

**Urban Spatial Reconstruction Research of  
Yongding Road Historic District  
Based on Landscape Architecture**

**MASTER THESIS**

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## **ABSTRACT**

The historic district is the cream of a city, and it is also the most vigorous space in a city with fabulous cultural resources and a large number of users. The historic districts are not only the carriers of urban morphology but also as the representations of urban culture. Meanwhile, the historic district is one of public space in a city, which owns maximal culture, maximal art fascination and reflects the history of a city. Based on the background of the development of the cities in China, the historic district is the most complex strip in a city.

The central area or historic district has always been the pioneer in the development and construction of cities. The historic district was the center of city politics, economy and culture. The historic district is an area with complicated function, the major facilities include the residential area, public service and ancient building group, it reflects the city features and the cultural characters, and it is the core space of the city. Now, the land resource of China becomes tenses day by day. The low level of urban land use has caused waste and the reduction of land benefit. With the economic and urban development in cities, there are some issues in the historic district, such as shortage of land resources, population pressure, urban construction and the protection of historic district, particularly in the conflict. So spatial reconstruction of a historic district is an important way for cities to obtain space for development on the condition of land scarcity.

Yongding Road Historic District, like a shining pearl island in the Taiyuan City of China. This historic district is a large architectural complex composed of complete city lanes and residences, there are many buildings and shops dating from the Ming and Qing Dynasties. From this, the protection and development of the historic and cultural value of this district had become the focus of local social attention. However,

the districts in Taiyuan there are various problems of protection and development of historic districts. The thesis based on the in-depth investigation of the protection and current situation in Yongding historic district, took the local regional development as the research object, from the perspective of landscape architecture, Based on sustainable development planning thought, by use of inducement and comparative method, explore the resource of cultural potential through landscape planning approaches, used the design strategy of urban spatial reconstruction to make the full use of existing land resources and provide local residents with a livable environment , promote the development of local cultural tourism and economy.

Key words: Historic District, Neighborhood Unit, Underground Space, Green Wall, Urban Spatial Reconstruction

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## **DECLARATION OF AUTHORSHIP**

**I certify that the material contained in this Master Thesis is my own work and does not contain unacknowledged work of others.**

**1. Where I have consulted the published work of others, this is always clearly Attributed.**

**2. Where I have quoted from the work of others, the source is always given. With the exception of such quotations the work of this thesis is entirely my Own.**

**3. This Master Thesis has not been submitted for the award of any other degree or diploma in any other institution.**

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**Date:**

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# 1.INTRDUCTION

## 1.1 Research background

### 1.1.1 Macro context

I choose the direction of urban spatial reconstruction research of Yongding Road historic district based on landscape architecture as a research subject.(Figure 1.1 The location of Yongding Road historic district in Taiyuan city) The cause is that the historic districts are the great wealth of cities. Historic district creates city characteristics. As the increasing development of a city in China, massive urban renewal makes historic districts suffered the serious impact. (Figure 1.2 Historic demolition project in Taiyuan) .



Figure 1.1 The location of Yongding Road historic district in Taiyuan

Source: Author



Figure 1.2 Historic demolition project in Taiyuan

Source: [http://www.weibo.com/p/1002061787535601/photos?from=page\\_100206&mod=TAB#place](http://www.weibo.com/p/1002061787535601/photos?from=page_100206&mod=TAB#place)

Meanwhile, as a pioneer of the modern city. The historic district is the city special and the core region, it has complex roles, including the historic housing area, school, hospital, office, residential estate, office, commercial and other groups. Because of the growing tension of the historic district land resources, land price expensive and land privatization, which have caused lacks unprofitable urban public space in the historic districts.

### 1.1.2 Specific context

That will be difficult to build a new large public square in a historic district. The neighborhood unit as a complement to large public square, it can make full use of existing public space for spatial reconstruction. The most outstanding characteristic of the neighborhood unit is closely connected with local residents' daily life.

At the same time, spatial reconstruction has become an important means of improvement of the historic district. Green wall has great environmental and aesthetic value, but the local authority did not use the new design method into the reconstruction project. With the increase in the number of the high-rise buildings and the land resource being scarce gradually in current days, a series of environmental problems have occurred in cities. While the green wall is the most important method to solve this problem. With the development of the green wall, the plants have been extended in the spatial space. So, the green wall is the requirement and inevitable trend of urban greening sustainable development. With the rapid development of society and economy in Taiyuan, the

residents of the historic district put increasingly higher demands on the quality of the living environment. However, at present, due to the shortage of the land resource in the historic district, the increasing of living standard for the residents is extremely difficult. If the local government want to improve the living environment of the historic district, they must develop the underground space. Therefore, the Spatial Reconstruction design method will provide local residents with a livable environment by developing the underground space and the green wall.

In addition, this paper researches the spatial reconstruction of Yongding Road historic district. By studying the concept and classification of public spaces, we analyzed the most useful public spaces in the Yongding Road historic district, try to find a way to effectively protect the historic district and improve the lives of the residents. Based on the distribution of the public spaces, we analyzed of the present problems of the Yongding Road historic district. Finally, we put forward the design proposal the Yongding Road historic district.

## **1.2 RESEARCH CONTENTS**

The developing dilemma of the Yongding Road historic district was caused by the phenomenon of slum expansion. A lot of the historic district's environmental depredation is a result of slum expansion. With the urban development, the problems of the Yongding Road historic district has become more and more serious. Frequent traffic events, disordered traffic order and outstanding traffic unlawful activities, all the following situations brings huge problems for the traffic system in the historic district. Meanwhile, the historic district lacks basic infrastructure. This kind of situation has left the local residents short of basic services such as water and power.

Now the Yongding Road historic district in Taiyuan has many problems, all the problems led to the decline of the historic district. But fortunately, in the extensive urbanization tide, There is not any damage to the Yongding Road historic district. The urban planning bureau even protected and repaired a number of courtyards and alleys. (Figure 1.3 Yongding Road historic district is a municipal-level historic conservation area)<sup>1</sup> Now the Yongding Road historic district is composed of the Yongding Road, Yongxing Road, Yongning Road and two

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<sup>1</sup> Wang, Fuhua. Historic Preservation List of Taiyuan[R]. Taiyuan:Taiyuan Urban Planning and Design Research Institute, 2005. 10

ancient architectural complex. The Yongding Road historic district is only one real historic district in Taiyuan City. The Yongding Road historic district is the miniature of the local residents' life of Taiyuan City (Figure 1.4 The daily life of the residents). Visiting the historic district will make the visitor feel the local customs and life scenes of Taiyuan. Every Sunday, when the bells tolled for church with a melancholy sound. The district reminds people of the precious memories of history. This is the most lively place in Taiyuan at least in my opinion.

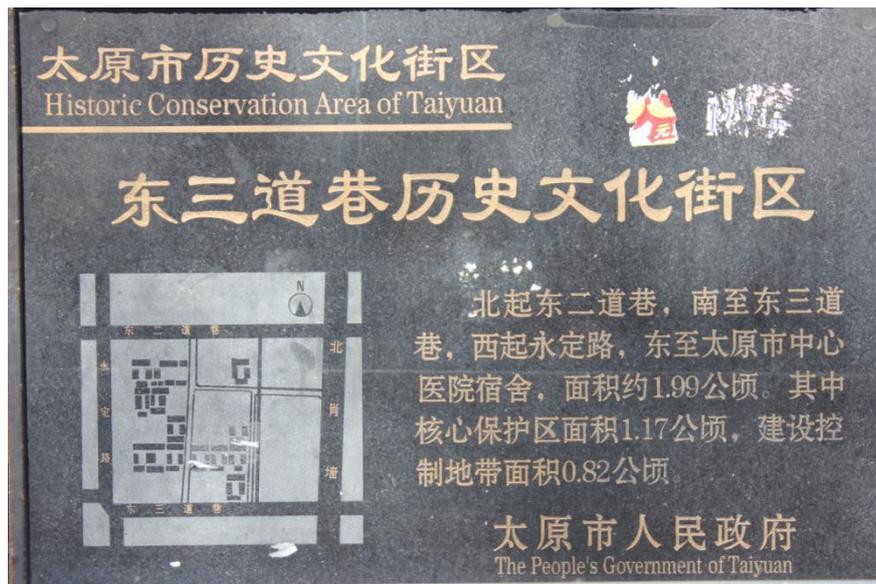


Figure 1.3 Yongding Road historic district is a municipal-level historic conservation area

Source: Author



Figure 1.4 The daily life of the residents

Source: Author

How to improve the protection and renovation of this area, full excavate land, history and culture resource potential, this is the task we have to take on. I will make a spatial reconstruction plan to improve the living environment, improve the quality of residents' life. We want to make better use of history and culture resources and pay attention to ecological environmental protection and construction, and at the same time develop the tourism, and finally improve local economies and local environment. This is the goal of this project proposal.

### **1.3 Overview of urban spatial reconstruction**

#### **1.3.1 Definition of urban spatial reconstruction**

The spatial reconstruction in a historic district is a coordinated reconstruction project includes the population, environment and public open space. If the public open space wants to maintain sustainable development, it is necessary to increase land use efficiency, develop in a direction of the building's exterior wall and underground space, and promote the sustainable development of the local environment. The main contents of urban spatial reconstruction basically including the following points: historic district protection, neighborhood unit construction, underground space development and green wall application.

#### **1.3.2 Historic district**

The historic district is an area of a city, and many ancient buildings have been preserved in this area. The historic district also reflects social politics, economics, cultural conventions and artistic ideas of the particular historical period.<sup>2</sup> In China, historic districts are protected by state laws.

