix 2.1). These five interrelations can be applied to contemporary development of streets to create distinctive street images, for instance, two parallel streets with a canal in-between,

each of which accommodates traffics from one direction. The traditional type of streets and canals has a width-height ratio between 1:2 and 1:1. It can be achieved in modern streets by dividing the streets into several parts by canals. The 'dual chessboard pattern' of street networks and canal networks are vital for the identity of Suzhou, and should be sustained.

For urban blocks and plots, three block types and three plot types (including plots arrangement and buildings arrangement) have been revealed (Appendix 2.2). The typological transformation of block types is very slow, while the transformation of plot types is faster in Suzhou. Plots coincide with the type 1 of blocks, which contain important public buildings. Plots in the type 2 of blocks from the first stage were split up in length and maintained their widths in the second stage. Shapes of the plots were more or less rectangular, and plots were arranged as orderly as those of the first stage. In the type 3 of blocks, plots arranged along the perimeters were smaller than the plots in the centre to allow buildings to be directly accessible from the streets. These types and typological processes are useful for the city's identity. Designers should follow them by using existing or previous traditional streets, lanes or alleys. A common block should be between 70 and 100 meters deep and 300 meters wide. A common plot should be 70 meters deep and around 20 meters wide, in which a pair of buildings can attach to each other with a mutual wall. Building fabrics should have a clear north-south orientation.

Together with the case study of Nanjing, the brief examination of two urban elements of Suzhou using typomorphology proves that the approach has great potential in China and should be further employed by scholars and designers in more Chinese cities to deal with the current identity crisis.

12.4 Further research

It is crucial that the Chinese urban tradition is considered and respected in the current urban development. The current practices of urban planning, design, renovation and conservation in China sometimes have resulted in sensitive and rational design, but in many cases, degenerated into a banal opportunism. The most recent 2008 Beijing

Olympics has seen the conflict between internationalisation of the city image and the conservation of its local tradition, and the search for a balance within this conflict. On the one hand, Beijing intends to show the world that it is capable of hosting one of the biggest events in the world with new high-tech sport venues, theme parks, green environment and advanced city infrastructures, especially the transportation system (Haugen, 2003, Broudehoux, 2007). Thus several construction projects have been carried out at an unprecedented scale to make Beijing an international city (the national stadium, the national swimming stadium, the national theatre, CCTV headquarter and etc). On the other hand, the city is proud of its profound ancient history and is willing to showcase its cultural identity as a symbol of Chinese unity. Thus the Olympic Village have been located to the north of the city away from the historical centre, to reflect planners' hope to push development outward and develop a viable 'satellite town' (Ong, 2004, p45). Although the question of whether Beijing has achieved a balance between globalisation and conservation is still under debate, the traditional national identity presented by the city image is still widely acknowledged to be essential for the city's future. The research in this thesis brings a powerful theory into China and shows a possible way of carrying out the typomorphological study in other cities and benefits urban practices.

A problem of the research project in this thesis is that it is based upon the author's field survey, photographs, empirical sketches and drawings, since detailed historical maps of urban forms are relatively limited in China (Chapter 1). The current presence of old urban forms in historical regions is considered as the 'historical type'. Although such types are formed in the historical period, they have inevitably experienced changes, thus they are not accurately 'historical'. In the analysis of the case study city, types of urban forms from each historical period are selected from different morphological regions, making the comparison of synchronic types in one place not always possible, which otherwise is the ideal procedure of the typomorphological analysis. However, the examination of synchronic types in different morphological regions, established over different periods, gives an idea of how urban forms have transformed in a city. The limitation of this research suggests the need to gather more data in the future.

Therefore, accurate historical information of urban forms should be available, such as historical maps, plans, literature and photos. This needs intensive field survey, archaeological investigation, and a wide range of literature research, which calls for contributions from scholars in several disciplines and from the local authorities. Furthermore, it suggests that urban design should gain a legal position in the current urban planning system to function appropriately and guide future urban development.

The design suggestions in this thesis mainly focus on urban design and urban elements at intermediate scales such as the block scale. Attention to forms at building scale and even smaller scales is not sufficient in this thesis. Building forms, as the well-focused and studied elements in literature, are very important for urban identity. Despite the typomorphological approach has been largely applied to architectural study and design in the western world, its utilisation and impact on Chinese architectural design is not yet commonly practiced. Together with urban design practices, this approach should be fully developed at a wide range of scales in the future.

Furthermore, the proposed methodology leaves space for further improvements. The typomorphological approach developed in this thesis involves some important terms and concepts in both typology and morphology, but not all of them. For instance, there are several important concepts in urban morphology not yet defined in this research, such as 'fringe belt', 'burgage cycle', 'morphological frame' and 'plot redevelopment cycle', since they have little relation to urban design. Along with the future development of typology and morphology by numerous scholars around the world, the approach of typomorphology should be improved to be handier and more comprehensive in the future.

In the current research, the typomorphological approach mainly focuses on cultural aspects of urban development. A truly sustainable development of the city should involve all other aspects. In order to exhaustively assist urban design, other design approaches, such as the responsive environmental approach, regionalists' approach,

empiricists' approach, are likely to be involved and tested in urban design projects in the Chinese context, **together** with the typomorphological approach. Only an integrated design approach could be able to solve problems and facilitate the cultural, socio-economical and environmental sustainable development of Chinese cities.

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APPENDICES

APPENDIX 1: CHRONOLOGY OF PERIODS AND MAJOR EVENTS RELATED TO THE URBAN DEVELOPMENT OF NANJING

Year	Period	Major events
	Stone Age	Peking Man
4000 BC		Banpo
2500-2140 BC		Yangshao
2100-1600 BC		Xia
	Slavery	
1600-1066 BC		Yin Shang
	Slavery; Bronze Age	
1066-771 BC		Western Zhou; Daoism;
	Slavery	
770-256 BC		Eastern Zhou
770-476 BC		Chun Qiu (Spring-Autumn) Confucianism (552 BC-)
475-221 BC		Zhan Guo (Warring States);
		▸ The emperor of the Yue State (473-334 BC) built the city—'Yue' in the area of Nanjing;
221-206 BC	Qin Dynasty; Feudal Period started	Qin Dynasty; Qin united the other six warring states;
206-23 AD	Han Dynasty	West Han
25-220 AD		East Han
220-280 AD	San Guo	San Guo (Three Kingdoms); ▸ Wu (one of the kingdoms) built the city—'Jianye' in the area of Nanjing;
265-316		Western Jin
317-420		Eastern Jin; ▸ The emperor built the city—'Jiankang' in the area of Nanjing;
304-439		Sixteen Kingdoms
420-479	Southern Dynasties	Northern Dynasties: Song; North Wei (386-534)
479-502		Qi; East Wei (534-550)
502-557		Liang; North Qi (550-577)
557-589		Chen; West Wei (535-557); North Zhou (557-581)
		▸ 'Jiankang', the city in the area of Nanjing, was their capitals of the Southern Dynasties;
581-618	Sui Dynasty	▸ 'Jiankang' was demolished;

618-907	Tang Dynasty	Tang Dynasty
907-979	Wudai Shiguo	Five Dynasties and Ten Kingdoms ▸ South Tang (937-975) (one of the ten kingdoms), 'Jiangning' was built as the capital in the area of Nanjing;
960-1127	Song Dynasty	Liao, North Song Liao (916-1125) West Xia, South Song West Xia (1032-1227 Jin Jin (1115-1234)
1127-1279		
1260-1368	Yuan Dynasty	Yuan Dynasty
1368-1644	Ming Dynasty	Ming Dynasty; ▸ The city wall was built in 1366-69; ▸ The emperor founded the capital 'Yingtian' in the area of Nanjing; ▸ The emperor moved the capita to Beijing in 1420;
1644-1911	Qing Dynasty	Qing Dynasty;
	Taiping Tianguo	Taiping Tianguo Kingdom (1853-1864); ▸ Nanjing was named as 'Tianjing' as the capital.
1912-49	Republic of China	Republic of China; ▸ Sun Zhongshan founded Nanjing as the temporal capital of the country in 1912; ▸ Nanjing became the formal capital of the nation in 1927; ▸ Shoudu Jihua was launched in 1929; ▸ Nanjing was abandoned because of the anti-Japanese war in 1937;
1949--	PRC; Planned economy	RPC founded (Liberation)
1953-57		The first five-year plan
1958-60		Great Leap Forward
1961-2		Failure of Great Leap Forward, years of calamities.
1963-5		Economic Readjustment
1966-76		Cultural Revolution and the third and fourth five-year plans.
1978-9	Market-orientated economy	Open Door Policy or economic revolution was launched by Deng Xiaoping
1980-		Economic reorientation and restructuring; ▸ Deepening house revolution and improving the mortgage system for housing purchase (1989)

APPENDIX 2: THE TYPOMORPHOLOGICAL STUDY OF SUZHOU, CHINA

Introduction of Suzhou

Suzhou is located in the south alluvial plain of Yangtze River, southeast of Jiangsu Province, east-central China, with 1,650 square kilometres urban land area. The surrounding area of the city was once the most fertile land in history. There are numerous streams throughout the region, and the most developed Chinese city currently that is Shanghai, is to its east. Suzhou has been lauded for centuries by Chinese and foreigners as 'a true, revelatory symbol of Chinese society and culture', and its material transformation that illustrates the social, intellectual and cultural relations typical of the traditional and modern civilization of China (Carroll, 2006, p7). Its central location in the east-coast China gives the city vital roles as a trading centre and information hub both in ancient and contemporary time (Figure 1). Historically, the river networks throughout the city provided convenient transportation towards the outside world when overland transport was not convenient.

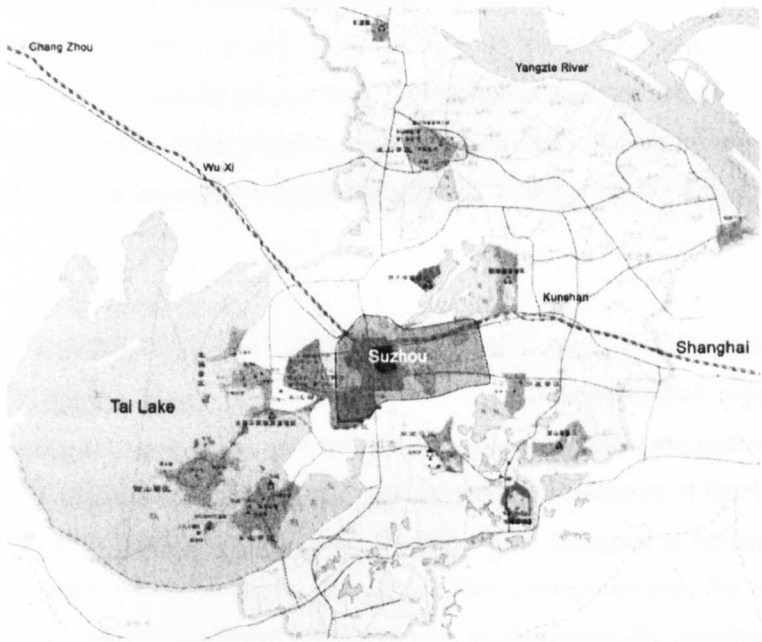


Figure 1 The location and typography of Suzhou (adapted by the author according to the regional map of the city from the City Planning Bureau of Suzhou, 2007)

Proven by the domestic archaeology, primitive human activities in this area can be traced back to six or seven thousand years before, when people were growing rice, working with textiles and making jade products (Chen, 2006, p23). The city of Suzhou was founded as the

capital of the state of Wu in 514 B.C. in the Zhou Dynasty (c. 11th Century—221 B.C.). The city was constructed as an expression of the emperor's ambition for the hegemonic power over other states (Wu, 2003, Chen, 2002, Pang, 2006, Xu, 2000). Fengshui and Lizhi, which came from the Chinese cosmology and philosophy—Confucianism, were the major influences on capital city planning since the ancient time. The book 'Kaogong Ji' (Artificers' Record' 470s B.C.) demonstrated detailed planning principles of capital cities. The plan of Suzhou was affected by these principles. According to ancient literature, the original city (514 B.C.) was rectangle and had three-fold city walls defining the territory, which were the inner city wall, the main city wall, and the outer city wall. There were eight city gates for both land transport and water transport along the main city wall. The positions of these gates represented the symbolic meaning of hegemony according to the Fengshui theory (Zhao, 1986, p25). The ratio of the perimeter of the inner city wall and the perimeter of the main city walls was 1:3, and the perimeter of the main city wall was about 15202.35 meters or 19319 meters (Zhao, 1986, p55).

After the state of Wu was conquered by the state of Yue in 473 B.C., the city lost its central status as a capital city, but remained as a fiefdom for thousands of years. In the Qing, Han Dynasties and Six Dynasties (221 B.C.—581), it became the trading centre within the south China area. During this period, many religious buildings such as Buddhist pagodas and Daoist temples were built, while people's attention to military moved to knowledge, poem, philosophy and etc, and some private gardens appeared along with this change (Chen, 2006, p29).

During the Sui Dynasty, the Grant Canal was built and brought Suzhou even better water transportation. In the Tang Dynasty, Suzhou was well-developed because of the government's tolerant tax policies. The city's agriculture, industry and commerce were all under developing, which could be seen through the initial breakdown of the Lifang system. In the Song and Yuan Dynasties (960-1368), the population increased to be two times of that in the Tang Dynasty. Many people in the north China moved towards the south bringing skilled labours, as a result, handicraft industries were unprecedentedly developed during that time. Suzhou became one of the most prosperous cities in the country (Xiang, 1999, p35).

The 'Ping Jiang Map' (1229) was the oldest available map of the study of Suzhou's urban forms, which was produced in the Song Dynasty and engraved on a stone (Figure 2). This historical map was not in accurate scale (Jin and Yan, 1986), however, the basic

morphological features can be observed clearly. The city was rectangular, symmetrical along a central north-south oriented axis, 4450 meters long in the south-north direction and 3400 meters wide in the east-west direction, and the perimeter was 15700 meters. Moreover, there were only five gates in use, and not symmetrical. These features have unchanged since then, despite built up areas exceeded the walled area in the Qing Dynasty (Figure 3).

From the late Qing Dynasty to the Republic China era, not only Suzhou, but also other cities in the country received influences from the Opium War and civic wars, national industry development, new educational system and modern lifestyles. For instance, the first modern industry of mechanical manufacture was found in Suzhou in 1863, and two textile factories were built in 1895 (Chen, 2006, p87). In the Republic of China era, the municipal government intended to facilitate the city's development by launching the 'Suzhou gongwu jihua (City Planning Scheme, 1927)', but unfortunately, only a small part of the scheme[1] had been implemented due to the anti-Japanese war in 1937. However, some large department stores and modern buildings were constructed in the city.

After the Communist Party founded the P.R.China, Suzhou experienced some radical political movements, for instance, the 'Great-leap Forward Campaign' (1958-60), and the 'Cultural Revolution' (1966-76), which had fairly negative impact on the city's development. For instance, heavy industries were unrealistically promoted over the country. A municipal policy launched in 1958 advocated to demolish the city wall and gates, and to burn the bricks to make steel, build streets and industrial buildings. As a result, only Pan Gate, Xu Gate, Jin Gate and small fragmental city walls remained. Moreover, during 1959, a master plan of Suzhou was produced by the government, which indicated the main characters of the city should be preserved which were the historic appearance and traditional handcraft industries. But this master plan was aborted in 1960 as the central government decided to have 'no urban planning in the country for three years', which was acknowledged to be a misunderstanding of planning in later years.