The historic building, it means the structure has inestimable historical, scientific and artistic value.<sup>3</sup> In China, the various historic building certification bodies are authority

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<sup>2</sup> City of Boston Gov. Historic districts[EB/OL]. <https://www.cityofboston.gov/landmarks/historic/>. Jun, 2016

<sup>3</sup> Administration of Cultural Heritage. Law of the people's Republic of China on Protection of Cultural Relics[Z]. 28 Oct, 2002

institutions who have achieved the accreditation of the national accreditation agency and they are very strict audit to historic buildings.<sup>4</sup> So the list of heritage registers can not cover all the historic buildings.(Figure 1.5 The concept of historic district given by the Chinese and overseas scholars)

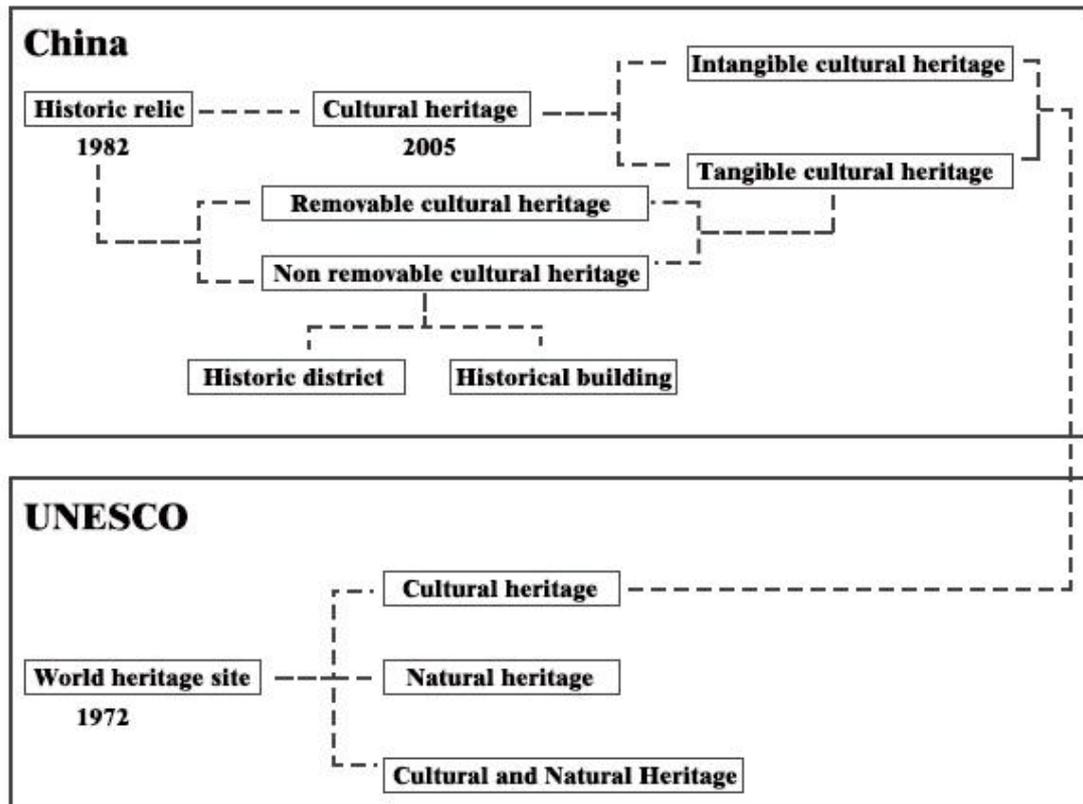


Figure 1.5 The concept of historic district given by the Chinese and overseas scholars

Source: Author

### 1.3.3 Neighborhood unit

Neighborhood unit, the term originated in ancient China two thousand years ago.<sup>5</sup> Neighborhood unit conception now has become a hot issue for the urban development and environmental improvement. As basement to fill the trunk network of the urban public space,<sup>6</sup> the neighborhood unit plays an important role in promoting the communication, reserving the social network inside the districts and stabilizing the social structure. As the basic unit of the city, neighborhood unit provides an effective platform to join sustainable urban development. Neighborhood unit as part of the urban public space, which includes

<sup>4</sup> Order No.393. Regulations on Protecting Historical Famous Towns and Villages[S]. Beijing:State Council , 2008.

<sup>5</sup> Ban, Gu. Book of Han[EB/OL]. <http://ctext.org/han-shu/di-li-zhi-xia/zhs>. Jun,2016

<sup>6</sup> World, Heritage, Encyclopedia. PUBLIC SPACES[J/OL]. [http://www.gutenberg.us/articles/public\\_spaces](http://www.gutenberg.us/articles/public_spaces). Jun,2016

neighborhood park, Community square, courtyard and public passageway etc. Meanwhile, in today's developed urban public space, the neighborhood unit is no longer confined to the residential area, but also extended to historic and business districts. Therefore, the ordinary concept neighborhood unit contains three features,

A. Neighborhood unit is considered to belong to urban public space, and at the lower level of urban public space.

B. In neighborhood unit, there only limited public services will be provided. In the space of neighborhood unit where is based on universality, accessibility and portability, neighborhood unit provides space for local residents.

C. Neighborhood unit is substantially smaller than large public open space, belongs to the urban public space in the foundation part. neighborhood unit is mainly distributed in residential areas, office areas and commercial areas.

Based on the laws of Taiyuan and the neighborhood unit needs, it is possible to identify several characteristics a neighborhood unit should have:

A. Fully open to the public.

B. The area where residents can easily get to.

C. From 50 square meters to 10,000 square meters.

D. Service radius in community area is less than 500 meters.

E. This area allows for residents to walk between their homes to the neighborhood unit.

In the early neighborhood unit of China, the urban planning department lack of consideration on community environment and housing, which lead to historic district became the "slum". As time passed by, the economics of China has been developing rapidly since the 21th century, many various urban public construction projects were spurred by this pheromone as well. People began to focus on community environment in

old residential and historic districts. During the period of neighborhood unit development in the world, transformation community environment has become the main themes (Figure 1.6 Sustainable Neighborhood Unit). Landscape architects make full use of existing areas to reconstruct ecological and livable civic environment.

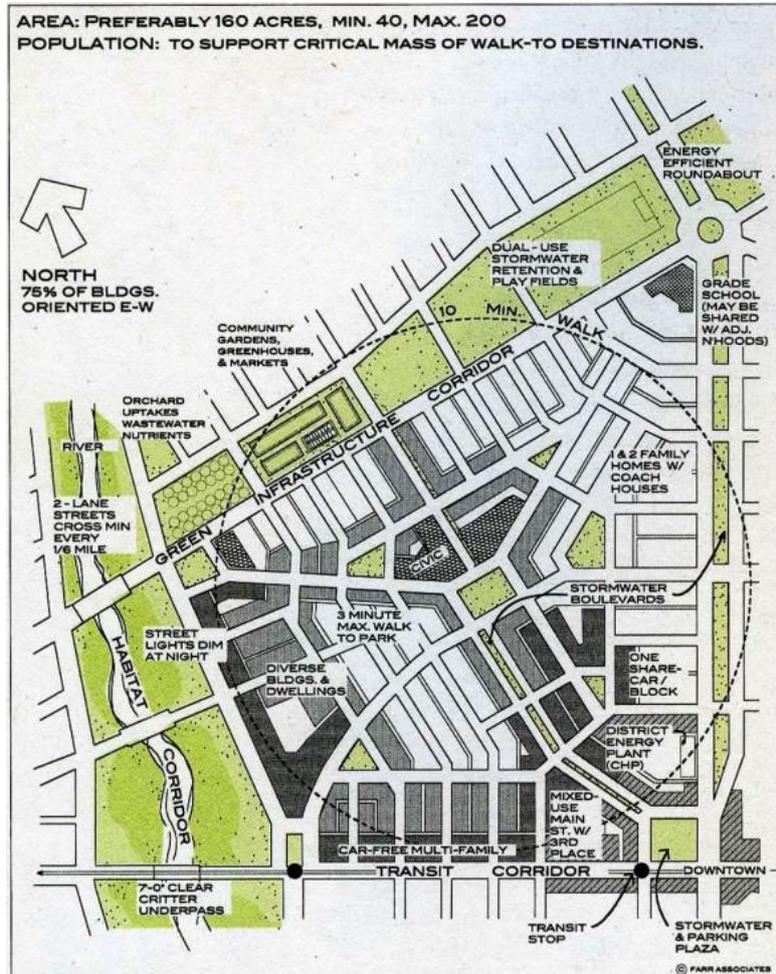


Figure 1.6 Sustainable Neighborhood Unit

Source: <http://bettercities.net/images/18849/sustainable-neighborhood-unit>

### 1.3.4 Underground space

The development of underground space have experienced a long and tortuous history, Cut a house cave<sup>7</sup> is the early human practice of underground space development (Figure 1.7 Cave Dwelling in Qikou Ancient Town, Shanxi Province, China). The techniques of European underground space development were transformed during the 17<sup>th</sup> and 18<sup>th</sup> centuries by use of gunpowder and by the substantial progress of steam engine. For instance, the

<sup>7</sup> Culture, Ministry, of, China. Ancient underground courtyards sinking out of sight[EB/OL]. [http://www.chinaculture.org/gb/en\\_curiosity/2006-02/14/content\\_79287.htm](http://www.chinaculture.org/gb/en_curiosity/2006-02/14/content_79287.htm). Jun,2016

Thames tunnel<sup>8</sup> was the first tunnel known to have been constructed, and was built between 1825 and 1843 (Figure 1.8 Thames tunnel in London, UK).