[1] The scheme indicated that the future development area should be the west part outside the city wall, thus it divided the city into three regions which would be developed one by one in three stages. Only the first stage of the scheme had been applied, thus only some streets and canals had been renewed, and some parks had been constructed.

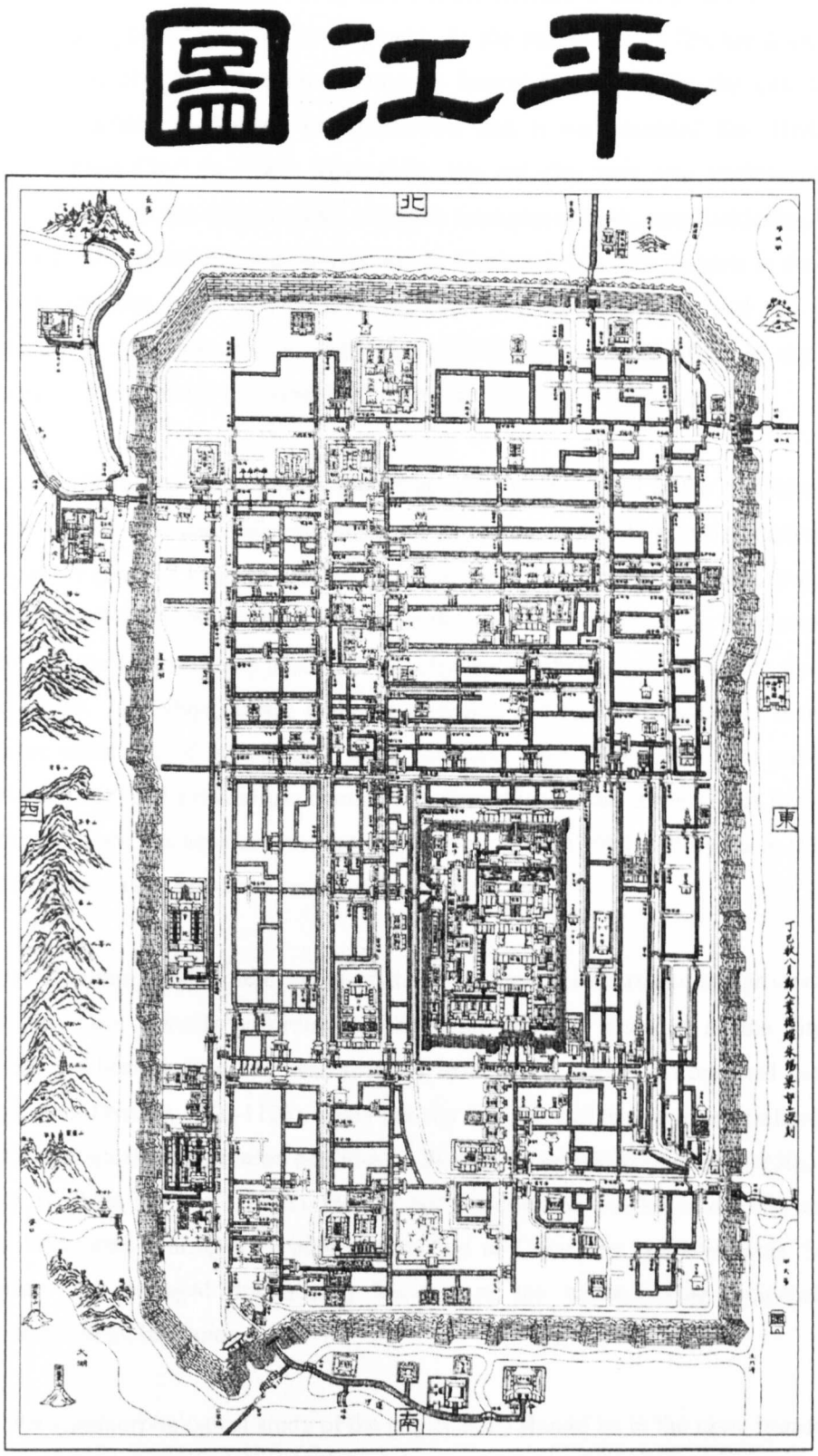


Figure 2 The oldest city map of Suzhou: the Pingjiang Map, 1229, (Wu, 1985, p94)

Until 1978 when the Open-door Policy and market-oriented economy was launched in the country, the city started massive development. At the end of the 1970s, the population of Suzhou reached 600,000. Tourism became an important industry in the city since the historical appearance of Suzhou was preserved, and it was awarded the 'Historic and Cultural Heritage City' in 1982. Meanwhile, the old city area also underwent careful regeneration, such as the improvement of public transport system, street widening, housing renewals and other infrastructural renovations. Furthermore, two new districts to the east and west of the old city were developed to accommodate expansions. Several city planning projects, such as the government's master plan of 1986, mater plan of 1996, and regeneration projects plans, were carried out from 1992 to the present (www. Szghj.gov).

Before the 1986 master plan, the city's built-up areas were limited in the middle and north part of the walled area, and some were near the city moats and main external roads as a fish-bone pattern (Figure 4). In the latter half of 1980s, the building fabric extended towards west and south. By 1999, the whole New Region on the west of the old city has been constructed. Furthermore, the south corners inside the old city had not been built for a long time before the late 1990s. Nowadays, along with the widening project of the Renmin road, which reaches the south end of the old city, these two parts have been altered into public parks (southwest corner) and a mixed-use commercial district (southeast corner) (Hua et al., 2006). The Industrial Park has been constructed in a short time from 1992 to the present (Figure 5). Its fabric continues the east-west central axis of the old city.

Through the above general description of the development of Suzhou, the process can be divided into three periods according to the most dramatic changes of the city forms throughout the history. The city was founded in 514 B.C, while it flourished during the Northern Song Dynasty (960-1126), when the city initially had been commercialised and its basic morphological configuration established. During the late Qing Dynasty (1850s) and the Republic of China era (1911-1948), the city had experienced modernisation and absorbing external influences. During the People's Republic of China era (1949-present), Suzhou's urban form has changed dramatically because of the national-wide industrialisation, urbanisation and globalisation.

Ideally, the typomorphological study of the city Suzhou should be in the same framework as demonstrated in the examination of Nanjing, which includes the seven city elements in a hierarchy of scales: the general plan, the urban silhouette, the streets and street-networks, the

urban blocks, the urban public spaces, the public buildings and the houses. However, due to the complement role of this case study, two major elements of Suzhou will be examined to show the adaptability of Typomorphology. The street network, canal networks, streets and canal will be analysed in Appendix 2.1, while the urban blocks and plots will be analysed in Appendix 2.2. These two elements are essential for the city's identity at the district scale, and for the urban design of the city, since urban design mainly focuses on such scale.

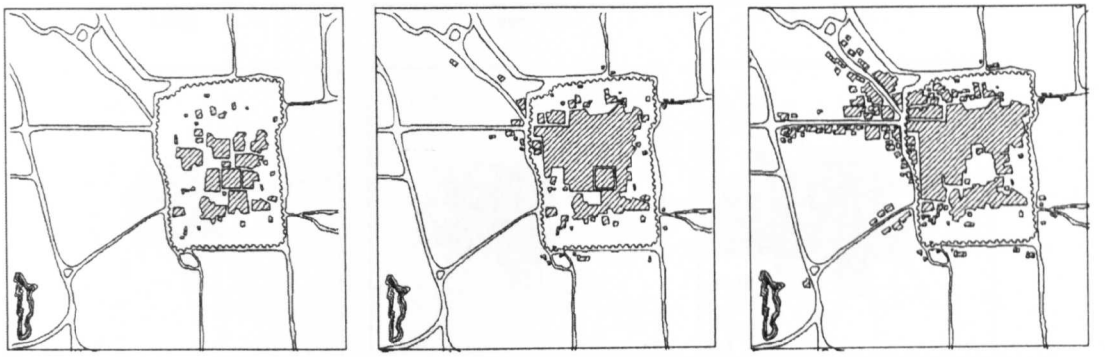


Figure 3 The Transformation of the built-up areas in the region of Suzhou from ancient time to the Qing Dynasty (Chen, 2006, p57)

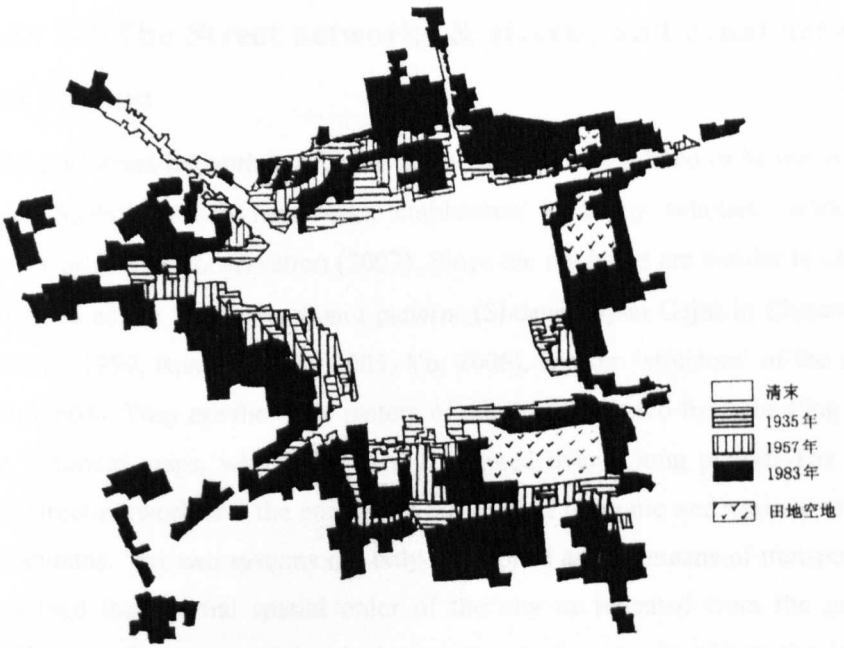


Figure 4 The transformation of built -up areas in the region of Suzhou from the late Qing Dynasty to 1983 (Ke, 1994, p129)

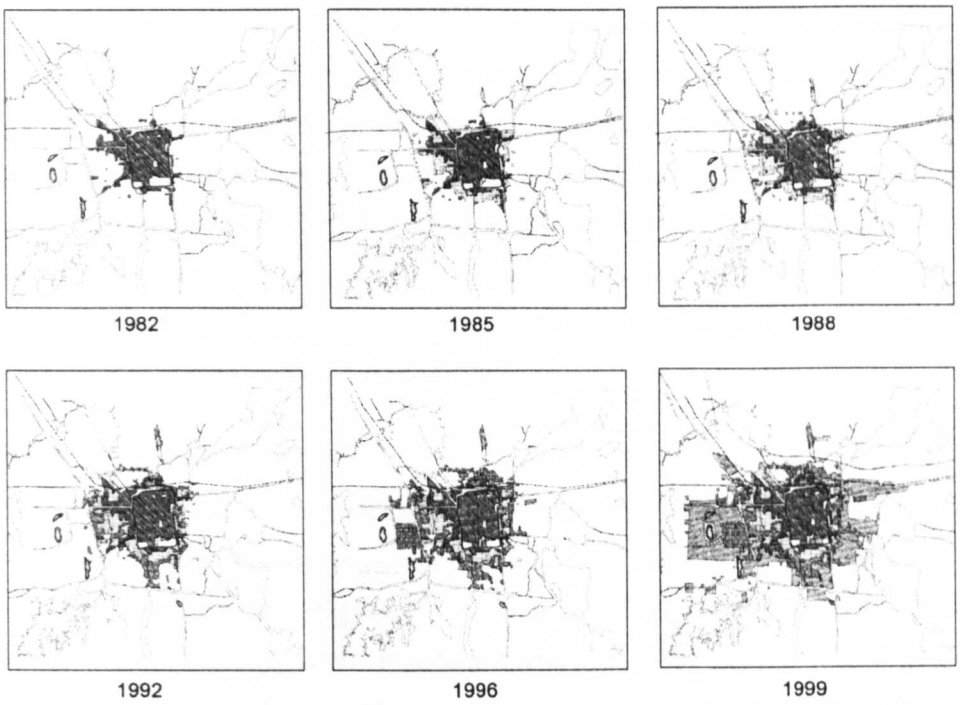


Figure 5 The transformation of built-up areas in the region of Suzhou from the 1980s to 1999 (Chen, 2006, p176-7)

Appendix 2.1 The Street networks & streets, and canal networks & canals of Suzhou

The parallel grid street-network and the canal-network are considered to be the most distinct elements of Suzhou, which have been emphasised in many scholars' works and the government's by-law of conservation (2003). Since the networks are similar to chessboards, they are defined as the 'dual chessboard pattern' (Shuang Qipan Geju) in Chinese literature (Ruan and Liu, 1999, Ruan and Liu, 2005, Yu, 2006), and the 'structure' of the urban form (Chen, 2006, p64). They are the basic pattern of the city abstracted from the Ping Jiang Map and other historical maps, which had hardly changed over a long period. The interaction among the street-network and the canal-network created dramatic and various urban spaces for the inhabitants. The two systems not only functioned as two means of transportation, but also determined the internal spatial order of the city as revealed from the general plan analysis. The transformation of the dual networks fundamentally affects the large scaled urban forms, while every single street and canal influences the daily urban spaces.

The historical period (--1850s)

As mentioned before, the topography of Suzhou area benefited agriculture boom and military protection since the ChunQiu period (770-476 BC). The natural water system gave the city a

canalization foundation. When the city firstly planned according to the planning concept recorded in the 'Kao Gong Ji' (470s B.C.), a crossing road network was formed to connect the four city gates from south to north and west to east, and one canal paralleled to the north-south oriented one. The main road was about 40 meters wide, while the canal was 36 meters wide (Chinese ancient book 'Yue Jue Shu'). It was difficult to address specific streets and canals due to the lack of ancient resources. It was widely acknowledged that a complete grid street-network and canal-network were not shaped until the Tang Dynasty (Chen, 2003b, p30).

Street networks and canal networks

The Ping Jiang Map was the earliest existing map of the city carved on a stone dated in 1229 in the Northern Song Dynasty, which provided a comprehensive view of the early street-network and canal network (Figure 6, 7). Even though the map was not scientifically produced, it still presented some important characters of the networks. The grid street-network covering the whole city had more than 12 east-west oriented streets in the northern city, 2 east-west oriented streets in the southern city, 4 south-north oriented streets in the western city, and 3 south-north oriented streets in the eastern city. The street-network presented different patterns in different locations—the north part, south part and middle part. It was clear that the street-network in the north part was much denser than that in the south part. It divided the north part of the city into rectangular blocks with sharp ratio of north-south dimension to east-west dimension, and a typical block was 60 to 100 meters deep and 300 to 500 meters wide. In the south part of the city, the density of street-network was much looser. A great amount of cul-de-sacs were built to access a few single buildings. The street-network near the Inner City was different from both the northern part and the southern part. Urban lands between the networks were narrow and deep. There was a street on the south of the inner city coinciding with the axis, along which most of the important official buildings were built. The width of the main street was 3 meters, and lanes were 1 to 2 meters.

As part of the canal-network, the city was surrounded by two moats, which were about 50 to 70 meters wide. Except the moats, almost all the canals were closely related to streets. The total length of the canals was approximate 82 kilometres in the 13th century, which was 78% of the total length of the streets (Chen, 2006, p65). There were four south-north oriented canals through the city, and three long canals crossing the city from east to west. The east-west oriented canals were very dense in the north, and lots of cul-de-sac canals were in the

middle part and the south part. The common size of the canal was 6 to 10 meters, which was wider than the streets.