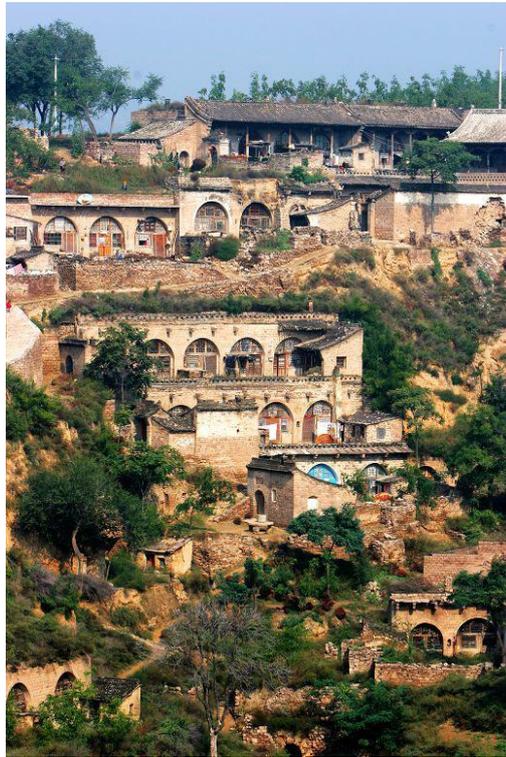


Figure 1.7 Cave Dwelling in Qikou Ancient Town, Shanxi Province, China

Source: <https://de.pinterest.com/pin/74168725088986432/>



Figure 1.8 Thames tunnel in London, UK

Source: <https://de.pinterest.com/pin/500532946068990270/>

The urban underground space development. Through the point of departure of the first

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<sup>8</sup> Brunel, Museum. The Thames Tunnel[EB/OL]. <http://www.brunel-museum.org.uk/history/the-thames-tunnel/>. Jun,2016

London underground railway,<sup>9</sup> cosmopolitan cities began to walk the way of developing the urban underground space. Underground space development program is to provide services for traffic improvement. The development of traffic infrastructure of the world, It makes great efforts to prompt greatly the development of economics and society. Since 1930, Japan has been developing retail business in urban underground space, and this developed a new area for underground space development (Figure 1.9 Tenjin underground city in Fukuoka, Japan). Underpass network, underground railway traffic network, underground road network, underground car parks and overground spaces. The above several networks are combined to produce an architecture complex and improved the utilization rate of the public facilities. The approach to simulate overground environment and makes people immersed in it, which is achieved through the following elements: air conditioner system, lighting system, interior design, landscape architecture and intelligent management system, etc.

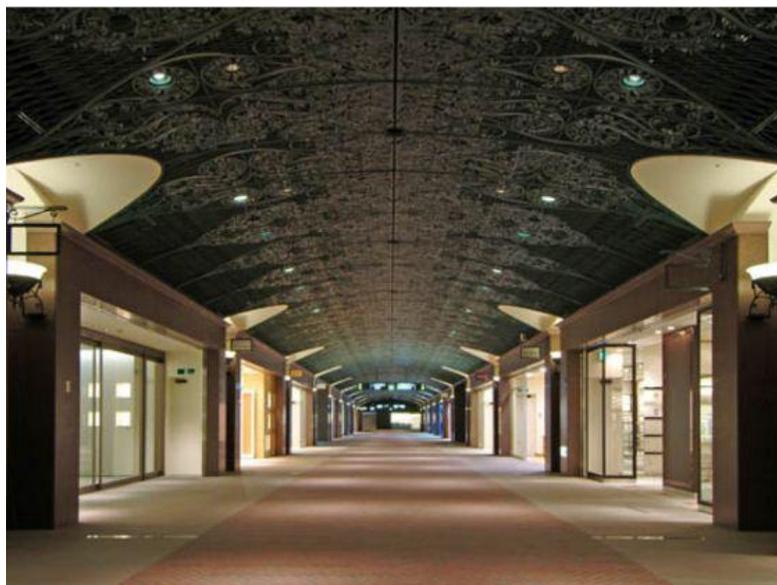


Figure 1.9 Tenjin underground city in Fukuoka, Japan

Source: <https://de.pinterest.com/pin/74168725088986432/>

From the end of the Second World War to the end of the Cold War to the dawn of the 21<sup>th</sup> century, the role of underground space has evolved. Underground space development got an unprecedented development in the urban development (Figure 1.10 Leipzig Hauptbahnhof).

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<sup>9</sup> Boris, Johnson. Annual Report and Statement of Accounts[R]. London:Transport for London, 2015. 4



Figure 1.10 Leipzig Hauptbahnhof

Source: <https://de.pinterest.com/pin/536913586807576138/>

### 1.3.5 Green wall

Green wall (Figure 1.11 Green wall) is a form of vertical greening, it is combined with vegetation, soil irrigation system and support structure. The green wall is famous for its alias, the vertical gardens. American landscape architect Stanley Hart White, He is considered to have invented the first green wall.<sup>10</sup> The green wall can be attached to interior or outside of existing wall.



Figure 1.11 Green wall

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<sup>10</sup> Richard Hindle. Reconstructing the 'Vegetation-Bearing Architectonic Structure and System (1938)'[EB/OL]. <http://www.grahamfoundation.org/grantees/4834-reconstructing-the-vegetation-bearing-architectonic-structure-and-system-1938>. Jun, 2016

Source: <https://de.pinterest.com/pin/536913586807576138/>

Along with the development of urban construction, and amelioration of environment, urban renewal and transformation is the trend of urban construction and development, it can not be avoided, and it is the inevitable process of urban development. Green wall in demand is also changing. The green wall has many functions that make the urban environment improved easily. The green wall function basically has the following several:

Increase the green coverage. According to available information, only when the green area accounts for 40% of the total community area, the environmental quality of the residential area is better. <sup>11</sup> At the present time. In the process of the rapidly developed China's urban construction, the urban planning manager have appeared lack of experience, more than 40% land is used as residential construction, and the present green area is in serious shortage in many cities of China, because of the severe extensive utilization of land and the wasting phenomenon. With development of living standard of China, the improvement of community space environmental becomes a pressing need. Historic district renewal as a very important in the development and construction of the city. How to make the historic district be regenerated, it is a major social issue of many cities. The practices show that the green wall is especially adapted for use in improving the environment of a historic district. The green wall makes good use of the vertical surface area, It is extremely drought tolerant and thrives in semi-arid areas. Therefore, the green wall is one which can save space but also a good way to increase the green area. (Figure 1.12 The application of green wall in a historic preservation project).

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<sup>11</sup> Huang Jun, Lu Mingqi. Material Selection and Construction of Green Wall[J]. Landscape Architecture, 2010, 1(6): 45-46

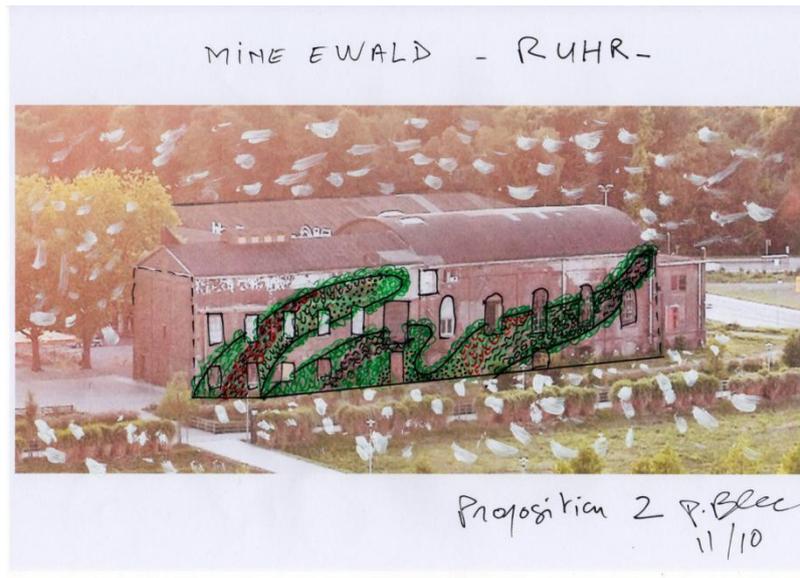


Figure 1.12 The application of green wall in a historic preservation project

Source: <http://www.verticalgardenpatrickblanc.com/node/4496>

A. Alleviate the urban heat island effect, reduce building energy consumption. The exploration and practice of the green wall in the recent years show that the green wall has high accurate and the application promotion value. The green wall could reduce hazards of radiation to buildings and people. The green wall could reduce overall temperatures of the building, it is an effective way to improve interior comfort and reduce the using of an air-conditioner. Wind speed has decreased evidently in the front of the green wall, therefore the building's wall could be protected widely. The green wall is beneficial to the reduction of heat island effect, have a clear role in regulating atmospheric temperature. Green wall as a protective layer, and keeps the building's surface temperature variation which was less than 4 °C.<sup>12</sup>

The green wall could effectively decrease the intrusion of external noise. In the streets outside the buildings, the air smelled like smoke and roared with noise. When the noise gets to people's ears can amount to 70 decibels or more, which can increase the risk for hearing loss and damage to the heart. A green wall is a new form of the sound deadening mat that has improved noise reducing properties and is greener than conventional materials (Figure 1.13 Green noise barrier).

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<sup>12</sup> Ong, B. Green plot ratio: an ecological measure for architecture and urban planning. *Landscape and Urban Planning*[J]. ScienceDirect database, 2003, 63(4)



Figure 1.13 Green noise barrier

Source: <http://www.urbangreenbluegrids.com/measures/1826-2/>

The utilization of green wall not only increases the expressive power and sense of the beauty of buildings, but also gives vitality and infectivity to architecture. Therefore, the green wall has become the important element of landscape design projects (Figure 1.14 Green wall can beautify the exterior wall of building).



Figure 1.14 Green wall can beautify the exterior wall of building

Source: <https://de.pinterest.com/pin/300404237627025583/>

The green wall is applied in construction and reconstruction project more and more widely.<sup>13</sup> Many green walls have been used for the reconstruction of the walls of the old

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<sup>13</sup> Airport World. An increasing number of airports are investing in vertical gardens and living walls to create a unique

buildings. The green wall can be used to rebuild the walls effectively and quickly, to improve the aesthetics (Figure 1.15 Green wall have been used in the historic architecture protection project).



Figure 1.15 Green wall have been used in the historic architecture protection project

Source: <https://de.pinterest.com/pin/300404237627025583/>

The historic district consists of old buildings and of narrow streets full of petrol fumes and coal dust. It can be overwhelming to walk through the narrow street, and so people will feel relaxed and comfortable more if the buildings on either side were already covered by vegetation.

## 1.4 SIGNIFICANCE OF RESEARCH

### 1.4.1 Make full use of existing public space

With the rapidly changing of a modern city. The Protection of the historic district is not a rigid and static strategy. The vitality of the historic district is more important. Through introducing the theory of “Urban spatial reconstruction of historic district”, this idea explore how the new spaces stimulate new energy under the background of Yongding Road historic district development in the Taiyuan City, and make the historic district becomes a livable “home” not only in culture but also in social and environmental aspects.