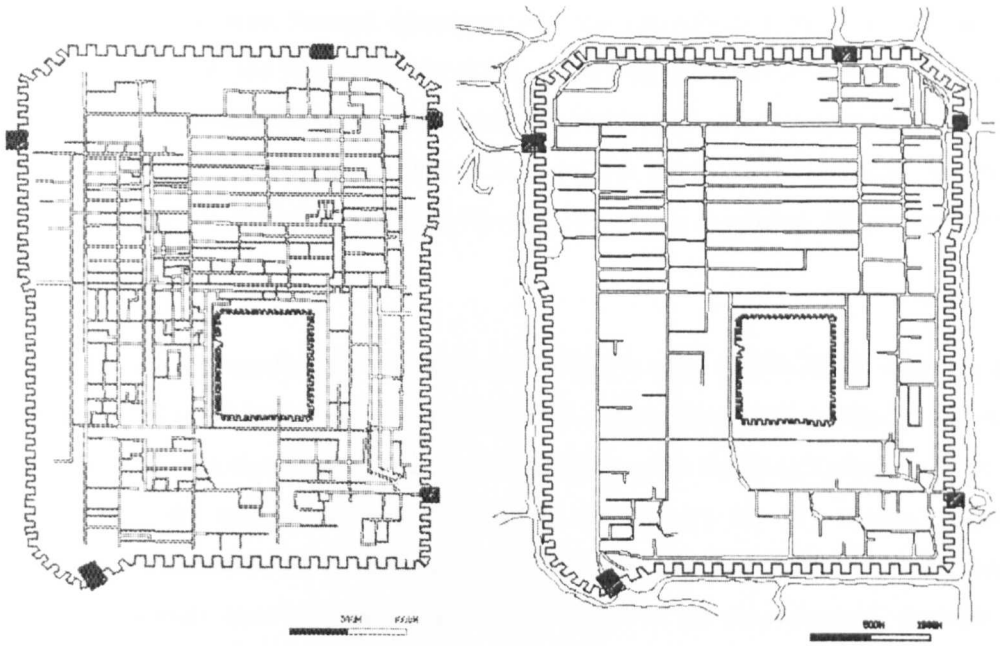


Figure 6 Street-network as recorded in the Ping Jiang Map (left, reproduced by the author)
Figure 7 Canal-network as recorded in the Ping Jiang Map (right, reproduced by the author)

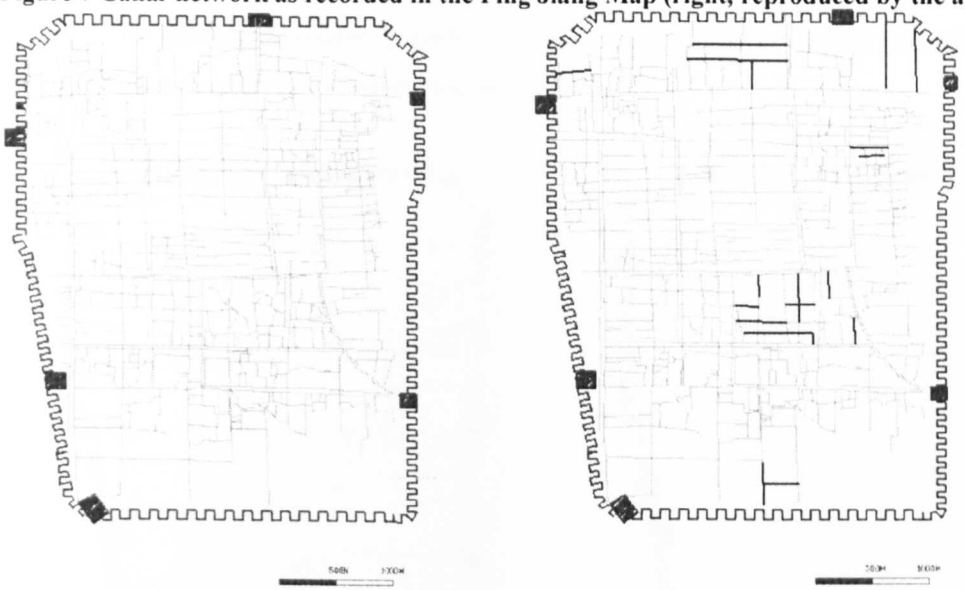


Figure 8 Street-network in the 18th century (left, adapted by the author)
Figure 9 Street-network in the 19th century (right, adapted by the author)

A very similar pattern of the street-networks can be observed in the map of the 18th century (Figure 8) and the map of the 19th century (Figure 9) as that of the Ping Jiang Map. Moreover, the southeast corner of the city remained undeveloped during the entire historical period. By comparing the map from the 18th century with the Ping Jiang Map, two major changes of the

street-network in the 18th century can be found. First, new streets had been built on the previous location of the Inner City in an extremely irregular pattern with three diagonal streets crossing the area. Second, associated with the emergence of the new city gate —Xu Gate, the network in the southwest part of the city had been intensified. From the 18th to 19th century, the street-network in the central part was developed as a more complete grid system than that of five hundred years before. In addition, the city expanded towards northwest to the walled region in the Ming and Qing Dynasty, which did not follow the grid pattern but a fish-bone form.

The canal-network reached its climax in the Ming Dynasty (1368-1644), when its length increased to 87 to 92 kilometres (ancient book 'Wu Zhong Shui Li Quan Shu'). The number of canals decreased significantly from the Ming Dynasty to the Qing Dynasty, which could be seen from the map of 18th and the map of 19th (Figure 10, 11). It was because the increasing population in the Qing Dynasty required more land to build houses. As a result, so many small canals were occupied, and the total length of the canal-network declined to 57 kilometres, even though the Qing government finally had dredged and renovated some of the important canals in the 1790s (Chen, 2003a). In the 19th century, canals in the south part of the city were partly demolished as well. However, the major seven canals that consisted of the basic structure still functioned during this stage.

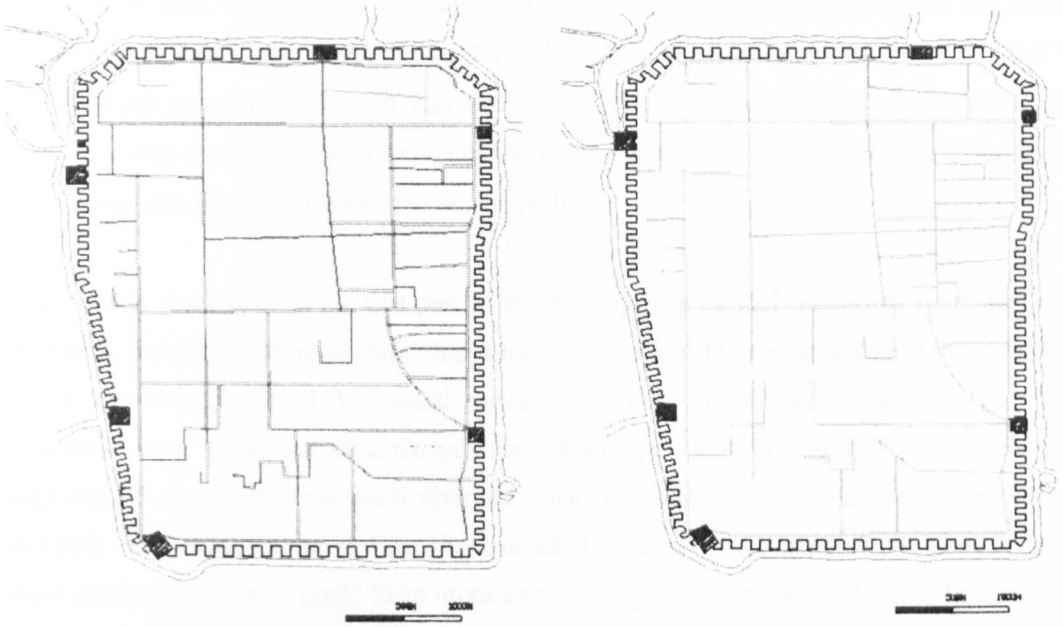


Figure 10 Canal-network in the 18th century (left, adapted by the author)
Figure 11 Canal-network in the 19th century (right, adapted by the author)

The street-network and canal-network of Suzhou in the historical period were stable. The grid pattern had such strong vitality that the area of the previous inner city was rebuilt to follow it. However, the northern city was the most developed area and the area experiencing the most alterations in terms of canal-network in history. The street and canal networks were maintained in the eastern city, and were hardly influenced by the urban transformation in the southern city at this stage.

Streets and Canals

Individual streets and canals were vital to form the characteristic of the city. They shaped diverse daily spaces for the inhabitants by gradually changing their width, degrees of closure and interrelation. It was observed that there were five types of building, canal and street interrelations during this stage (Figure 12). The first type (Type A) was that one canal was in between of two rows of buildings, while the second type (Type B) was one street in between of two rows of buildings. The third type (Type C) was one canal parallel to one street, along which two rows of buildings were posited. The fourth type (Type D) was one canal in between of two parallel streets, and the streets connected to two rows of buildings. The last type (Type E) was one canal connected to a row of buildings on one side, and to open space on the other. The relationships of canals and streets changed over time, so the portions of each of the five types changed in different stages. Furthermore, the five types were not separated. In fact, they usually appeared in different segments of the same street and canal. The portions of each type based on the Ping Jiang Map are illustrated in Figure 13. Type C was the most popular one, which was over half of the total 74.9 kilometres of canals, and Type D ranked the second with 29.8% of the total. Type A and E were not very common in this period, which were 10% and 1% respectively.

Since streets and canals in the east part of the city represented their historical characteristics very well, the examination of individual canals, streets and their relationship will be carried out in this area (Figure 14). Several series of sections in relation to the five types are illustrated. In a residential area named 'Ping Jiang Qu' (area I) (Figure14, 15), there are segments of one main north-south oriented canal, four east-west oriented secondary canals and both outer moat and inner moat, from which 12 sections were taken. It can be seen from these sections, one canal could have more than three types of street-canal interrelations, and type C and D are the majority. Furthermore, the width of the street near the main canal is between 6 meters and 9 meters, and the width of the canal is between 7 and 20 meters. The width of the secondary canal is between 3 meters and 17 meters, with a node where the canal

meets the moat, which is 27 meters. The streets that parallel to the secondary canals are between 3 and 7 meters wide. Therefore, the difference of widths between main canal and secondary canal is not very much, while the difference of width between main streets and secondary streets is comparatively apparent. Therefore, there might be no obvious hierarchy in the canal system in the ancient time, but there was in the street system. In addition, buildings along the streets and canals did not exceed two stories, which created a pleasant linear space with a height-width ratio of 1:1 to 1:2 for people.

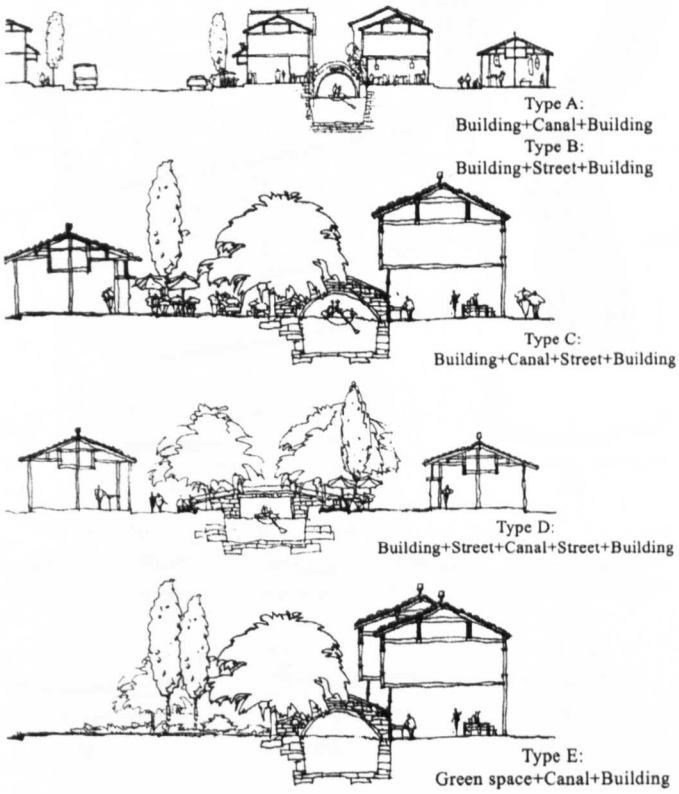


Figure 12 Five types of street-canal interrelations (adapted from Chen, 2006, p82)

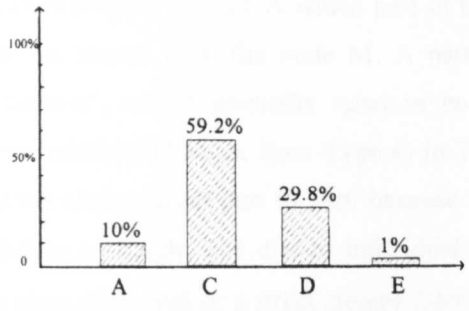


Figure 13 Portions of each type (left, by the author)
Figure 14 Locations of sample areas (right, by the author)

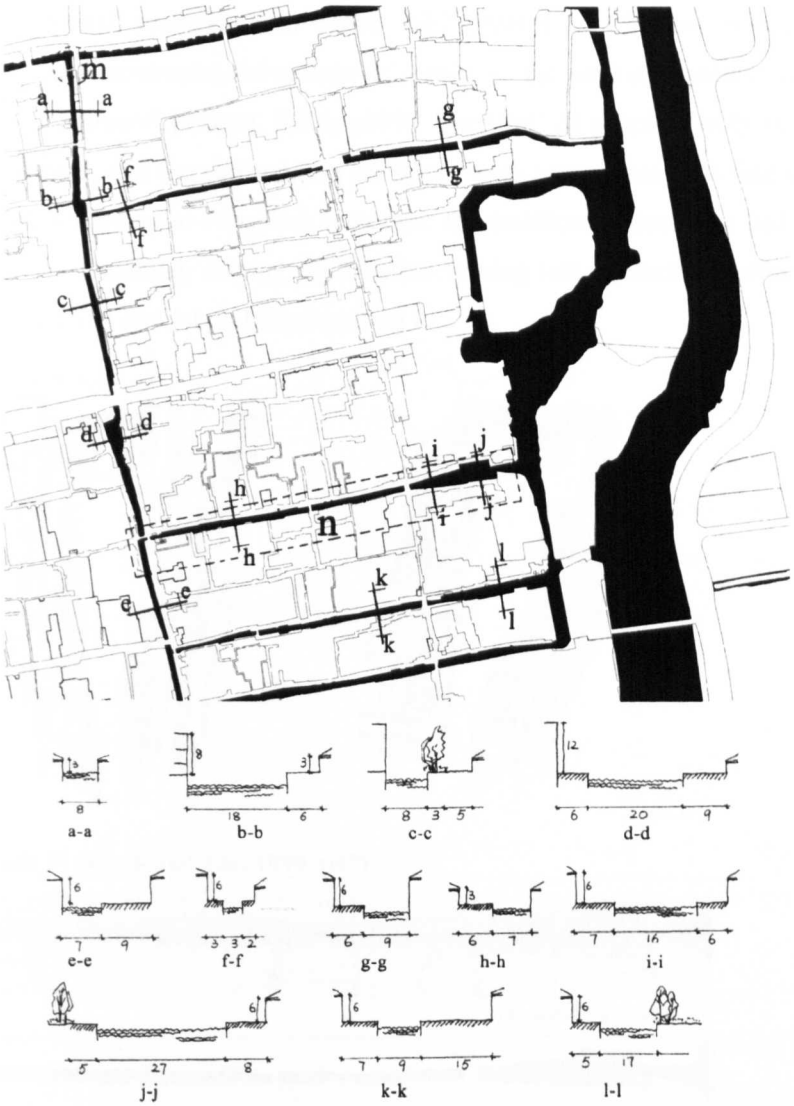


Figure 15 Sections of canals and streets in the area I (by the author)

One node where two canals meet (M) and one combination of a parallel canal and street (N) are selected as examples to demonstrate the detail spatial quality of the traditional setting of canals (Figure 16, 17). A widen part of the canal which is a harbour for boats with accesses to the streets is in the node M. A narrow and sharp segment of the canal connects the 'harbour', and it gradually turns to be the normal width, and the types of canal-street interrelations changes from Type D to Type C. In N, the widths of both the canal and the street change from part to part, because the residential buildings defining the spaces do not follow a straight line due to individual construction over a long period. The changing of widths of a canal or a street creates dramatic and diverse spaces. Bridges were built in every 150 meters to 250 meters, which was the reasonable walking distance.

The dramatic spatial sequence was called 'Shi' (force) in Chinese, which connoted a 'potential force of movement, advantage of position, the striking position in battle, and influence in government' (Zhong, 1986, p199). The 'Shi' of people's daily movement was not straightforward, and the surrounding buildings were not supposed to face each other to avoid bad luck according to Fengshui, therefore, the traditional street type had variations of narrowing before widening, turning right before turning left, ascending before descending, dim before lightening and let go before pulling in.

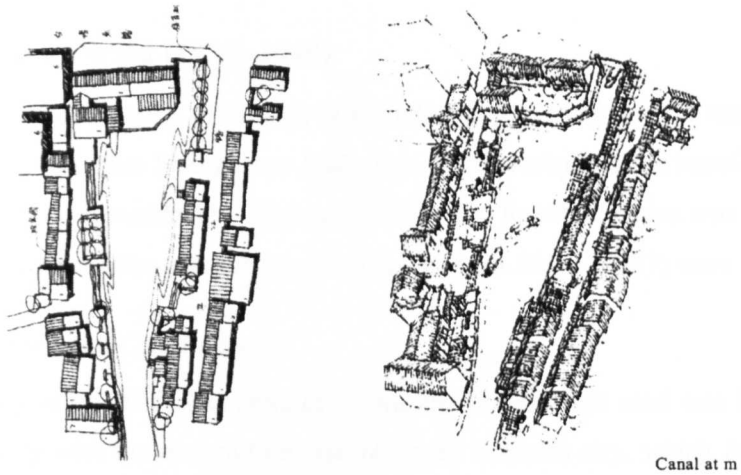


Figure 16 Node M (Ruan and Liu, 1999, p47)

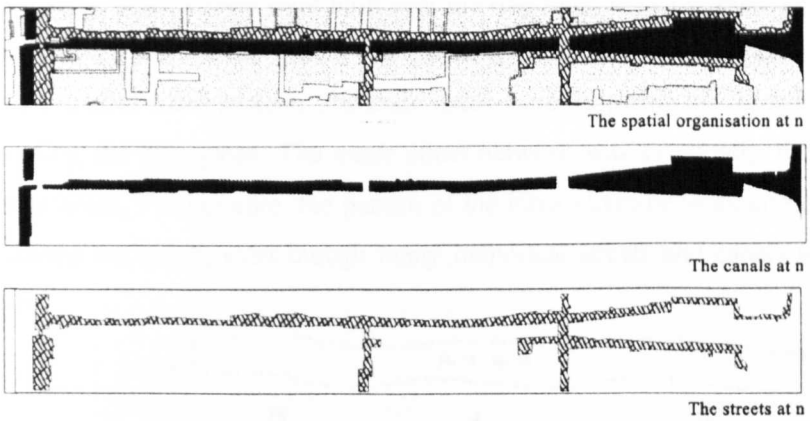


Figure 17 Node N: canal and street (by the author)

In addition, canals were usually on the west of streets in south-north oriented combinations, while canals were on the north of streets in east-west oriented combinations. This pattern helps reducing the temperature during the summer by preventing the reflection of light onto buildings. And the orientation of canal and street networks which is 7.14 degrees east from the north coincides with the wind direction of Suzhou area in the summer in order to enhance natural ventilation in the city. Therefore, the canal system played important role in the eco-environment of Suzhou.

To sum up, the traditional canal-network and street-network were extremely stable, and they brought vitality to the city during the historical period. Furthermore, there were great variations in each linear spatial sequence created by individual canals and streets, which infiltrated into inhabitants' daily transportation, communication and etc. Five types of canal-street interrelations have been found, each of which has specific size range and height-width ratio.

The Modern Period (1850s-1949)

The initial modernisation of Suzhou in the late Qing Dynasty and the emergence of the first railway that was from Shanghai to Suzhou in 1908 accelerated the transformation of streets, canals and their networks at a large scale. After the Republic China was founded in 1912, a series of reconstruction plans in the 'Suzhou Gongwu Jihua' (1927) were implemented.

Street-network and Canal-network

In the early years of the Republic of China, the first modern road was built to connect the southern city with the new railway station in the northern city, which formed an outer half ring paralleling to the moat around the west half of the city (Figure 19, a). The road was 16 meters wide. Some streets were built near the ring road, which shaped a new irregular street-network in the west of the walled city. However, this new network had obvious relationship with the natural water system. The main roads were following the direction of the rivers and connecting the city gates. The outer street-network was eventually linked with the inner street-network. Furthermore, the pattern of the inner street-network and canal-network were not altered too much, even though many individual streets and canals were demolished or rebuilt.

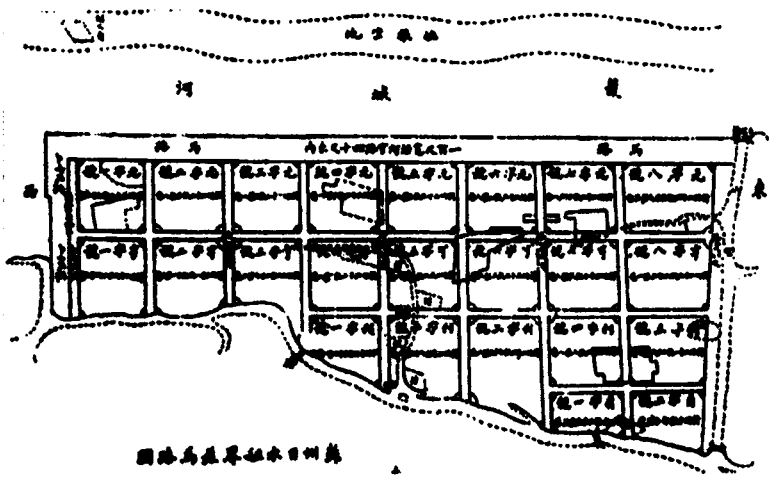


Figure 18 The Japanese colonial district (Editors group, 1995)

Meanwhile, the foreign colonists had built many colonial districts to the south of the city without reference to the existing context. Figure 18 illustrates the actual plan of one of the colonial districts published in a local newspaper, which was in strict grid pattern. The round left-over space in each crossing was designed for vehicular use. The major road along the south moat was 100 'Chi' (about 33 meters), and the inner streets were 40 'Chi' (about 13 meters). Thus the block size was presumably 80 meters by 80 meters, which was much smaller than the land between inner city streets. The plan had not been well implemented due to Japan's failure of the war in the 1930s. There were other colonial districts not far from the Japanese one. The influences from these districts were not striking, but their emergences facilitated connections between these districts and the inner city.

Streets and Canals

Compared to the change of street-network and canal-network of this period, streets and canals were experiencing more apparent changes. Street construction was an important issue in the 'Suzhou gongwu jihua' (SGWJH). In the initial plan of SGWJH, the width of the standard road was approximate 7.3 meters, which was increased to 9 to 13 meters in the 1930s in order to accommodate increasing number of motor vehicles. As a result, some new city gates and new streets were built for easier access between the inner city and outer city, and several original streets were widened as well. For example, Jingde Road was widened in 1927 to connect the Guan Qian Qu with the Chang Gate area. A new gate—'Ping Gate' that led to the railway station was constructed based on the ancient site of Ping Gate, and a new street was built to connect it with the existing Hulong Street (Renmin Road nowadays), which was also widened. The three streets formed a half circular route in the northwest city. Meanwhile, another important circular route in the city was rebuilt from the outer half ring road through the Xu Gate, crossing the Hulong Street, linking the Lindun Road and leading to the Qi Gate. All the streets in the circular were renovated and widened in the 1930s (Figure 19, b, c).

Guan Qian Street was another example of the street-widen project. As a historical commercial centre, Guan Qian area re-flourished in the late 19th century since the historical temple 'Xuanmiao Temple' survived from wars, and the 'Miao Hui' (regular folk market) revived the area after hundreds of years. Associated with the new circular route, convenient connection between the new railway station, the Chang Gate commercial area and the Guan Qian area brought commercial opportunities to this area. As a result, the land value was

increasing dramatically. Thus the economic force facilitated the widening and reconstruction of the Guan Qian Street, where trading activities usually took place. The street was originally 3 meters wide, with two-story mix-used buildings along both sides. The street also accommodated extensions of the ground floor shops to display flags and temporary stalls. In 1930, it was expanded to 9 to 13 meters. Buildings along the street were also rebuilt in modern style or eclectic style, and two or three stories tall (Figure 20). Moreover, banks, cinemas and other entertainments gradually appeared in this area as well. Although the width of the Guan Qian Street has been widened, the width/length ratio which determines the spatial quality of enclosure has not changed too much (from 1:2 to 1:1).

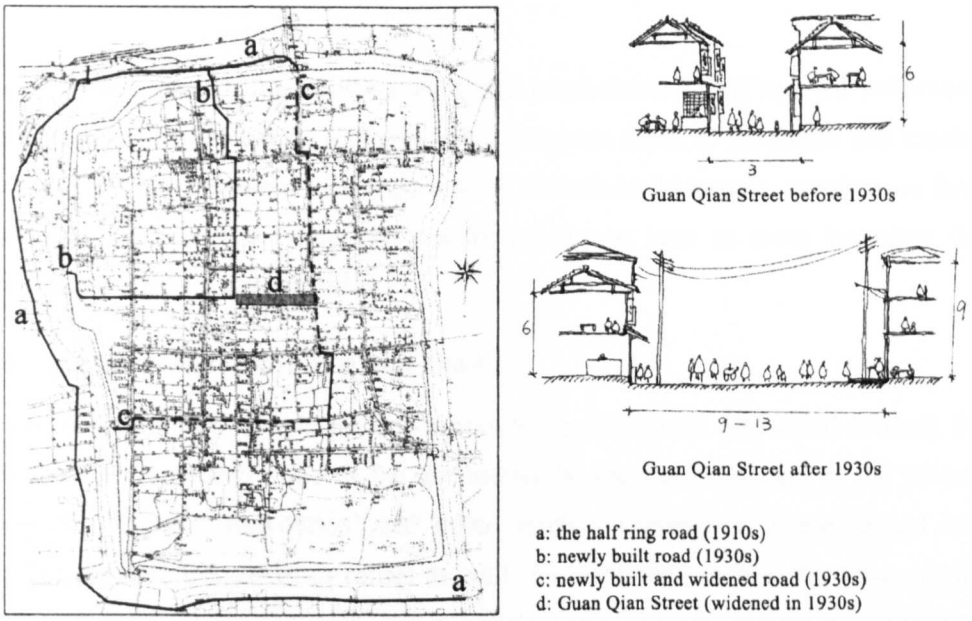


Figure 19 Renewed roads and sections of Guan Qian Street (by the author)

Figure 20 Guan Qian Street after renewal in the 1930s (Chen, 2006, p130)

Even though the canal-network had not been changed too much in this period, the number of canals continuously decreased. The disappeared canals were largely from the north and west part of the city. There were two reasons of the decrease. First of all, the water was polluted due to early industrialisation, increasing population, lack of governance in the war period. Second, the republic government considered that the canal threatened the environment of the whole city. Therefore, the government encouraged people to give up the water transportation, demolish the canals, and widen streets instead. According to the government record, 8 canals had been filled up in the period of the Republic of China, which was 6.7 kilometres in total (Editors group, 1995).

In the modern period, the street-network and canal-network had resisted influences from either foreign culture or early modernisation. However, some of the streets and canals in the economical blooming areas were experiencing alterations. Moreover, canals were facing big challenges since overland inter-city transportation was seen as more important than the traditional over-river transportation.

The Contemporary Period (from 1949)

In the first 25 years of this period, Suzhou's street-network and canal-network had not transformed dramatically due to the government's attention was paid to the 'Great Leap Forward', 'Cultural Revolution' and other political campaigns. These radical activities brought negative influences to canals as well. As mentioned before, the urban planning of 1959 was not implemented well, and in certain years, the government misunderstood that urban planning was unnecessary. Until the late 1970s, Suzhou area started rapid urbanisation and the walled city area was under modernisation. Most significant widening and extension of the streets and canals happened in this stage. In the late 1980s and early 1990s, the government paid attention to the urban conservation and traditional neighbourhood renewal. As a result, the street-network and canal-network were considered to be the distinctive characteristics of the city and to be preserved. Even though the traditional networks are under the pressure of heavy traffics, the solutions are not so radical.

Street-network and Canal-network

The street-network had maintained its historical pattern, but with stronger connection with the outside wall before the 1970s. The grid system was very clear on the north of the Xu Gate, while the south part was still agricultural land. The northeast corner of the walled city

was also undeveloped (Figure 21). The densities of network in the central and eastern city were slightly higher than the west and northern city.

The canal-network changed so dramatically that small canals were almost disappeared, and one of the main canals was demolished. Historically, there were four north-south oriented and three east-west oriented canals. By 1980, the canal structure was changed to 'three north-south oriented and three east-west oriented' pattern. According to the governmental record, the total length of the canals by that time was only 25 kilometres, and over 16 kilometres of canals were filled up during the radical campaigns (Editors group, 1995) (Figure 22).

From the 1980s to the present time, the city's development moved towards the peripheral of the city, therefore, the two networks were preserved even though single streets and canals were renewed gradually.

Figure 21 Street-network in the 1970s (adapted from the 1972 Map of the city by the author)
Figure 22 Canal-network in the 1970s (by the author)

Streets and Canals

After the new P.R. China was founded, several major streets in the old city have been widened gradually, among which the Hulong Street, which is called Remin Street nowadays crossing through the city from north to south, is the most important one (Figure 25, b). As mentioned in the previous paragraph, the north segment of the street was widened from 3 meters to about 7 meters in the period of the Republic of China. After that, it had been

widened part by part several times. It was further extended toward the southern city gate, widened to 30 or 40 meters and paved by bitumen during 1941 to 1979, and the section of the street completely changed. The main vehicular lane was 10 meters wide. Two side vehicular lanes were 6 meters, and two pedestrian lanes were 5 meters wide. The vehicular lanes were separated with the pedestrian lanes by vegetations, which were symmetrical along the main vehicular lane (Figure 23). The layout was very similar to the boulevard system of Nanjing. As can be seen from the image, modern buildings were not completed along the street. By the middle of 1980s, the streetscape was completely modernised, and the buildings along the streets were built in modern style, six or seven stories high. A pagoda located in the middle of the street acts as a landmark to associate the street with historical features of the city.