### 1.4.2 Provide local residents with livability environment

Taiyuan is a city of China, which has more than 2500 years history. In the city, there are numerous historical districts, all of which are long history's testimony. (Figure 1.16 The existing historic buildings in Taiyuan) However, the Yongding Road historic district has the unusual significance regarding the city of Taiyuan. The Yongding Road historic district, which has witnessed the prosperity and decline of Taiyuan near millennium, are the resident economic activity and social cultural event stage.

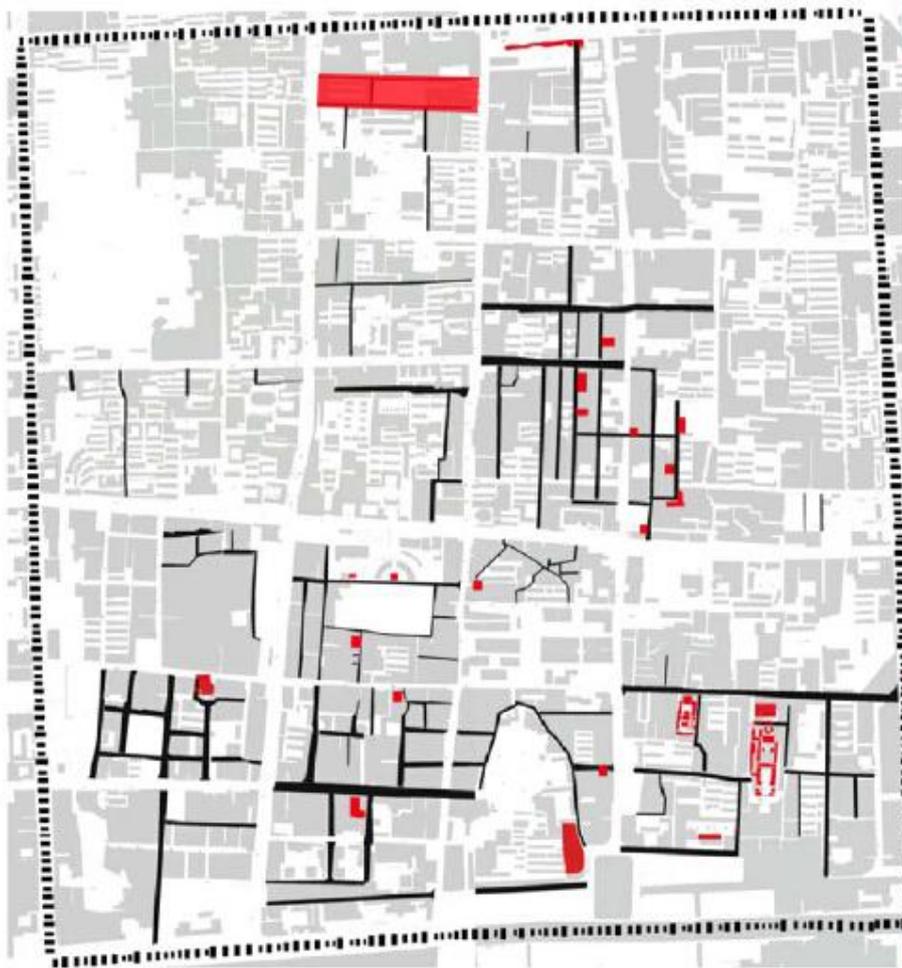


Figure 1.16 The existing historic buildings in Taiyuan

Source: Li Zhenyi. Research on the "T-shaped crossing" Pattern of Traditional Streets in Taiyuan.[J].Xi'an: Xi'an University of Architecture and Technology,2011:38.

But Yongding Road historic district's narrow space, unenlightened transportation and other questions caused Yongding Road historic district's living conditions to be less optimistic and rich people moved out, which mainly caused Yongding Road historic district

became to the reputation of a slum. As the increasing development of the city in Taiyuan, massive urban renewal makes the Yongding Road historic district suffered the serious impact.

Therefore, this article decides to conduct the exploration research to historic districts “Urban Spatial Reconstruction” pattern and intends to view of the Yongding Road historic district in the existing streets and public open spaces pattern system. Finally, The urban spatial reconstruction of historic district will provide local residents with a livable environment in Yongding historic district.

## **1.5 RESEARCH METHODS**

Urban spatial reconstruction research of Yongding Road historic district based on landscape architecture as the topic, in order to “ask questions - analyze problems - solve problems” (Figure 1.17 Research route) as the main line analysis studies. From the perspective of “revitalize the neighborhood unit”, through the analysis of “development of underground space” and “green wall” of the three aspects, and combining with landscape architecture, urban planning, architecture of the relevant theoretical knowledge to analysis and study of Yongding Road historic district feature of Taiyuan, by studying a large number of literature, field survey, analysis of present situation and problems of the Yongding Road historic district, according to these problems, design principles and design method, finally provide a design proposal for Taiyuan urban planning bureau.

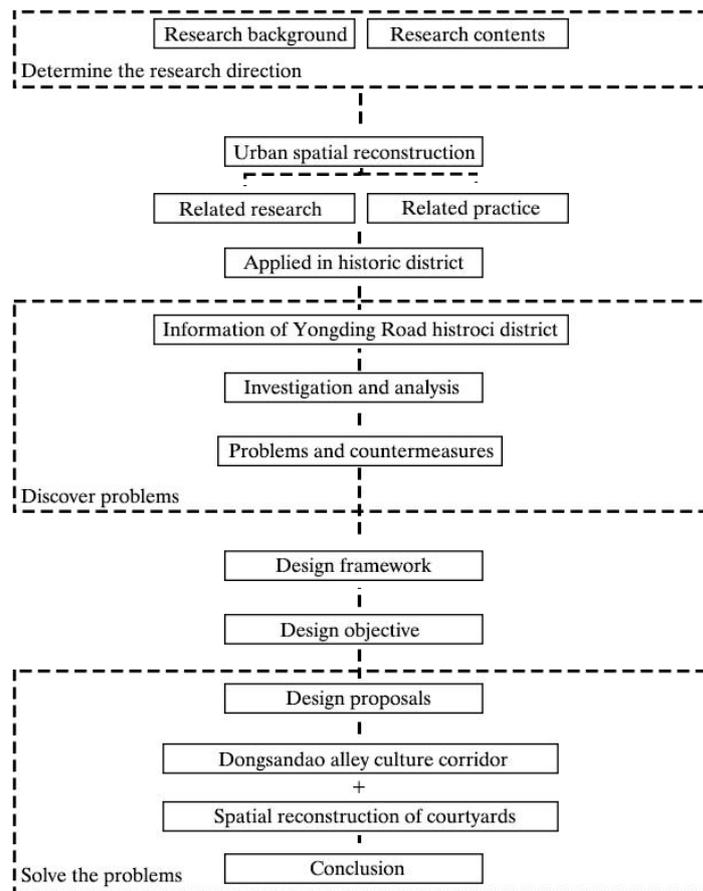


Figure 1.17 Research route

Source: Author

## 1.6 RESEARCH FRAMEWORK

Paper the research method as follows:

Chapter one introduction: research background and significance, the overview of urban spatial reconstruction, framework and methods in the study of this article.

The second chapter of the evolution of the existing public open space at landscape architecture and the related theory, through the analysis of the excellent example of landscape architecture, the commonness of good examples, provide the reference for Yongding Road historic district spatial reconstruction design proposal.

The third chapter from the perspective of “Urban Spatial Reconstruction” research of Yongding Road historic district’s public open space. Through to the public open space layout of the current situation, and the existing public open space of several representative field investigation and study, sums up the characteristics and problems of Yongding

historic district's public open space, according to the characteristics of the problem and analyze the reasons.

The fourth chapter According to the characteristics of the Yongding Road historic district, the existing public open space and problems, provide rational design proposal for the Yongding Road historic district. The aim of this design proposal is to set out the designer's ambitions for the Yongding Road historic district. It provides a framework for prospective developers to respond to, highlighting all the essential issues that need to be addressed in any forthcoming scheme.

The fifth chapter summarizes the research achievements of this paper and the breakthrough point, and the deficiency existing in the article and hopes to improve in the future prospected.

## 2. CASE STUDY ON URBAN SPATIAL RECONSTRUCTION

### 2.1 Related research

#### 2.1.1 The protection of historic districts

The protective measures for the historic district is a core element of the “Athens Charter”, International Congresses of Modern Architecture(CIAM) in 1933.<sup>14</sup> This is the underlying spirit of the concept of the “Historic District”. The international council on monuments and sites(ICOMS) Passed the “Venice Charter” in 1964, the “Venice Charter” defines the historic district as a complete preservation of ancient buildings. It is emphasizes the particular importance of the environment in historic districts.<sup>15</sup> According to the “Washington Charter” of the year 1987 by ICOMS, the historic district is the historical areas in towns and cities, the historic districts not only serve as a witness to the development of the city’s history and society but also embodies the core value of city’s traditional culture.<sup>16</sup>

During the development of cities, the urban renewal theory’s urban development-leadership role experienced the course of the sprout, formation, development, and perfection. After the second world war, Through the long-term practice research, the urban renewal concepts of the developed countries has transformed greatly. The urban renewal of cultural heritage has been changed from the reconstruction of a single building into the reconstruction of a historic district. Large-scale reform is unrealistic, the historic district needs more humanistic care and spiritual care. The historic district as an urban cultural symbol, it is the carrier of humanistic spirit. Since the 1960s, in the construction of cities, it is important to inherit the historical tradition and develop the international influence of the city’s culture. Therefore, in the process of city construction and internal reform, excavate cultural connotation and protect historical and cultural heritage is to become an international consensus. In the 1980s, the international community has reached a series of

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<sup>14</sup> Curtis. Modern Architecture since 1900[M]. London:Phaidon Press, 1986. 173

<sup>15</sup> ICOMOS. The History of the Venice Charter[EB/OL]. <http://www.icomos.org/venicecharter2004/history>. Jun, 2016

<sup>16</sup> ICOMOS. Charter for the Conservation of Historic Towns and Urban Areas(Washington Charter 1987)[EB/OL]. [http://www.icomos.org/charters/towns\\_e](http://www.icomos.org/charters/towns_e). Jun, 2016

international conventions, in order to deal with the destruction of urban development to historic district protection. Those international instruments become a universal international standard of the historic district protection and development. According to the conclusions of this study have the following 8 documents:

A. The United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1964 published “The Venice Charter for the Conservation and Restoration of Monuments and sites” (Venice Charter). This chapter discusses the necessity importance and urgency of the historic district, the monuments means not only the historic buildings but also the traditional feature and the special local culture in a certain period.<sup>17</sup>

B. According to a 1968 UNESCO report called “Recommendation concerning the Preservation of Cultural Property Endangered by Public or Private works”, this report proposes the definition of cultural heritage and clear on the principle of protection of cultural heritage.<sup>18</sup>

C. A report published by UNESCO in 1972 had established the principle of constructive protection of cultural heritage.<sup>19</sup>

D. The report “Nairobi Recommendation” identifies the role and value of protection of the historic district , was introduced by UNESCO in 1976.<sup>20</sup>

E. The “Washington Charter” of the revised The International Council on Monuments and Sites (ICOMOS), which had come into force on 1 October 1987, established the general principles of protection and development for the ancient town and historical cultural.<sup>21</sup>

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<sup>17</sup> UNESCO. The Venice Charter[Z]. 31 May, 1964

<sup>18</sup> René Maheu. Recommendation concerning the Preservation of Cultural Property Endangered by Public or Private works[R]. Paris:UNSECO, 19, Nov,1968

<sup>19</sup> René Maheu. Recommendation concerning the Preservation of Cultural Property Endangered by Public or Private works[R]. Paris:UNSECO, 16, Nov, 1972

<sup>20</sup> Amadou Mahtar M Bow. Nairobi Recommendation[R]. Paris:UNSECO, 22, Nov, 1976

<sup>21</sup> ICOMOS. The Washington Charter[Z]. 1 Oct, 1987

F. The counter, measures and methods to heritages and monuments protection were confirmed by the “Xi’an Declaration” enacted by the ICOMOS on the 22 October 2005.<sup>22</sup>

G. The “Vienna Memorandum” was an assembly’s result signed by UNESCO on 14 May 2005, the memorandum in order to explain the key concept “Historic Urban Landscape” (HUL) for integrated method connecting the contemporary architecture, sustainable urban development and landscape design based on existing historic building and district.<sup>23</sup>

H. The “Recommendation on the Historic Urban Landscape” was approved by the UNESCO on 10 November 2011. The recommendation of the draft has made the clear and unambiguous definition of the term “HUL” as well as the practical methods for rational protection and effective management of HUL.<sup>24</sup>

Compare the international community, the protection of historic district started later in China, many problems are exposed in the course of urban development, but a number of relevant laws and regulations have been implemented in the last 30 years, it makes a great progress. The term “Historic traditional district”, which was put forward by China’s Ministry of Housing and Urban-Rural Construction (MHURC) in 1985, simply means that the historic traditional district is a block where the heritage and monument already exists. The lists of the “Major Historical and Cultural Site Protected” were published by local governments. The following were the 4 main laws and regulations on the protection of historic district in China:

A. The “Management Measure for Historical and Cultural Protection in Tunxi Street Historic District” issued in 1997 by MHURC, according to the government policies and the public needs, the management measure establishes the protection principle and the method of the historic district, and gives an evolutionary and small-scale scheme for protection and development of the historic district.<sup>25</sup>

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<sup>22</sup> ICOMOS. The Xi’an Declaration[Z]. 22 Oct, 2005

<sup>23</sup> Koichiro Matsuura. Vienna Memorandum[R]. Vienna:UNSECO, 14, May, 2005

<sup>24</sup> UNESCO. The Recommendation on the Historic Urban Landscape[Z]. 10 Nov, 2011

<sup>25</sup> MHURC. The Management Measure for Historical and Cultural Protection in Tunxi Street Historic District[Z]. 5 Mar,

B. The “Law of the People's Republic on the Protection of Cultural Relics” was promulgated by China’s State Council on 19 November 1982, so far, it has existed for 34 years. This Act adopts this statutory term “Historic district”, and the list of historic districts was provided by the local governments.<sup>26</sup>

C. MHURC promulgated the “Measures for the Administration of City Purple Lines ” on 1 February 2004, this Act establishes the concept of city purple lines. This requires the urban planners comprehensive consideration the protection of historic district.<sup>27</sup>

D. According to the “Code for the planning of preservation of historic cities”, it defines that the contents and depth of the planning for the historic district. This standard was issued by MHURC in 2005.<sup>28</sup>

Historic district as a witness to the development of city and human society, it is the symbol of urban history, advancements of social politics, economy, science, technology, Ideology and culture. Therefore, the protection for historic districts is very important for us. It is not only to protect a historic district, but also the urban historic culture.

### **2.1.2 The integration of neighborhood units**

Urban public space is the main location of human activities, also a big system including the cultural and natural environment. Urban public space belongs to the space category, and it is the area contains lots of population and infrastructures. The land is the basis of activities for human beings, the urban public space is the result of economic development in human society. The scenes of urban public space always show to what extent the economic, cultural, environmental and social development has reached in a region, and it also decides the basis and platform of social, economic, cultural and environmental development. According to German architect Robert Krier, the urban public space as

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1997

<sup>26</sup> China’s State Council. The Law of the People's Republic on the Protection of Cultural Relic[Z]. 19 Nov, 1982

<sup>27</sup> MHURC. The Measures for the Administration of City Purple Lines[Z], 1 February 2004

<sup>28</sup> GB50357—2005. Code for Planning of Preservation of Historic Cities[S]. Beijing: Standards Press of China , 2005.

defined is one where between buildings incites and other localities. This space is geometrically bounded by a variety of elevations. It is only the clear legibility of its geometrical characteristics and aesthetic qualities which allow us consciously to perceive external space as urban space.<sup>29</sup> Simply stated, Urban public space, it means space can be perceived directly, it consists of three main parts: urban public open space, neighborhood unit and architectural interior space.(Figure 2.1 The system of urban public space)

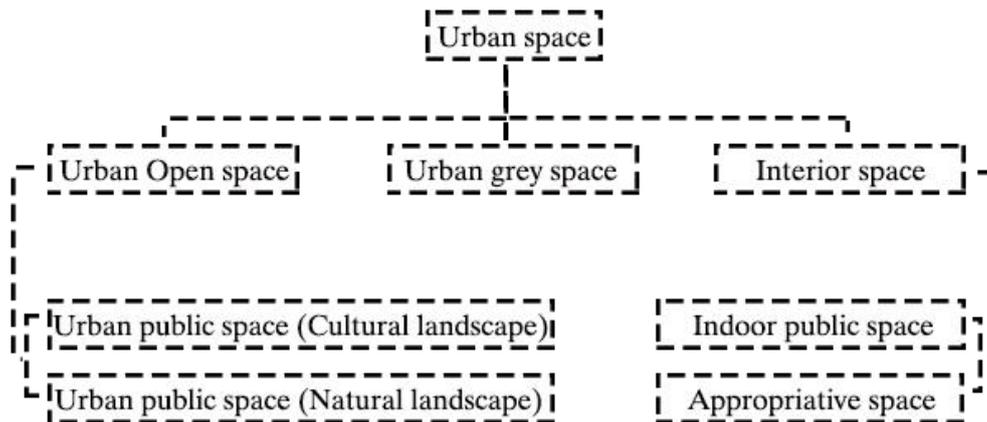


Figure 2.1 The system of urban public space

Source: Author

Since human being entered into the civilized society, the neighborhood becomes one of the essential parts of the lifestyle of human-being. (Figure 2.2 The traditional homestead layout of African tribe) Neighborhood unit was constructed out of mankind's need for secure, for social events, for economic development. Neighborhood units are the place where the social activities are mainly conducted. Therefore, the square in the center of a primitive tribe, that is the earliest known neighborhood unit. <sup>30</sup>

<sup>29</sup> Robert Krier. Urban Space[M]. London:Academy Editions, 1991. 15

<sup>30</sup> Hong Liangpin. The Process of Urban Design[M]. Beijing: China Architecture & Building Press, 2002. 13

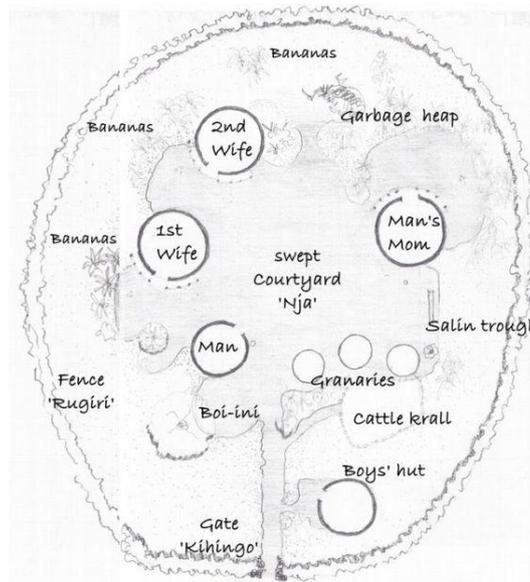


Figure 2.2 The traditional homestead layout of African tribe

Source: <https://de.pinterest.com/pin/478085316674690956/>

The urban development is the course of the development of human residential environment, the symbol of social development. The sustainability of the city is an important part of sustainable development of the entire society. In the process of city development, every city has its unique history, cultural tradition, customs, environment, which find reflections in its neighborhood unit. The neighborhood unit as the basis of the urban public space, its do reflect the lifestyle of local residents. It is a direct portrayal of the social and historical development of a city.