In 1999, the regeneration project of the Guan Qian area was launched by the government. The project aimed to readjust the land-use structure and street facilities such as lamps and vegetations, to renovate the temple and surrounding buildings, as well as to improve the infrastructure such as car parks and etc (Tan, 2003, p66). The regeneration gave the area new appearance and economic dynamics to be a modern commercial centre. Because of the awareness of the importance of historical conservation at that time, the project kept the basic layout of the Guan Qian Street, which was well defined by the street-facing ground floor shops. The width-height ratio maintained as 1:1. At present, even though there are many large scale department stores appeared in the nearby area, their design have adopted some of the Chinese traditional features. It's noticeable that the street segment was widened to be a square in front of the temple, which becomes an important public space in the city.

Ganjiang Road is another important main street crossing through the city from east to west (Figure 25, a). The reconstruction project of Gangjiang Road was launched in 1992 due to the city's transportation demands. This project became the biggest road project which involved not only the street itself but also the renovation and conservation of the buildings along the road in Suzhou in this period (Chen, 1999, p88). The road was about 7 kilometers long, 50 meters wide, and the project also dealt with 31 bridges and 25 hectares land along the road (Tan and Qi, 1997, p34). Regarding the traditional types of the interrelation between street and canal, the road was designed to be one canal in between of two parallel streets. The canal was 10 meters wide and the each of the street was 20 meters wide. The side streets were divided into motor vehicular lanes and a bicycle lane by trees, and there was a pedestrian lane near the buildings. The canal was carefully covered by grass, sculptures and

bridges, even though the heavy traffic flow negatively decreased public access of the canal (Figure 25, section). Regulations about the height limit and architectural control had been applied to the buildings along the road, which contributed to the restoration of the traditional streetscape.

In the present city, Remin Road, Guan Qian Street and Gan Jiang Street are the most influential streets that represent the contemporary street types in the old city area of Suzhou. They are not very broad compared to streets in other Chinese cities, and the buildings along them are less than 24 meters high and with Chinese features. Therefore, the width-height ratio of these streets is controllable. Even though in the case of Gang Jiang Road, the street is 50 meters wide, it is divided into small parts by canal and trees. The other important feature is that many streets are seeking relation with canals.

Figure 23 Remin Road in the 1970s (Chen, 2006, p133)

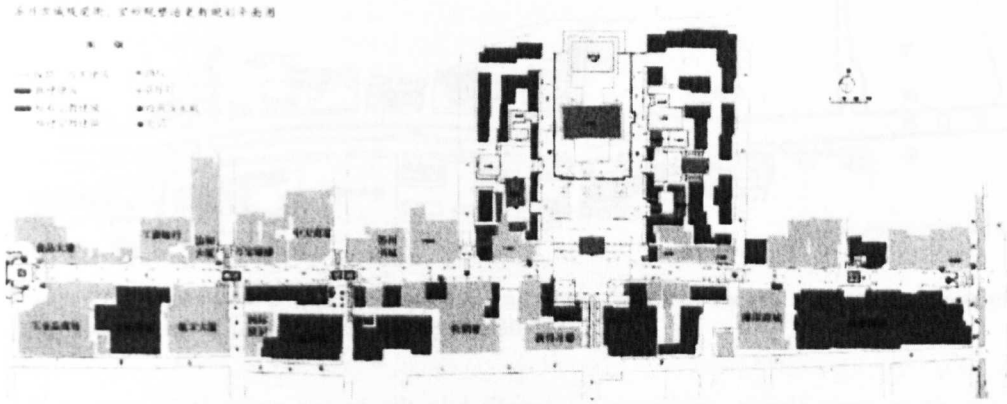


Figure 24 Renewal plan of Guan Qian Street in the 2000s (Tan, 2003, p67)

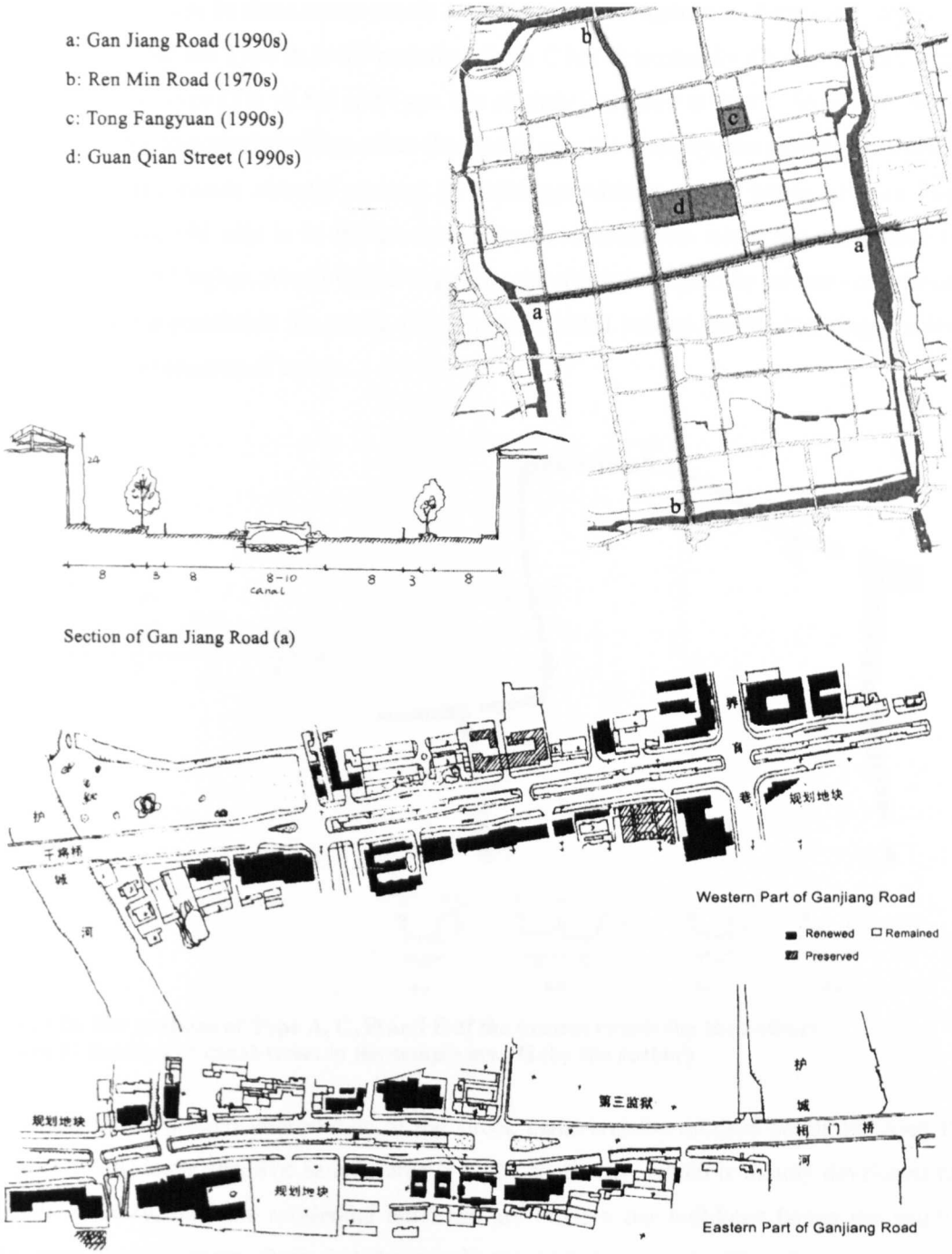


Figure 25 Sample streets locations, section and plans (adapted by the author, the plans of Gang Jiang Road come from (Tan and Qi, 1997, p36)

After years of cleaning out of silt and illegal constructions, canals were partly recovered from demolishment, and the total length reached 35 kilometres (including the moat) in the present city. In Figure 14, each of the canals was marked with numbers, such as H1, H2, H3 and V1, V2, V3 and V4. Referring to the five types of street-canal interrelations, the current

portions of each type in these seven canals in terms of their lengths out of the total length of the canals are that the Type A is the majority; Type C has dramatically decreased from over a half to 31.8%; Type D is 18.8% and Type E is slightly increased to 10.4%. In another word, compared to the historical situation when the type D was the majority, the current situation is that most of the canals directly connect to buildings without public access (Figure 26). Furthermore, the old city is in the process of commercialisation while the land value is getting higher and higher. Along with a large amount of land occupied by private companies, many canals are prohibited for public use. They are hided behind private buildings, which obstruct the appreciation of canals.

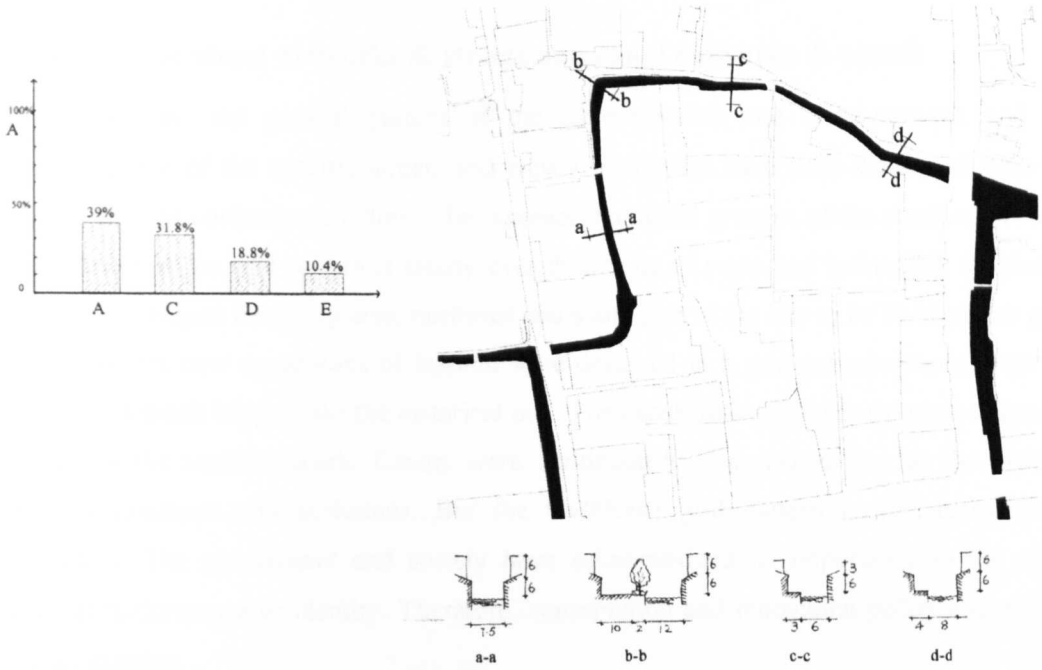


Figure 26 The portions of Type A, C, D and E of the present canals (by the author)
Figure 27 Sections of canal-street in the sample area II (by the author)

To illustrate the present interrelation of the street, canal and the modern buildings, Area II (Figure 14, II) is chosen. The sample area is in the south city, which is mainly developed in the 20th century, thus the residential buildings are modern bar buildings facing the south. However, these sections show that the canalscape and streetscape still maintain the same width-height ratio as the historical ones. Buildings near the open space are controlled to be one or two stories, while other buildings could be three or four stories high (Figure 27). Moreover, more green spaces are developed near the canal than that in historical time, which can also be seen from the statistic figure of the Type E among the five types.

Nowadays, the original functions of the canals such as providing water for daily lives, draining away wastes and transportations don't exist any more. In order to endow the canals new life, scholars suggested that they should house the water route inside the old city for tourists and the accessibility of the canals should be improved. The number of canals should increase to revive the historical performance of a water city (Yu, 1994, Chen, 2003a, Duan, 2003). In the governmental policy on the city's conservation, the street-network and canal-network have been preserved. In detail, the water quality and resources of the canals are maintained; water banks, bridges, buildings along canals are at historical scale; waste pollutions are forbidden and so forth (The government of Suzhou, 2003).

Summary for street networks & streets and canal networks & canals

In this section, the general pattern of the street-network and canal-network and the transformation of the specific streets and canals in Suzhou have been examined from the ancient time to contemporary time. The typomorphological process of the street-network is very clear that the grid pattern is steady over thousands of years and influential. It affected the later developed inner city area, northeast and south part of the city to be divided into grid. Moreover, the new expansions of Suzhou were designed in a grid pattern even though the grid size is much bigger than the historical one. The canal-network is not as much degree of steady as the street-network. Canals were continuously demolished due to the lack of original functions and pollutions. But the traditional grid pattern is still recognisable nowadays. The government and society have acknowledged its importance in the city's cultural performance or identity. Therefore, conservation and renovation policy and actions are undergoing.

Another important finding was the five types of street-canal interrelations. All of the five types have survived over time even though their portions among the total length changed evidently. Most importantly, the types have been used in widening road projects such as Type D in Gang Jiang Road project. The original narrow canals have been expanded and beautified. Two parallel streets have been adopted, which were for traffics from different directions. Buildings along the road were also under control. This is a successful example of the traditional type adapting to modern use.

The traditional width-height ratio of streets and canals was normally 1:2 to 1:1. The modern streets and canals also have similar ratio and at human scales. For instance, modern streets are divided into several parts by trees or canals. Buildings near the canal are limited into

two-story high and with pitch roofs. Another feature of the traditional street and canal was spatially diverse and uneven in every segments of one street or canal. This feature is not apparent in modern developments. In addition, the public accessibility of the canals is decreasing at the present time, which needs improvement.

Like Chinese scholars declaimed that the 'dual chessboard pattern' is the structure and the characteristics of Suzhou, the street-network, canal-network, streets and canals are essential in the city's conservation, and should be adapted to further development of the city.

Appendix 2.2 The urban blocks and plots of Suzhou

This section focuses on urban blocks including plots and building-grouping patterns as one of the fundamental elements of an urban form. The analysis of urban blocks can help designers and policy-makers understand the historical transformation of them, and assist them in creating new urban forms appropriate to the context. Based on the hierarchical method of subdividing urban forms, urban blocks consist of plots, which further consist of buildings. The synchronic types of blocks, plots and building fabric which carry the characteristics in each period and the possible typological process of these types will be illustrated. Particular synchronic types are defined by size, height, location, proportion, density, volume of physical forms and their relationship with surrounding environment, such as orientation and connection with accesses routes. These are based on statistic data analysis of a number of blocks in particular morphological regions in each period. Moreover, some representative blocks are further selected to identify plot patterns and spatial relationships of buildings with their surroundings in detail.

The historical period (--1850s)

Traditional urban blocks in big Chinese cities were fundamentally influenced by two policies of feudal governments, namely, the zoning concept and the LiFang system. The concept of zoning was to separate the noble class, humble class, and different kinds of handcrafts industries, as determined by the feudal social hierarchy. The LiFang system was a system of social ordering employed by the government, and one LiFang was physically identical with an urban block. An urban area within a city was divided into a number of LiFangs or rectangular or square blocks, consisting of twenty-five south-north orientated family courtyard houses (Zhong, 1986, p218). LiFangs were walled and with four gates in each side, which were strictly controlled by government officers during the night until the Song Dynasty. Even though walls of LiFangs had been broken down and the numbers of

households in one Lifang later became more diverse, its impact on the morphology of the traditional urban blocks and plots remained, and can be observed in Suzhou.