Clarence Perry, an American planner, first brought forward “The Neighborhood Unit” as a kind of changes in the structure of urban space related to the urban transportation systems.<sup>31</sup> This theory was intended to provide the resident with a more habitable area. <sup>32</sup> Perry’s definition of neighborhood unit is a public space of residential area to offer outdoor interactive places for residents and visitors.<sup>33</sup> He thought that the public life and neighborhood unit have a huge amount to say to one another. The rational planning of neighborhood unit system can decrease “urban diseases” phenomenon, and promote the

<sup>31</sup> Banerjee T, Baer W. Beyond neighborhood unit: Residential Environments and Public Policy[M]. New York: Plenum Press, 1984. 1-11

<sup>32</sup> Perry C. Neighborhood unit[M]. London: Routledge/Thoemmes, 1998. 25-44

<sup>33</sup> Larry Lloyd Lawhon. Neighborhood unit: Physical Design or Physical Determinism?[R]. Manhattan: Kansas State University, 2009

same neighborhood relation development.<sup>34</sup> However, The original intent of city neighborhood theory was to provide rational and planning for residential area, it does not cover aspects of urban planning. But what really caught academic attention was a book called “The Death and Life of Great American Cities”, written by Jane Jacobs.<sup>35</sup> Jane Jacobs was an American journalist, author, and activist.<sup>36</sup> She studied the basic framework of urban spatial form, and the role that those played in urban development. In the landscape architecture theory, “figure-ground relation” is a very important part.<sup>37</sup> The “ground” means a large square or city park. And, the number and area of city parks were relatively less and large. Therefore, the city parks and large squares for the community do not suffice for the need of the outdoor activities. In order to reshape the features and characteristics of a city, improving the inhabitants’ quality, particularly the construction of the neighborhood unit is very important. Based on this theory, scholars have launched a series of study about it. With wide coverage and involve many fields, here are four representative results in this area.

A. Visual aesthetics: from the theory of typology, through the observation of actual landscape spatial elements. This type of research summarizes the effects of spatial elements on neighborhood unit, it puts forward design strategy to guide neighborhood unit design of urban public space to create its own development model. Camilo Sitte, the originator of typology.<sup>38</sup> Based on different urban space, He analyzed visual aesthetic research for his book “City Planning According to Artistic Principle”. Based on human visual and psychological feelings, he brings forward the importance of enclosed space and organization. Camilo Sitte’s theory of urban planning was put forward in the 19<sup>th</sup> century, it has a deep influence in architecture and landscape architecture, but as a result of the

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<sup>34</sup> Vidyarthi Sanjeev. Inappropriately Appropriated or Innovatively Indigenized?: Neighborhood Unit Concept in Post-independence India[R]. Chicago: Department of Urban Planning and Policy, University of Illinois at Chicago, 2010: 260-276

<sup>35</sup> Peter Dreier. Jan Jacobs’ Radical Legacy[EB/OL]. <http://www.nhi.org/online/issues/146/janejacobslegacy.html>. Jun, 2016

<sup>36</sup> Douglas Martin. Jane Jacobs, Urban Activist, Is Dead at 89[N]. The New York Times, 26 Apr, 2006

<sup>37</sup> Borden D Dent. Visual Organization and Thematic Map Design[M]. Washington: Annals of the Association for American Geographers, 1972. 79-83

<sup>38</sup> Arch Inform Database. Regierungsrat Camilo Sitte[EB/OL]. <https://eng.archinform.net/arch/2690.htm>. Jun, 2016

specific historical and cultural backgrounds, it did not attract more people's attention at that time. Finally, the book was translated into English until 1945.<sup>39</sup> Then an American urban planner called Edmund Norwood Bacon. He formed his own unique concept of "Understanding Cities" on the basis of learning from Camillo Sitte's theory, and combined with his own research and practices about the traditional public space. He is a great urban planner, the construction of the Philadelphia has made outstanding contributions. He extended the visual aesthetic to the new level of dynamic space observation. Therefore, he was called as "The Father of Modern Philadelphia".<sup>40</sup>

B. Space perception: Kevin Andrew Lynch, an American urban planner and author.<sup>41</sup> In Lynch's most famous work, "The Image of The City", he noted that whether the environment can be accepted by people highly depends on the feeling and experience of people to architecture and environment. This simply is Spatial identity.<sup>42</sup> In his theory, it takes the relationship between people and environment to an entirely new level. He presents the concept of the environmental awareness of people, Lynch also coined the terms "imageability" and "wayfinding".<sup>43</sup> After Kevin Andrew Lynch, Scholars have ascended people's perception of the environment to the social and emotional development. Edward Relph, he is a Canadian geographer. In his "Place and Placelessness" theory, he points out that the core of urban public space is affinity, which made the people and environment into a direct and obvious contact.<sup>44</sup> In fact, as Stephen Carr explains in his book "Public Space", various images construct the public space of various literary interest.

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<sup>39</sup> Leif Jerram. From Page to Policy: Camillo Sitte and Planning Practice in Munich[EB/OL]. <http://www.arts.manchester.ac.uk/subjectareas/history/research/manchesterpapers/>. Jun, 2016

<sup>40</sup> Greg Heller, Ed Bacon. Planning, Politics, and the Building of Modern Philadelphia[M]. Philadelphia: University of Pennsylvania Press, 2013. 17

<sup>41</sup> MIT Libraries. Preliminary Inventory the Papers of Kevin Lynch[EB/OL]. <https://libraries.mit.edu/archives/research/collections/collections-mc/mc208.html>. Jun, 2016

<sup>42</sup> Lynch Kevin. The Image of The City[M]. Cambridge: MIT Press, 1960. 8

<sup>43</sup> Lynch Kevin. The Image of The City[M]. Cambridge: MIT Press, 1960. 4

<sup>44</sup> Edward Relph. Place and Placelessness[EB/OL]. [http://www.arch.ksu.edu/seamon/place\\_%26\\_placelessness\\_classic\\_texts.pdf](http://www.arch.ksu.edu/seamon/place_%26_placelessness_classic_texts.pdf). Jun, 2016

There is three positive correlation between resident and neighborhood unit. First, how to suit behavior and characteristic of resident the creating perfect environment. Second, neighborhood unit is a group of places, it has all sorts of social relations between the community. Third, neighborhood units are playing an important role in the environment construction of cities, and the neighborhood unit is an important constituent of culture for the city.<sup>45</sup>

Behavioral and psychological factors: As the carrier of cultural and social activities, the neighborhood unit has important implications on human social behavior. The Danish architect Jan Gehl, according to the different human activities, the activities are divided into three types: the essential activities, spontaneous activities and social activities. All kinds of human behaviors and physiological status are affected by living environment, He said. The local government should create the high-quality public space for the local residents to engage in social movements and partnerships.<sup>46</sup> William H. Whyte was an American urban theorist, through his observations of human behavior in urban settings, he summed up the urban public space can not only to promote the social activities but also realize the urban development.<sup>47</sup> Such as, a good urban public space should have the free walking condition and a suitable environment for social activities.<sup>48</sup> The American sculptor Alexander Calder<sup>49</sup> proposes the geometric center and space boundary are the most important elements in his public space theory and uses it in the practice of public sculpture.(Figure 2.3 Mies van der Rohe. Flamingo by Alexander Calder) In his opinion, the main reasons that caused social activities were the border between public space and residential area.<sup>50</sup> Some other scholars thought that the neighborhood unit is the most vigorous

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<sup>45</sup> Stephen Carr. Public Space[M]. Cambridge: Cambridge University Press, 1993. 3-22

<sup>46</sup> New York City Department of Transportation. New York City DOT releases World Class Streets Report, Calling for Enhanced Public and Pedestrian Space[R]. New York: New York City Department of Transportation, 14 Nov, 2008

<sup>47</sup> Michael T. Kaufman. William H. Whyte, 'Organization Man' Author and Urbanologist, Is Dead at 81[N]. The New York Times, 13 Jan, 1999.

<sup>48</sup> Project for Public Spaces. William H. Whyte[EB/OL]. <http://www.pps.org/reference/wwhyte/>. Jun, 2016

<sup>49</sup> Ordovas. Calder in India[EB/OL]. <http://www.ordovasart.com/exhibition/calder-in-india/>. Jun, 2016

<sup>50</sup> Andres Pardey. Swing Low, Sweet Chariot: Kinetic Sculpture and the Crisis of Western Technocentrism[EB/OL]. <http://www.mdpi.com/2076-0752/4/3/75>. Jun, 2016

component of urban public space, and it is sure to play an important role for promoting social communication.<sup>51</sup>



Figure 2.3 Mies van der Rohe. Flamingo by Alexander Calder

Source: <https://de.pinterest.com/pin/40884309093192359/>

C. Public space: Ali Madanipour, the British urban planner, said, the publicity is the chief characteristics of public space, and the public space should serve the people of this city.<sup>52</sup> Meanwhile, accessibility is an important factor in public space planning. Accessibility can be further divided into three levels: vision accessibility, space accessibility and physical accessibility. Vision accessibility means the public space have a strong visual appeal. Space accessibility means the public space rather appeals to residents and visitors. Physical accessibility means the public space is easily accessible by foot, bike, public transport or car.

Meanwhile, all governments in Europe give high attention to the neighborhood unit in a historic district, have issued a series of policies and measures, to improve the environment quality. Therefore, the government should provide the safe and enjoyable public space to the people has become a consensus of all countries. Social activities are the human's free choice and should not have interfered with the business, municipal construction and politics. For this reason, a number of countries have taken a number of measurements to

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<sup>51</sup> Banerjee T. Baer. Beyond the Neighborhood Unit: Residential Environments and Public Policy[M]. New York: Plenum Press, 1984. 1-11

<sup>52</sup> Newcastle University. Professor Ali Madanipour[EB/OL]. <http://www.ncl.ac.uk/apl/staff/profile/alimadani.html#background>. Jun, 2016

improve the accessibility of public space. Some cities have started to build amount of neighborhood unit in historic district, the neighborhood unit helps to enhance the city vitality.

### **2.1.3 The development of underground space**

The land surface system is a complicated system which includes lithosphere and atmosphere. The surface of lithosphere has been breaking down gradually into soil.<sup>53</sup> The weathering form kinds of soil-forming material, the surface of the land is covered by soil. Under the natural state, there is not space in the lithosphere. If the local government wants to make use of the vertical space, the government must develop the urban underground space.

In the development and construction of the city, renovation of historic district has become a problem. With the development of a city, the development of historic district is facing many problems, such as old infrastructure facilities, narrow streets, dilapidated buildings, and traditional courtyard layout. So how to protect and develop the historic district has become an important direction of underground space development research.

In the course of historic district protection, the most central and obvious difficulty and contradiction are not enough public space in the historic district. The excessive development and reconstruction of the overground will destroy the environment, style and features of the historic district to some extent. Under the premise of protecting the urban traditional layout. Meanwhile, the government must insist on the effective use of underground space, such as the construction of the underground garage, underground tunnel and underground market.(Figure 2.4 Underground car park, underground tunnel and underground market) This measure will not only solve the traffic, environment and land shortages problems but also protect the landscape and feature of historic district. Meanwhile, make full use of underground space of historic buildings, in this way, the more space can be expanded without affecting the appearance of buildings.(Figure 2.5 The entrance of Louvre museum)

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<sup>53</sup> American Museum, of, Natural, History. EARTH: INSIDE AND OUT[EB/OL].  
<https://www.amnh.org/learn/resources/earth.pdf>. Jun,2016



Figure 2.4 Underground car park, underground tunnel and underground market

Source: <https://de.pinterest.com/pin/344947652688323312/>  
<https://de.pinterest.com/pin/469078117409596916/>  
<https://de.pinterest.com/pin/474074298250701322/>



Figure 2.5 The entrance of Louvre museum

Source: <https://de.pinterest.com/pin/321585229617295722/>

Through research and access to relevant literature reference, finally, I summed up the development trends of underground space in the world:

A. Comprehensive use of underground space: this method is able to optimize the allocation of underpass system, underground rail traffic system and underground tunnel system. It is an opportunity to combine underground space and overground space, and promote the development of a city. The underground complex can make full use of the potential of underground space. The end result is a much more efficient use of land resources. At broad, underground complex has been constructed in many cities and has achieved desirable results.

B. Develop to deep underground: With the deepening of urbanization, more and more cities develop to deep underground. With the development of technology and equipment, construction technique for underground space has been greatly improved. At the same time, advanced construction technique may promote the public service development of underground space, it has a good prospect for the development of underground space.

Make a natural environment: during the development of underground space, today designer pays more and more attention to creating the natural and lively atmosphere in underground space.(Figure 2.6 Expo Axis) Therefore, the control of underground space micro-climate often realized by control of the air conditioners and lighting equipment. Even by means of some techniques and design, to give the underground space of the introduction of sunlight, fresh air and rainwater.<sup>54</sup>



Figure 2.6 Expo Axis

Source: <https://de.pinterest.com/pin/421860690065210826/>

<sup>54</sup> Ztlighting. Shanghai Expo Axis[EB/OL]. <http://www.ztlighting.net/mobile/en/projects/project06.html>. Jun,2016

#### 2.1.4 The application of green walls

The green wall is the fully integrated product of modern landscape architecture theory and vertical greening technology. To study on the green wall is conducive to discover the forms and an exiting problem of vertical greening and improve the situation with appropriate methods and approaches. Though the reviews the process of developing green wall in the world and summarizes the experience and lessons. These practices could compensate for the lack of experience, and make its theories systematized.

The green wall is the excellent technology as developing and interacting with each other between architecture and landscape architecture, all these make us necessary to connecting with other projects during planning. To deepen the understanding of the green wall. A lot of landscape architects are the stranger to the vertical greening technology. However, the lacks of vertical greening theory and practice guidance in planning, and therefore lead to the spatial value of landscape architecture is ignored.

The research of green wall started early in developed countries and also achieved very great success. In order to improve the urban environment, the developed countries are summarized in the newly-updated knowledge, and put the theory into practices to make innovations and develop by green wall theory with the development of the practice.(Figure 2.7 Galeries Lafayette, Berlin)



Figure 2.7 Galeries Lafayette, Berlin, designed by Patrick Blanc

Source: Author

Singapore is called the “Garden City”, the green coverage rate reaches 50%.<sup>55</sup> Therefore, it is acknowledged that Singapore has become one of the World’s most livable city. In order to improve the environment, the Singapore government is promoting the technology of green wall. The green wall is looked on as an important part of the Singapore's national ecological environment construction. According to the “National Biodiversity Strategy” of Singapore’s National Biodiversity Centre(NBC), the construction projects must use less hard materials, such as bricks and stones. And also the construction projects should fully use the green wall to beautify the urban environment.<sup>56</sup> We can give a bird’s eye view of the city, here you will see the buildings throughout the city were covered by green.(Figure 2.8 The world’s largest green wall in Singapore)



Figure 2.8 The world’s largest green wall in Singapore

Source: <https://de.pinterest.com/pin/446560119279863030/>

Ken Yeang is a Malaysian architect. He has been researching on the bio-climatic landscape design and makes the green wall has been a great development in Southeast Asia.<sup>57</sup> In vertical greening of the urban area, he has done a great deal on an unprecedented research and engineering practice.(Figure 2.9 Spire Edge Tower by Ken Yeang) He combined with hot-humid climate characteristics of Southeast Asia, he always carries out vertical

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<sup>55</sup> National Parks of Singapore. Gardens, Parks & Nature[EB/OL]. <https://www.nparks.gov.sg/gardens-parks-and-nature>. Jun,2016

<sup>56</sup> Singapore’ s, National Biodiversity Centre. National Biodiversity Strategy[Z]. Singapore: Singapore Government,2009.

<sup>57</sup> Wang Hongyue, Cao Lei. Ken Yeang's Ecological Building in Xi’ An[N]. China Construction News, 6 Mar, 2009

greening construction and architectural construction separately and leave wide extra space between the building and green wall for natural ventilation.(Figure 2.10 Ken Yeang’s design idea) His theory in the international has a greater impact. The bio-climatic landscape design theory is regarded as one of the most mature approaches. Therefore, he was named by the Guardian as “one of the 50 people who could save the planet”.<sup>58</sup>



Figure 2.9 Spire Edge Tower, India, designed by Ken Yeang

Source: <https://de.pinterest.com/pin/275001120973329829/>

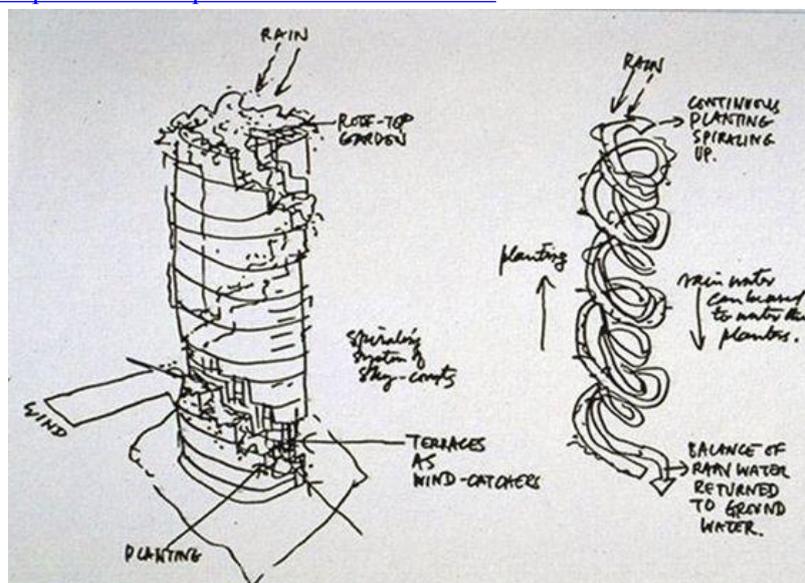


Figure 2.10 Ken Yeang’s design idea

Source: <https://de.pinterest.com/pin/387731849149013290/>

Japan is a fairly small country with small land and dense population. In order to maximize

<sup>58</sup> The Guardian. 50 people who could save the planet[EB/OL].

<https://www.theguardian.com/environment/2008/jan/05/activists.ethicalliving>. Jun,2016

the effectiveness of land to increase the urban green area. The green wall has included in the scope of legal realm. The Urban Green Space Conservation Act endorsed by the Japanese government in 1973.<sup>59</sup> Through long-term practice, the Japanese government sees this is an effective way for changing the environment, improving the greening quantity and enhancing natural landscape.(Figure 2.11 Tokyo Nara Tower, Tokyo, Japan, Designed by Ken Yeang)



Figure 2.11 Tokyo Nara Tower, Tokyo, Japan, Designed by Ken Yeang

Source: <https://de.pinterest.com/pin/339881103109405266/>

Japanese architect Mituo Kondou,<sup>60</sup> in his book “Urban greening technology”, he has analyzed the green wall in urban environment. He noted that urban ecological problems have been associated with the development of a city. In order to solve the environmental problems, the planner must do the entire landscape planting of the city.<sup>61</sup> He proposed some techniques of the green wall. Which has brought the extensive concern of the whole world.

Patrick Blanc is a French landscape architect and botanist. In his writing “Vertical Garden: From Nature to the City”, The introduction is a welcome analysis of green wall’s future.<sup>62</sup>

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<sup>59</sup> UrbanLex. Urban Green Space Conservation Act[EB/OL]. <http://urbanlex.unhabitat.org/law/454>. Jun,2016

<sup>60</sup> ResearchMap. Mituo Kondou[EB/OL]. <http://researchmap.jp/read0027147/>. Jun,2016

<sup>61</sup> Bay FM. Mituo Kondou: Vertical Greening, Suggestions on City Afforestation [EB/OL]. <http://www.bayfm.co.jp/flint/20080601.html>. Jun,2016

<sup>62</sup> Patrick Blanc. The Vertical Garden, from Nature to the City[EB/OL]. <http://www.verticalgardenpatrickblanc.com/patrick-blanc/dates-clefs>. Jun,2016

In this book, he introduced us to a special vertical greening technology. He describes his green wall as follows: the hexagonal hollow bricks in the vertical arrangement. The irrigation system is arranged on the roof of a building. Then, put the plants into the cracks between the hollow bricks. This design method has been obtained more attentions recently, and it could be integrated into historic districts at minimal cost.<sup>63</sup> (Figure 2.12 Green white house Qiantan, Shanghai, designed by Patrick Blanc)



Figure 2.12 Green white house Qiantan, Shanghai, designed by Patrick Blanc

Source: <http://www.verticalgardenpatrickblanc.com/node/7721>

Through the study on a large amount relevant documents, we can notice that the common design ways of vertical greening have been gradually extended to the urban environment. Thus, the urban environment can get beautified.