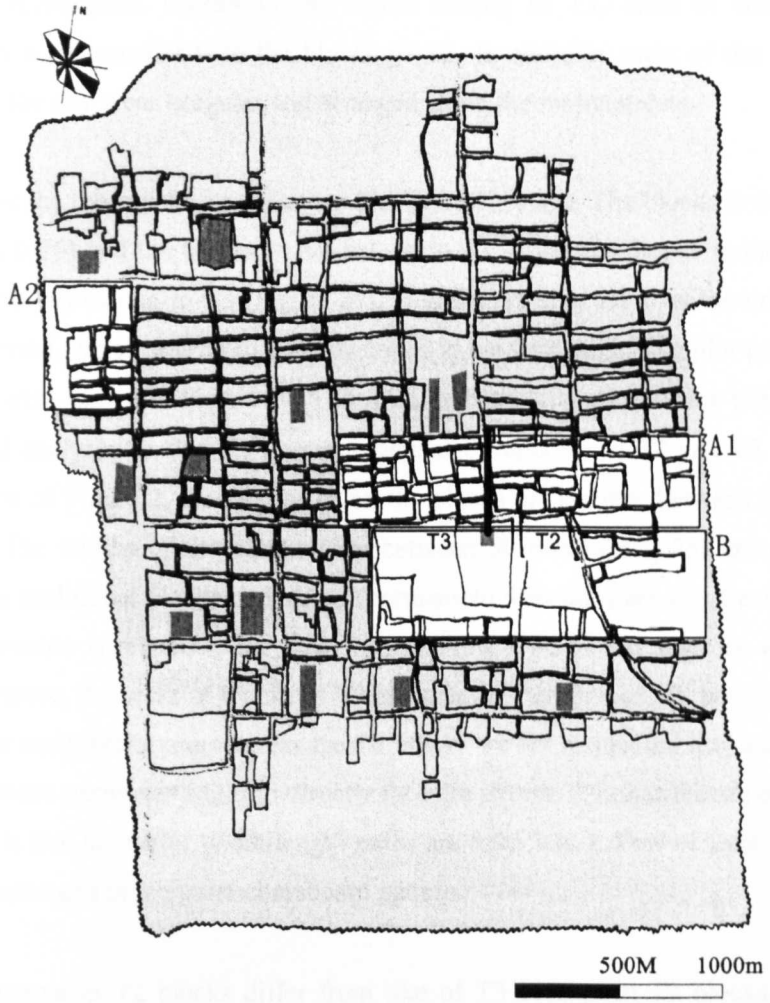


Figure 28 Urban Blocks of Suzhou in the 18th Century and the selected study area A1, A2 and B; Buildings in the blocks of T1 are marked as grey rectangles. (Adapted by the author according to the official map of Qian Long's reign (Chen, 2006, p48))

The earliest study resource of the urban blocks in Suzhou is a map dated from the Emperor Qian Long's reign (1736-95). The completely built-up urban blocks were prevalent in the north and west parts of the city, while the previous Inner City and the south part of the city were undeveloped by this period (Figure 28). There were three types of urban blocks in Suzhou in this period. The first one was the special block type (T1), of which one block contained one grand building complex only. Another block type was the post-LiFang block type (T2), of which blocks usually contained houses. The third type was the ordinary block type (T3). There were twelve blocks of T1 in the city, which were between 200 meters and 300 meters wide and 250 meters and 300 meters deep, which made them bigger than nearby

blocks. They were walled, north-south orientated and not fully occupied by buildings. Furthermore, the blocks of T2 were situated in the northeast and northwest parts of the city, which were rectangular. Blocks in the centre belong to T3, most of which were for commercial use and smaller than the blocks of T2. In addition, most of the blocks in the fringe belt of the city were irregular and arranged along the major streets.

A1 and A2 are the representatives of urban blocks in this stage. The blocks in the east half of A1 (block 41to 76) and the blocks in A2 belong to T2, while the blocks in the west half of A1 (block 1 to 40) belong to T3 (Figure 29). B is the representative of the urban blocks in the second period, which was almost undeveloped in the first stage. The plot patterns in each block of A1 were shown in Figure 29. The sizes, portions and areas of the blocks of A1 are measured and analysed to find the common physical properties of T2 and T3. As shown in the four charts of Figure 2, the lengths of all the blocks are similar, between 50 meters and 100 meters. The widths of the blocks vary between 50 meters and 250 meters. Thus the lengths of the traditional blocks in Suzhou (north-south direction) are less flexible than their widths. The reason is related to the courtyard building type of this stage as will be shown later. Furthermore, the areas of blocks of T3 are smaller than that of T2, because most of T3 blocks are for commercial use whereas the T2 blocks are for residential use, and commercial blocks need more perimeter edges to directly face the streets. Another feature observed from these blocks is that the major width/length ratios are from 1 to 2. Few of them exceed 4. All blocks were arranged in a regular chessboard pattern.

The plots patterns in T2 blocks differ from that of T3 blocks. In T2 blocks, a plot often occupied a narrow and long slot from its north edge to the south edge of its block. There are exclusions though, for instance, Block 72 has a big centrally located plot, which is similar to T1, because the rest of the block was undeveloped in this period. Block 59, 60, 63 64 and Block 70, 73-6 that are near the east moat of the city were also not fully developed in this period. In T3 blocks, plots are located along perimeters, which are smaller and much denser than plots in T2 blocks, especially in Block 1-22.

In order to identify the plot patterns and building-grouping patterns of T1, T2 and T3 in more detail, several examples of urban blocks are selected from A1 and A2 areas. Their accessibility analysis illustrates the relationship between buildings and the surrounding areas during the period. The Inner City was a typical special block (T1) which accommodated the prefecture governmental buildings before the 14th century and was leftover after that (Figure

30). It was analogous to the whole city with rectangular walls and moats. Major buildings were arranged along a north-south orientated axis. Their forms were largely similar, apart from some peculiarities on their roofs and minor ornamentations illustrate statuses. These buildings formed large courtyards and defined ritual sequences through the block. Additionally, there were some military buildings along the secondary axis to the west of the main one. The walls and moats of this block defined its boundaries, from which buildings had certain distances as shown in the small special block to the southwest of the Inner City in Figure 3. Buildings in these blocks were symmetrical along the axes with access routes from the south streets, many with symbolic gates (Pai Fang) indicating the division of LiFangs.

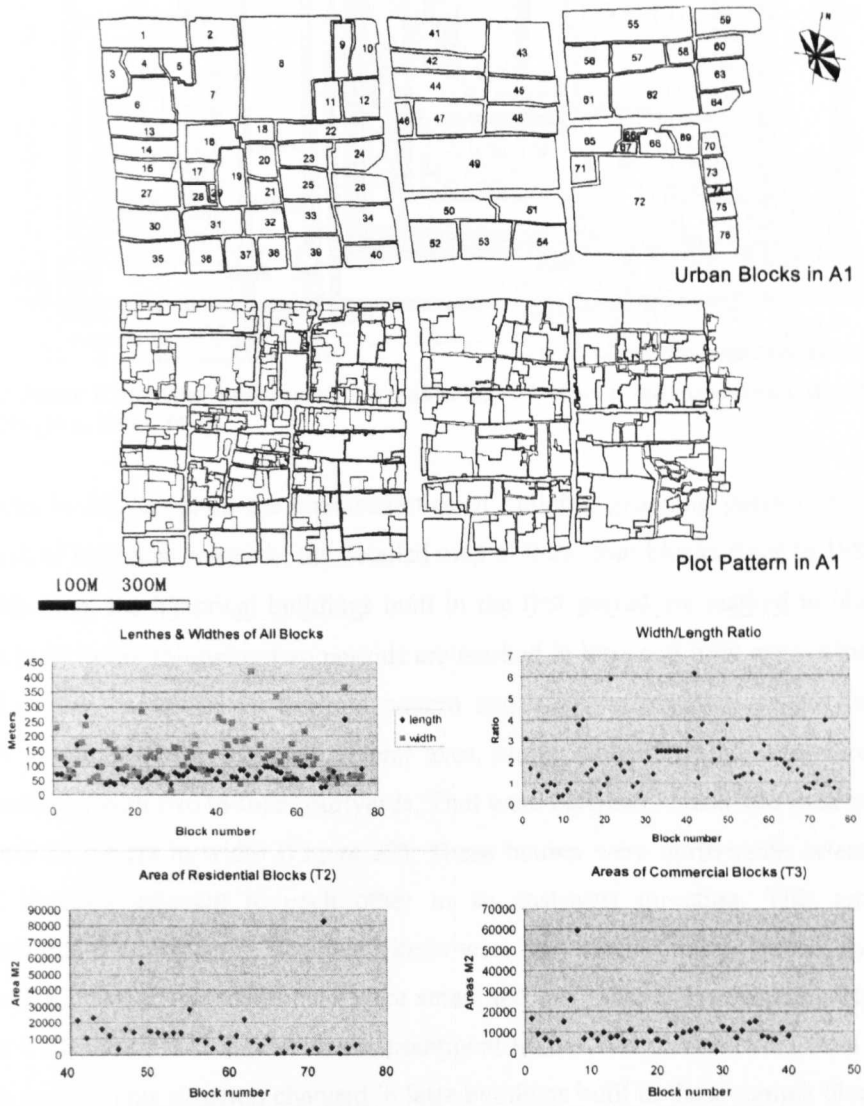


Figure 29 Analysis of A1 including the sizes, portions and areas of the blocks (produced by the author)

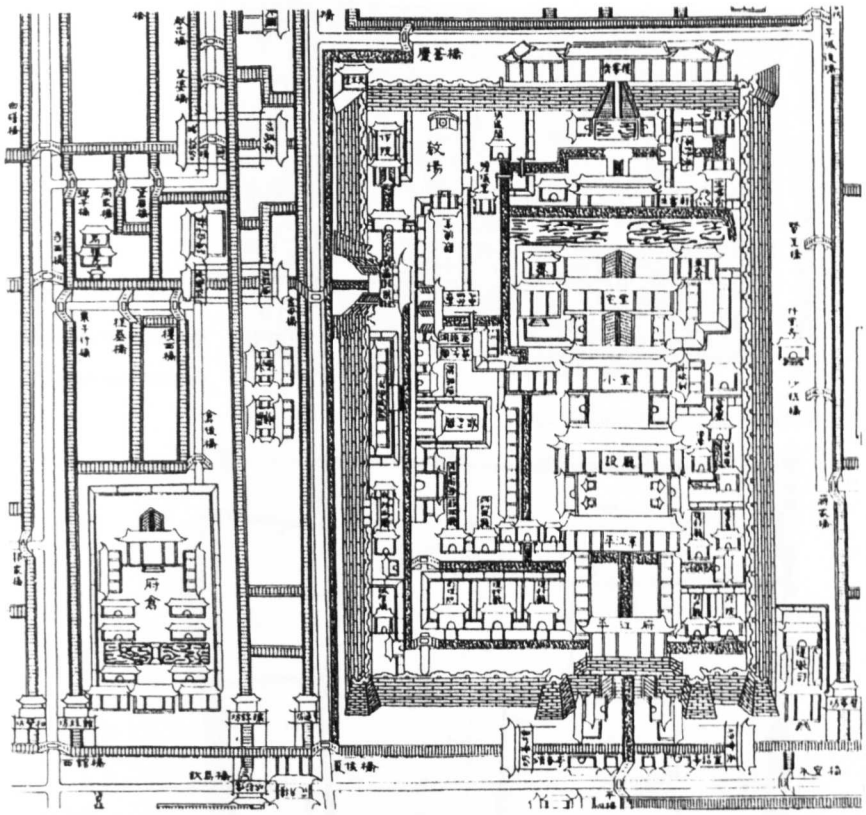


Figure 30 Inner City Area and several surrounding T1 blocks (adapted from the Ping Jiang Map (1229) (Wu, 2003, P94))

Four blocks in A2 represent the characteristics of building grouping pattern of T2 blocks. Due to lack of historical resource, the detailed map of these four blocks dates to 1988 (Figure 31). In this map, the historical buildings built in the first period are marked in black, while buildings built in the following two periods are marked in blue and light grey, which will be excluded in the discussion on the plot pattern and building-grouping pattern in the first period. A house complex included several axes, along each of which were three to five roofed buildings with two to four courtyards. That were between 70 and 100 meters in length, and around 20 meters in width (Figure 32). These houses were north-south orientated, and arranged in rows adjacent to each other in an east-west direction. This arrangement determined that the lengths of T2 urban blocks were very similar in this period, as observed in Figure 2. Courtyards in each house were small and of U shape. The accessibility analysis in Figure 4 illustrated that almost all the traditional houses had direct access from the south and north streets. This situation changed in later buildings built in these sample blocks due to changes of building types.

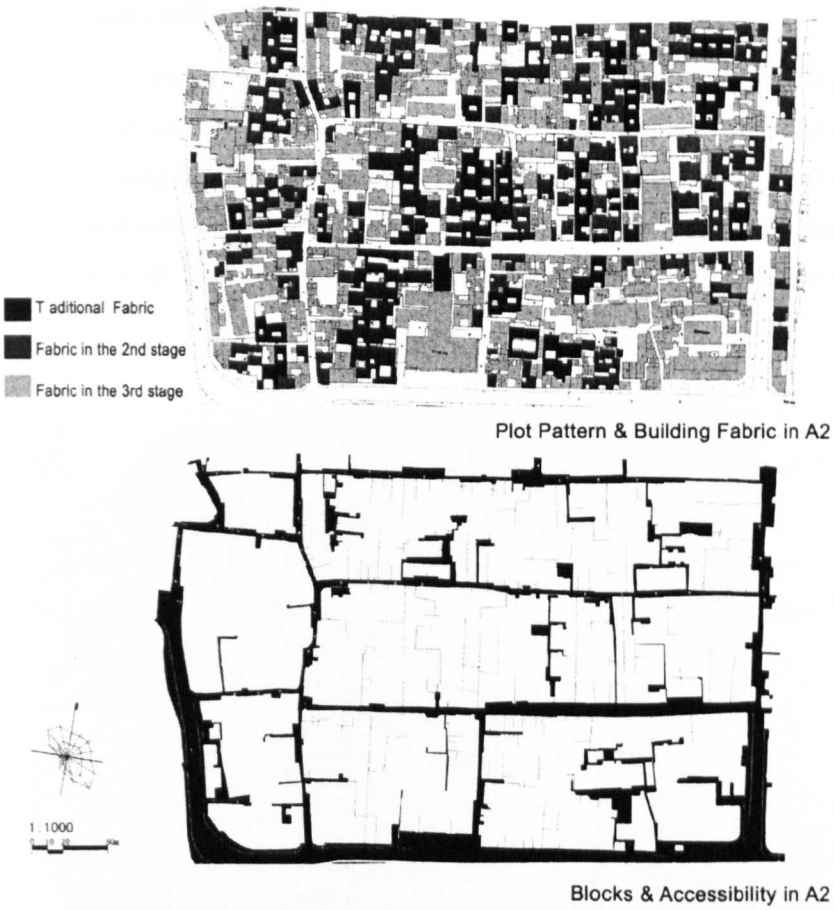


Figure 31 Plot patterns, building fabric and accessibility analysis of blocks in A2 (produced by the author according to the survey map of this area from the Urban Planning and Designing Institute of Southeast University (1998))

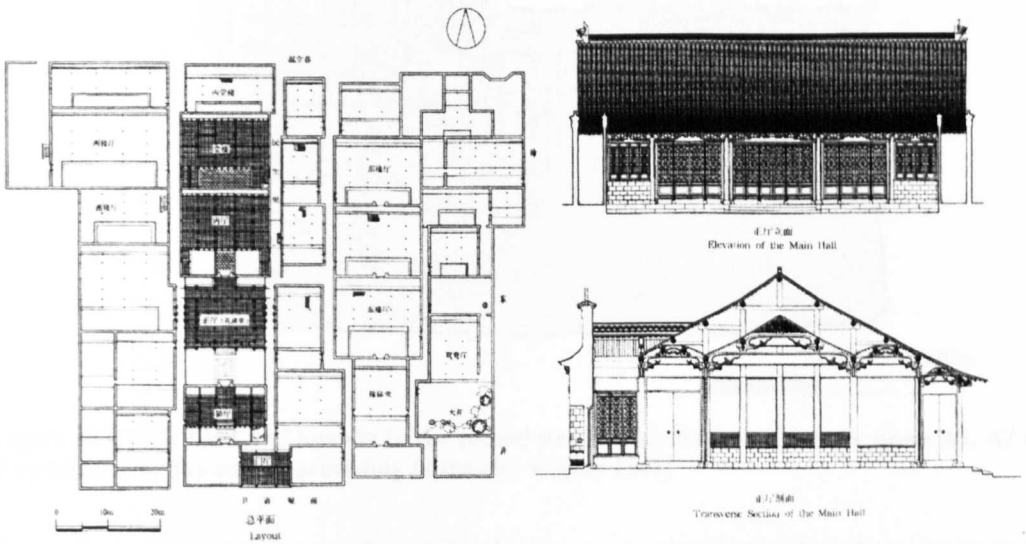


Figure 32 The plan layout, elevation and section of a traditional house complex in the city (The Real Estate Management Bureau of Suzhou, 2004, p218-9)

The modern period (1850s-1949)

The city gradually recovered from the Opium War and civil wars in the late Qing Dynasty and the early twentieth century. The Republic government launched the 'Proposal of Suzhou Planning' (Suzhou Gong Wu Ji Hua She Xiang) in 1927 in order to develop and modernise the city. The proposal influenced the urban forms of Suzhou, even though only part of it had been fulfilled because of interruptions caused of World War II and the Chinese Civil War (Chen, 2006, p98).

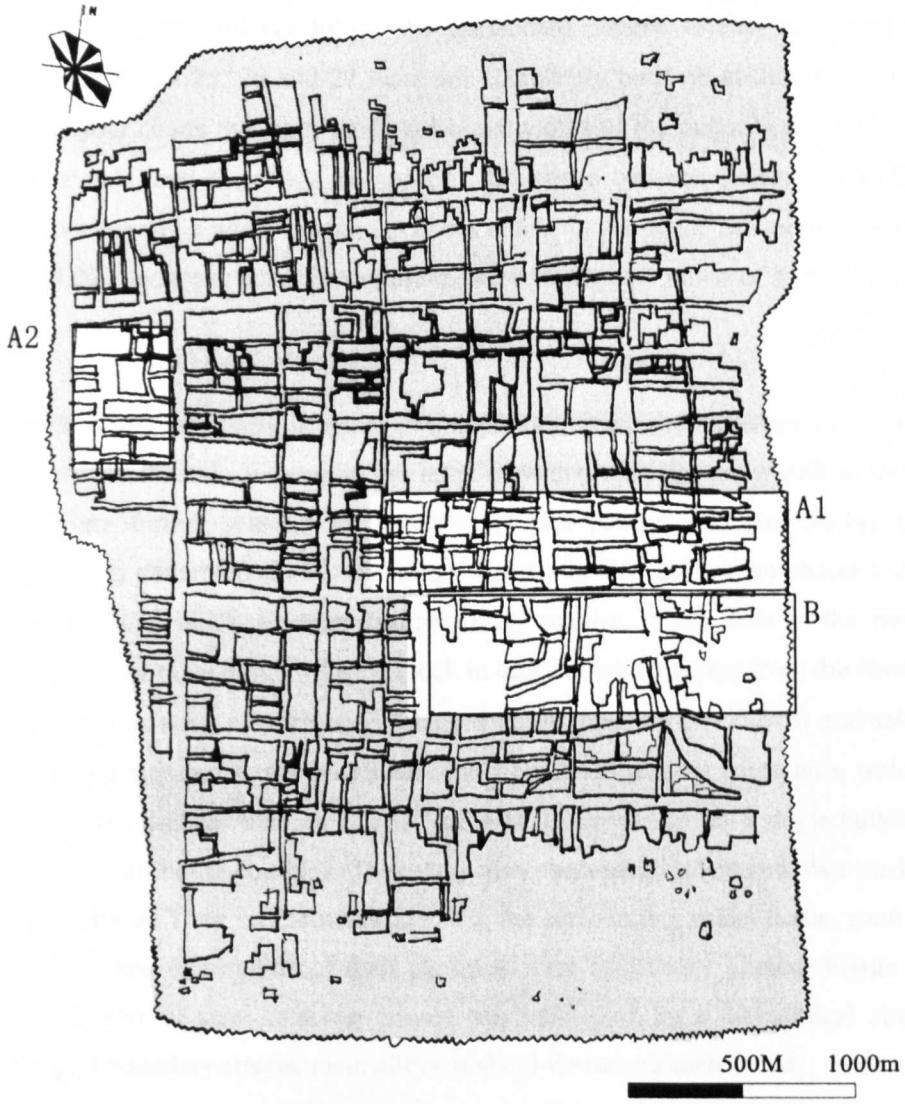


Figure 33 Urban Blocks of Suzhou in the second period and the selected study areas A1, A2 and B (produced by the author according to the city map in 1949)

Generally compared to the previous urban blocks, some changes to the urban blocks in this period can be observed (Figure 33). First of all, some blocks were formed near the northern

city gates due to the construction of the modern railway station to the north of the city. These blocks were in similar size and pattern as other blocks along the main streets. Secondly, some special blocks were subdivided to contain a number of plots after original historical buildings had been destroyed. Thirdly, urban blocks in B were largely shaped during this period, even though the formation was not fully complete

Similar to the analysis of A1, blocks in the representative morphological region B were marked by numbers from 1 to 27 (Figure 34). They were not specifically for residential use or commercial use, and did not follow the chessboard pattern strictly, but in an elusive irregular matrix. Block 25, 26 and 27 were not completely built up at this stage. It can be seen from the four charts that both the lengths and widths of the majority of blocks did not exceed 200 meters, and there was no apparent difference between length and width. The areas of blocks were of a wider range than of the blocks in A1 of the first period, being from 10,000 to 50,000 square meters. Furthermore, the width/length ratios of these blocks were diverse.

The plot pattern was extremely irregular in this period. Plots near the edges of blocks were much smaller than those in the centre, the latter of which were not fully built at this stage. Block 13-17 are further selected to illustrate the plot pattern, the accessibility and the building-grouping pattern in detail. Buildings formed in this period are marked in black (Figure 35). Plots in block 13 were comparatively regular, while plots in the remaining blocks occupied one outer corner of each block in order to create access from the streets. The building type of this stage was the semi-detached house type. A pair of them maintained the same shape and dimension as the traditional roofed buildings without courtyards, which were built of bricks and timber. A house of this type was in similar size to a single building in a traditional courtyard house complex. They were also north-south orientated, two stories high and with pitch roofs. They sat harmoniously with the surrounding urban tissue, even though the composition and fenestration of their elevation were completely altered (Figure 36). In each plot, a cluster of semi-detached houses was connected by a hierarchical circulation system: the plot boundary streets, main alleys, and cul-de-sacs to each house.

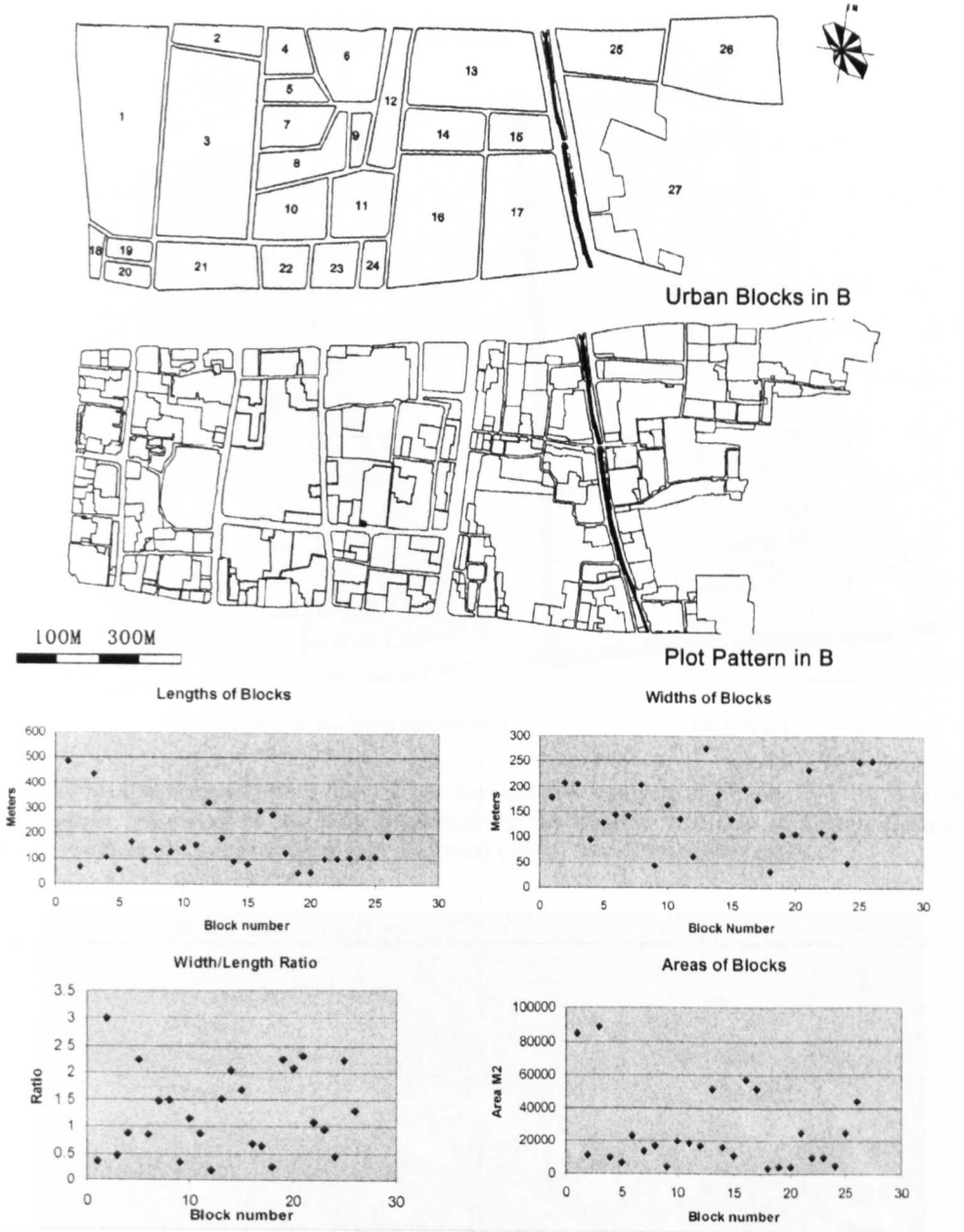


Figure 34 Analysis of blocks in B including the sizes, proportions and areas of the blocks (produced by the author)

The emergence of the new building type which slightly altered the previous plot and block types was attributed to the social and economic changes of this period. Household sizes decreased and populations within the city dramatically increased. Traditional houses were too spacious to be economical. Moreover, western architectural concepts had been adopted in design since this period, affecting traditional building layouts, materials and appearances.

The semi-detached house type in Suzhou was a combination of the western apartment type and the Chinese traditional courtyard house type.

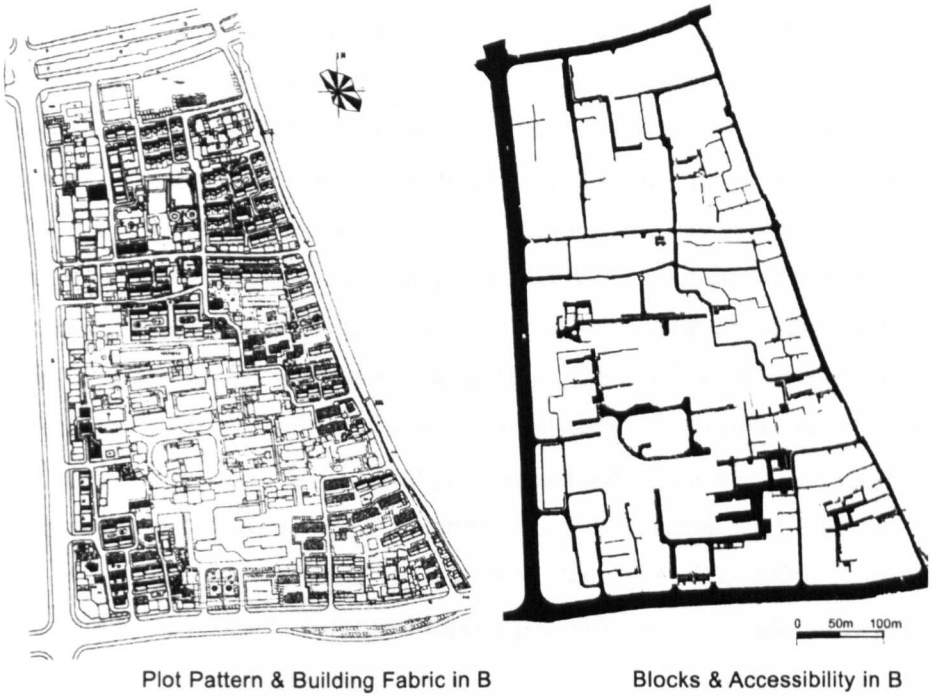


Figure 35 Plot Patterns, building fabrics and accessibility analysis of Blocks 13-17 in B (adapted by the author according to the map produced by the Suzhou Institute of Urban Design and Planning (Suzhou shi gui hua she ji yan jiu yuan) (1998) from (Shi, 2001, p38))

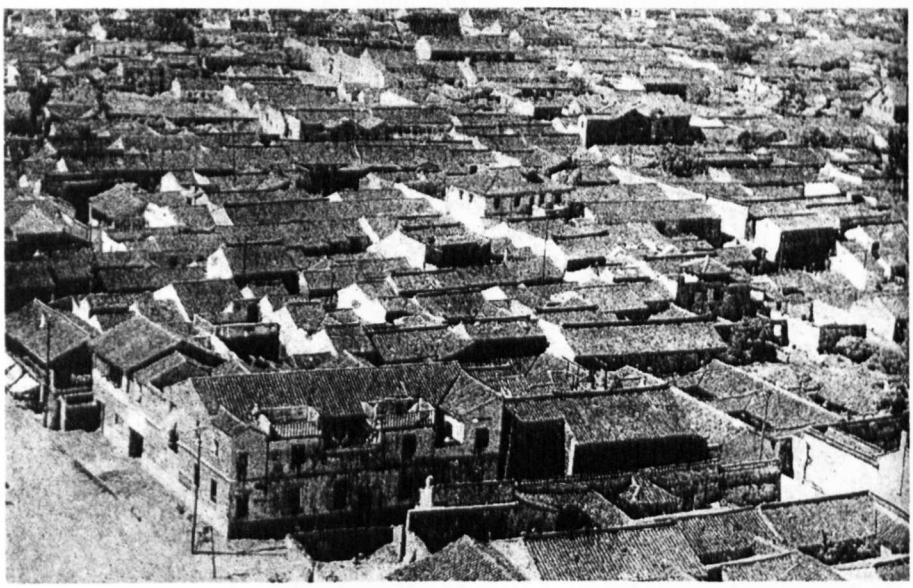


Figure 36 A mixture of traditional houses and semi-detached houses of Suzhou during the 1940s and 1950s (Architectural Department of Tongji University, 1958)

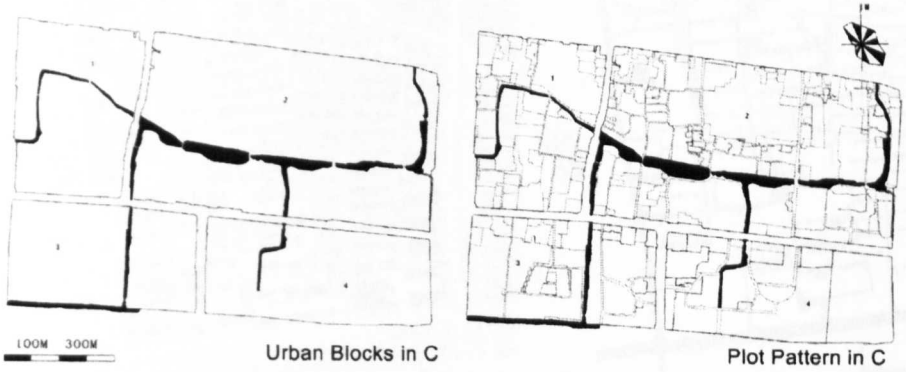
The contemporary period (1949—present)

There were two stages of the development of the city in the third period. These were from the year when P.R. China founded (1949) to that of Economic Reform (1978) and thereafter. In the first stage, the development of the city was stagnant because of several unrealistic social and political campaigns such as the Cultural Revolution. Meanwhile, radical industrialisation greatly influenced urban forms, for instance, many of the canals were refilled for hygiene; houses were converted into factories; and newly built factories altered the original building fabric. As a result, the plot pattern in many of the urban blocks changed following the transformation of building fabric. Like other Chinese cities, Suzhou entered an era of rapid urbanisation and globalisation after 1978. The city has been expanding towards the western and eastern suburbia, where a new chessboard network has been formed. Moreover, the government has emphasized preservation and regeneration of the old city area since 1986, when the first conservation planning of Suzhou (Suzhou Shi Cheng Shi Zong Ti Gui Hua, 1986-2000) was launched (Shen, 2005, Dai, 2004, Yu, 2006). Therefore the general urban form has been changing and adjusting to new needs throughout this period.

The current physical configurations of urban blocks and plots of Suzhou are shown in Figure 37. Compared to the previous situations, the built-up area was expanded into the entire old city. The block patterns in the middle part have been preserved, and individual blocks are much smaller than new blocks in the south part of the city, as are the plots. Some previously uncompleted urban blocks have been occupied by urban parks, residential quarters or public sectors, for instance, Blocks 7, 8, 9 in B become a public park; Block 27 in B has been occupied by the University of Suzhou. Therefore, these blocks remained as super blocks and have brought transport pressures to their surrounding areas.

The area of C is the representative morphological region to show the characteristics of urban blocks and plots of Suzhou at this stage. In a bigger area than A1 and B, C contains only four blocks. The dimensions are shown in the table, which are much bigger than the previous blocks (Figure 38). The smallest block is about 24,000 square meters, while the biggest block is 62,600 square meters. The width/length ratios are about 1 to 2.5. The plot pattern in these four blocks is irregular. Plots near the main street are small, and big inside each block as well as near the east and south city walls. There are several super plots in each block. The access routes are comparatively wide, geometrically straight and have circular vehicle buffers.

Figure 37 Urban blocks and plots of Suzhou in the third period (adapted by the author according to the latest city map 2007)



Number	Length	Width	Area	Width/Length Ratio
1	611	428	257821	0.700490998
2	603	1060	626093	1.75787728
3	370	674	240119	1.821621622
4	349	817	271542	2.340974212

Figure 38 Analysis of blocks in C including the sizes, proportions and areas of the blocks (produced by the author)

Take Block 1 in this area as an example to interpret the plot pattern and building cluster in detail (Figure 39). There are clearly three plot patterns coinciding with three types of plot pattern in Block 1seperated by the canal, which are located on the northwest of the canal, the northeast of the canal, and the south of the canal. In the northwest area, the first type of plot pattern is generated by some modern detached houses and vast administrative buildings with two front squares. The second type of plot pattern in the northeast area is formed by hotels and office buildings, each of which is free standing and surrounded by green land and wide roads. A central circular point at the entrance radiates several secondary roads throughout the area from the main street of the city on the north. In the middle and south of the area, the residential quarter presents the third type, which consists of identical bar buildings in similar length but different widths. Buildings are north-south orientated, six stories high and laid out in rows and columns. The inner street system is geometric, and in a 'tree' pattern from the major street of the city into each cell of the buildings. The southwest corner is occupied by a hospital and some commercial buildings. They are also in bar shape but bigger than the residential buildings. Similarly, they are arranged in rows.

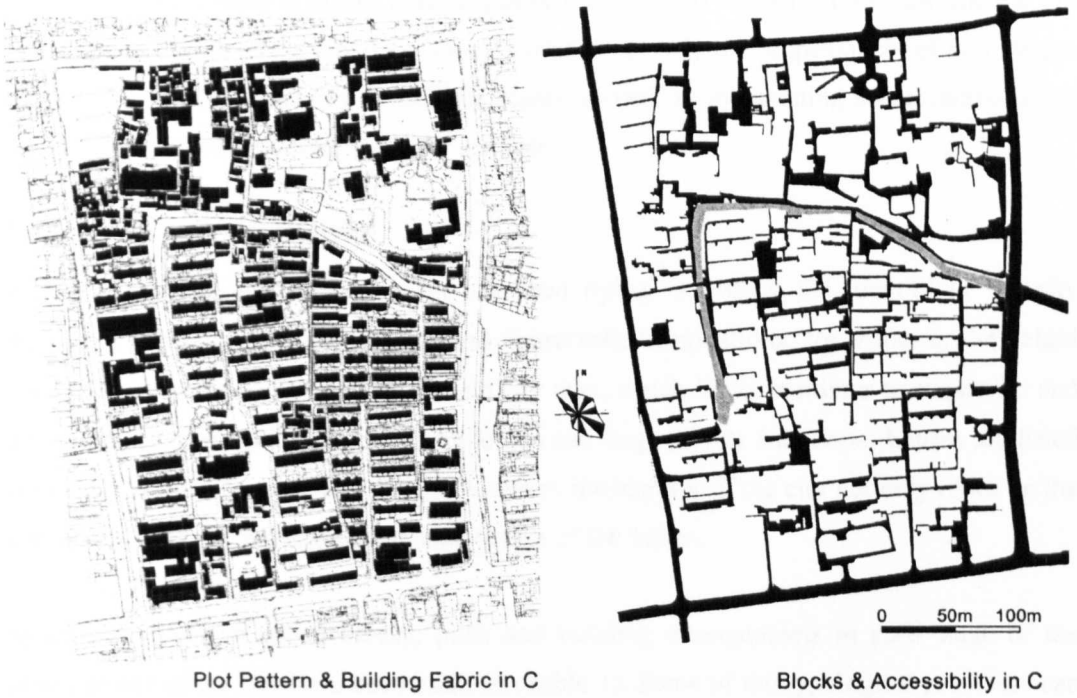


Figure 39 Plot patterns, building fabrics and accessibility analysis of Blocks 1 in C (produced by the author according to the current map from the Jiangsu Institute of Urban Planning and Design)

The third type of the geometric 'trees' arrangement is the major type of the area, as shown in the accessibility analysis in Figure 12. The large scale housing development arranged in this

type is driven by profit and adapts to the demographical changes and shortage of urban lands. The modern forms in limited types are copied and mass-produced nation wide, regardless of local culture, topographies and climates. They largely disrupt existing urban fabrics. The identical appearance of buildings and singularity of arrangement create monotonous city images. Furthermore, standard plans in residential developments have limited spatial flexibility, which causes environmental damage and resource waste due to second-time renovation of each apartment by consumers after purchase. Buildings in the other two types of grouping patterns are also international style contemporary buildings without a relation to the traditional fabrics.

In this period, many design attempts of modern courtyard houses have been conducted to replace the dilapidated traditional courtyard houses and fit into the largely existing traditional fabric. However, they were not very successful, because a design of those houses not only fell victim to superficial image-imitation of the tradition houses, but also lead to social gentrification in certain areas due to a lack of awareness of traditional types of blocks and plots. Thus a more effective design approach is required to connect the new and the old in the future design of the city. One should concern not only the 'appearance' of new design but also the spatial structures at multiple scales, as well as the existing social relationships based on the above typomorphological analysis.

Conclusion and suggestions

Presently, the municipal government has been trying to protect the identity of the city through a number of design policies and conservation regulations, for instance, the height restriction in new developments in the old city area, which limits buildings to six stories and 24 meters; several traditional public buildings and large private traditional houses are listed for conservation (Government, 2003). However, the identity of the city not only relies on the conservation of the old, but also on new design of the future.

Synchronic types of urban blocks, plots and building arrangements in each stage of the development of the city have been outlined (Table 1). Some of the typological processes can be clearly recognised from the similarity and changes between these synchronic types (Table 2). The typological processes indicate that the series of types survive the dramatic changes brought about by political, economic and cultural forces. The typological transformation of block types is very slow, while the transformation of plot types is faster in Suzhou. Plots in the T2 blocks from the first stage were split up in length and maintained their widths in the

second stage. Shapes of the plots were more or less rectangular, and plots were arranged as orderly as those of the first stage because the semi-detached building type of the second stage was related to the courtyard house type of the first stage. In T3 blocks, plots arranged along the perimeters were smaller than the plots in the centre in order to allow buildings to be accessible directly from the streets. The typological process of building types only continued in the first two periods. Therefore, all the synchronic types in the first stage and their typological processes in the first two stages are useful for the city's identity and future designs.

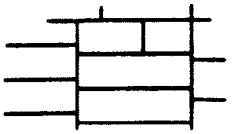
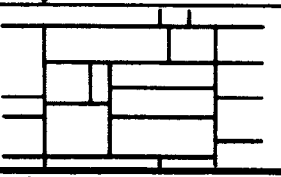
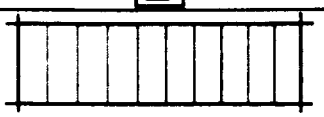
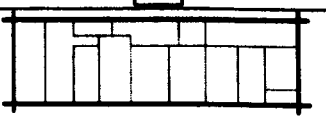
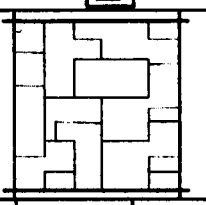
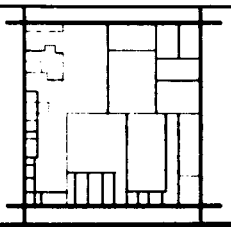
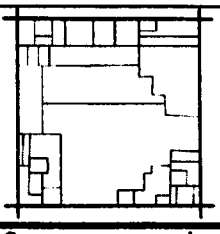
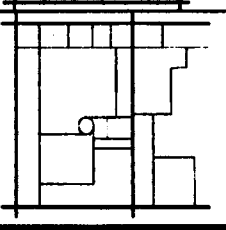
Block types				
		Type 1	Type 2	Type 3
Block Types	Characters	1, Size depends on the grand building complex. 2, Symmetrical 3, A building complex is in the centre, walled.	1, Lengths are 70 to 100 meters; widths are various; Width/length ratios are 1 to 3. 2, rectangular shape 3, orderly arranged.	1, Lengths are 70 to 100 meters; widths are various; Width/length ratios are various. 2, Shapes are various. 3, arranged in gridiron, less orderly.
	Diagram			

Table 1 Characteristics and diagrams of the three block types in Suzhou (produced by the author)

Typological processes of urban blocks, plots and building fabrics			
	The first period	The second period	The third period
T1,T2, T3 blocks	Refer to table 1	remain the same	T1, T2 remain the same; T3 changed.
Plot type in T1			
Plot type in T2			
Plot type in T3			
Building arrangement type in T1	Buildings form a sequence of courtyards along a north-south orientated axis or several axes; Symmetrical;	Some remained as conservation sites; some were demolished.	Some remained as conservation sites; some were demolished.

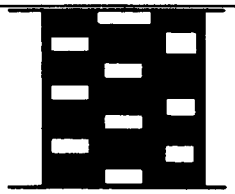
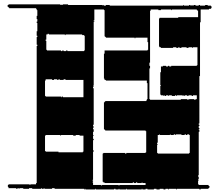
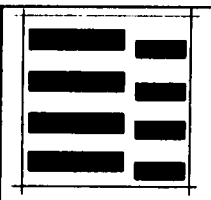
Building arrangement type in T2			
Building arrangement type in T3	The same structure as the traditional single building; not strictly north-south orientated.	Modern building composition.	Modern building composition.

Table 2 Diagrams of the typological processes of urban blocks, plots and building arrangements, '¦' indicates the continuity of the typological process; '||' indicates the discontinuity of the typological process (produced by the author)

Furthermore, traditional urban forms are worth preserving and reemploying because of the following three reasons. Psychologically, traditional urban forms are imprinted into the collective memory and become symbols of the culture. Functionally, they have been playing an indispensable role in the inhabitants' daily lives. For example, the physical form of traditional houses facilitates a high frequency of social interaction between dwellers, for instance, the courtyards are ideal communal places for public dinners, gathering, housework and children's play. The streets and alleys in the neighbourhood are at human scales and away from automobile so that they are pleasant spaces for informal chatting and activity. Ecologically, they are the most robust choices for the local natural conditions, for example, courtyards are essential for sunlight prevention and ventilation in the summer.

Designers should follow these traditional types by using existing or previous traditional streets, lanes or alleys. In this case, pure pedestrian is likely to be insisted upon inside traditional blocks of the old city, while vehicles should be kept on the main streets near the block borders. Currently, private car ownership is not prevalent among residents of the old city (Cao and Cui, 2002, p149), and it should be discouraged by both urban policies and urban design. Public transportation system should be highly developed as the alternative. New buildings should maintain the lines of traditional plots and blocks, which need support from the land lease policy of the government. A common block should be between 70 and 100 meters deep and 300 meters wide. A common plot should be 70 meters deep and around 20 meters wide, in which a pair of buildings can attach to each other with a mutual wall. Building fabric should have clear north-south orientation.

Since the blocks and plots types are determined by buildings, building types are important. Apart from necessary conservation, some traditional courtyard houses can be adapted to different needs required of the present time. It is unlikely that a single family would occupy the entire complex as before, because the population of the city has increased rapidly and

house ownership has completely changed to collective ownership in the third period. Since the structure and the space utilisation are separated in traditional house complex, it is possible that individual buildings to be subdivided into small rooms similar to modern apartments for small size families, and the courtyards kept free for public uses.

Furthermore, where traditional houses do not exist, new houses should be one or two stories high, 20 meters wide, north-south orientated, with southern main entrances and grey pitch roofs. Several such houses in one plot should be arranged in a column, and there could be low walls on the east and west edges of two houses to define the public accessible courtyards. Housing density and capacity can be maintained the same as before by following the traditional plot patterns. Moreover, even though the modern apartment house types are inevitable alternatives, ,modern buildings located in the old city should be incorporated with elements of the traditional courtyard house type and the semi-detached house type by employing the features of roof, eave and following the traditional plot and block types.

Buildings with other functions should have a similar volume to the historical roofed buildings, for instance, the same width, depth and height. They should be arranged along the perimeters of blocks and attached to each other. One modern function such as education and exhibition should be dispersed in a group of small buildings where possible. The necessary mega-structures such as stadiums, theatres and airports should be kept at a distance from the areas with an identifiable traditional fabric.