## 2.2 RELATED PRACTICE

### 2.2.1 Dealing with historic district: Case study Berlin

The truth of history is given by the real practice fundamentally. The historic districts are the objects created by the human beings in the process of practice. As a structure or facility, heritage does not provide any information about history. On the contrary, the historic districts showed real history to people and recorded the development level of science and technology, economy and culture of people in each social historical stage faithfully.

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<sup>63</sup> Tobias Grey. Patrick Blanc, the Master of the Vertical Garden[N]. The Wall Street Journal, 23 Jan, 2014

## Berlin, Germany

Berlin has suffered great destruction at the end of the Second World War. About a quarter of buildings as blown up when Berlin is conquered by the allies in 1945.<sup>64</sup> (Figure 2.13 Berlin was almost entirely destroyed during the Battle of Berlin) In the 1950s, there are generally various of diseases in structures, which were brought from old and without repair. Therefore, the people of Berlin began rebuilding the city. Like many European cities, various kinds of old buildings in the city have been torn down, they are replaced with modern skyscrapers. Many historic districts are destroyed. After the foundation of the German Democratic Republic (DDR), the Berlin City Palace (Berlin Stadtschloss) and some historical buildings were damaged in political movements.(Figure 2.14 The Berlin Stadtschloss) In 1973, the government ordered to build the Palace of the Republic (Palast der Republik) on the former address of Berlin City Palace.<sup>65</sup> (Figure 2.15 The Berlin Stadtschloss)



Figure 2.13 Berlin was almost entirely destroyed during the Battle of Berlin

Source: <https://de.pinterest.com/pin/413557178262966929/>

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<sup>64</sup> RAF staff. Royal Air Force Bomber Command 60<sup>th</sup> Anniversary[EB/OL].

<http://webarchive.nationalarchives.gov.uk/20070706011932/http://www.raf.mod.uk/bombercommand/dec43.html>. Jun, 2016

<sup>65</sup> Dave Itzkoff. Architect Chosen for Berlin Palace[N]. The New York Times, 28 Nov, 2008 (C2)



Figure 2.14 The Berlin Stadtschloss

Source: <https://de.pinterest.com/pin/227713324886759095/>



Figure 2.15 The Berlin Stadtschloss

Source: <https://de.pinterest.com/pin/379991287282908301/>

The European Charter of the Architectural Heritage was adopted by the Council of Europe's initiative in 1975, the charter underlines the importance of protecting the architectural heritages on "human recollection". 1975 was also the European architectural year.<sup>66</sup> Same time, the government and people of Federal Republic of Germany (BRD) has realized the importance of the architectural heritage protection. Through a variety ways and means, the various of historic districts had been protected. Now, Berlin is

<sup>66</sup> ICMOS. The European Charter of the Architectural Heritage-1975[EB/OL]. <http://www.icomos.org/en/charters-and-texts/179-articles-en-francais/ressources/charters-and-standards/170-european-charter-of-the-architectural-heritage>. Jun, 2016

famous for its well-preserved historic districts. In 1999, the Museum Island of Berlin was once voted the “World Heritage Site” by UNESCO.<sup>67</sup>

In the course of historic district protection and urban development, the German government fully respects for the history of urban development. The city has kept their real memories of history and war through its historic districts.(Figure 2.16 Destroyed church, Berlin) I have to learn from the Berlin’s way of urban development and historic district protection. There are four main ways to protect the historic district or heritage:

Integral Restoration: For the heritage or historic district with very important historical value, social value, science and technology value, economic and aesthetic value, the policy focus on protecting the integrity of the historic district. The designer was used with the materials based on the original method, then it showed us the authentic appearance of a historic district. As a landmark of Berlin even Germany, the restoration of the Brandenburg Gate (Brandenburger Tor) was praised by most experts.(Figure 2.17 Brandenburger Tor, 1945) From casting the sculpture to using the high-tech electron laser new technology maintenance of sandstone. The neoclassicism style Brandenburg Gate stands on the Unter den Linden Street of central Berlin.(Figure 2.18 Brandenburger Tor, 2015). Moreover, heritages and historic districts such as Berlin Cathedral (Berliner Dom) and Museum Island. A large number of historic districts and heritages all adopted this protection method.



Figure 2.16 Destroyed church, Berlin

Source: <https://de.pinterest.com/pin/6192518210746771/>

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<sup>67</sup> UNESCO. The World Heritage List[EB/OL]. <http://whc.unesco.org/en/list/&order=country#alphaM>. Jun, 2016



Figure 2.17 Brandenburger Tor, 1945

Source: <https://de.pinterest.com/pin/538672805402545820/>



Figure 2.18 Brandenburger Tor, 2015

Source: Author

Vestige Reserve: In Berlin, more vestiges are intact preserved, there is no difference with the monuments and heritage. The vestige reserve of the Berlin Wall (Berliner Mauer) is a classic case of heritage protection.(Figure 2.19 Berlin wall, 1985) The sections of the Berlin Wall was protected selectively.(Figure 2.20 Berlin wall, 2015) The sections of Berlin Wall located in the city was torn down. The designer kept the stones along the former address, and the inscribed bronze plates are embedded in the road.(Figure 2.21 inscribed bronze plates) Since the 1970s, the Berlin Wall was thickly covered by graffiti. These freedom-themed graffiti has made the Berlin Wall famous. Now, the Berlin Wall and its graffiti have long been removed. The wrapped bits of Berlin wall are sold as tourist souvenirs, it may be the

ultimate recycling product.(Figure 2.22 Berlin wall fragment) Recent years, in the stage of urban development in Berlin, the Berlin has been damaged. In 2013, the East Side Galley was destined for demolition, the vast crowds have held a huge demonstration in Berlin. (Figure 2.23 East Side Galley, Berlin)



Figure 2.19 Berlin wall, 1985

Source: <https://de.pinterest.com/pin/314970567663677094/>



Figure 2.20 Berlin wall, 2015

Source: Author



Figure 2.21 inscribed bronze plates

Source: Author



Figure 2.22 Berlin wall fragment

Source: <https://de.pinterest.com/pin/237635317811402673/>



Figure 2.23 East Side Galley, Berlin

Source: <https://de.pinterest.com/pin/9429480445370180/>

A. Building Translation: the building translation has been started in the heritage protection and historic district plan by migration and rotation technique of whole building. The Potsdam Square (Potsdamer Platz) is the largest construction project in Berlin. In the construction of the second largest part “Sony”, they moved Emperor Hall (Kaisersaal) 150 meters forward. The heritage parts preserved.

B. The unified style: the measure of unified style is adopted in the course of reconstructing. Such as the 1995 protection relics law lays down a set of heritage protection. The new buildings heights is limited in the urban planning plan, and it must in the modern style, duplicate the heritages are not allowed. All these measures improve the development and protection of historic district. The old and new buildings are amalgamated to form a sight of a harmonious historic district.

Berlin’s government has accumulated rich experience in the practice of historic district protection. And the institution of historic district protection, which is established on a certain legal basis. I can draw on German’s successful experience in this area. The experience is executed in my design proposal.

### **2.2.2 Neighborhood unit in Barcelona**

In recent years, the urban public space development has been a hot issue, but landscape architects main focus in the City Park , and neighborhood unit on little. But, the key to solving the problem is to take full advantage of neighborhood unit.

#### **Barcelona, Spain**

The neighborhood units have becomes the most representative view of Barcelona. In 1976, based on the advantages and disadvantages, Barcelona makes its aim to change the appearance of the city greatly. Urban planning department GMP has always insisted that the microcosmic administration is the most important component in urban planning, and it is the key successful factor. In the design process, they made full use of neighborhood units in the historic district. Such as the Royal Plaza (Plaza Real) (Figure 2.24 Plaza Real in Barcelona) and Merce Plaza (La Plaza de la Mercé). (Figure 2.25 Plaça de la Mercè in Barcelona) Then with the neighborhood unit construction project success in the historic district, It was

extended to another district of Barcelona. Finally, they completed the integration of the neighborhood unit in the city. It is because of the existence of neighborhood units in Barcelona that make the city so fascinating. Thus, the neighborhood unit construction of Barcelona has been considered as models worldwide.



Figure 2.24 Plaza Real in Barcelona

Source: <https://de.pinterest.com/pin/385620786820849358/>



Figure 2.25 Plaça de la Mercè in Barcelona

Source: <https://de.pinterest.com/pin/365987907190978697/>

Since the industrial revolution, in the 18<sup>th</sup> century, the development of the social economy has accelerated the urbanization process greatly. As a center of the industrial revolution, a lot of people from the countryside moved to the Barcelona, this place became the one of the world's largest city. But the urbanization brought a serious of urban disease, especially the urban ecological environment problem which damaged and reduced the environmental

quality and the city seriously. In the 1850s, urban planner Ildefons Cerdà designed a district called Eixample of Barcelona.<sup>68</sup> The master plan is called “Cerdà Plan”. This project was supported by the government, and it marks the beginning of urban spatial transformation in Barcelona. Finally the Eixample district forms the magnificent view of the whole city.(Figure 2.26 Aerial views of the Eixample district, Barcelona) Now, the Eixample district has become the model of urban planning. With urbanization, and urban population increases, the government had to increase the building floor area ratio. Plans to expand the Cerdà model have had to be quietly shelved. Until 1980s, in order to promote the ecological development of urban environment, enhance the image of Barcelona and provide better public space for people, local government have restarted the Cerdà plan. By moving and removing the illegal dangerous structures in Eixample district. The planner has restored buildings, roads, and courtyards in this district. Meanwhile, the government has also introduced policies to encourage the investment in heritage’s protection and reconstruction. In the process of the reconstruction, the usability and accessibility neighborhood unit have been adequately considered. Whatever you are, you can go to the neighborhood unit from your place in a few minutes.(Figure 2.27 The map of the distribution of neighborhood units in Barcelona)



Figure 2.26 Aerial view of the Eixample district, Barcelona

Source: <https://de.pinterest.com/pin/168744317258018108/>

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<sup>68</sup> Geoff Boeing. Honolulu Rail Transit: International Lessons from Barcelona in Linking Urban Form, Design, and Transportation[R]. Berkeley, CA:University of California, Berkeley, 2016. 28-47

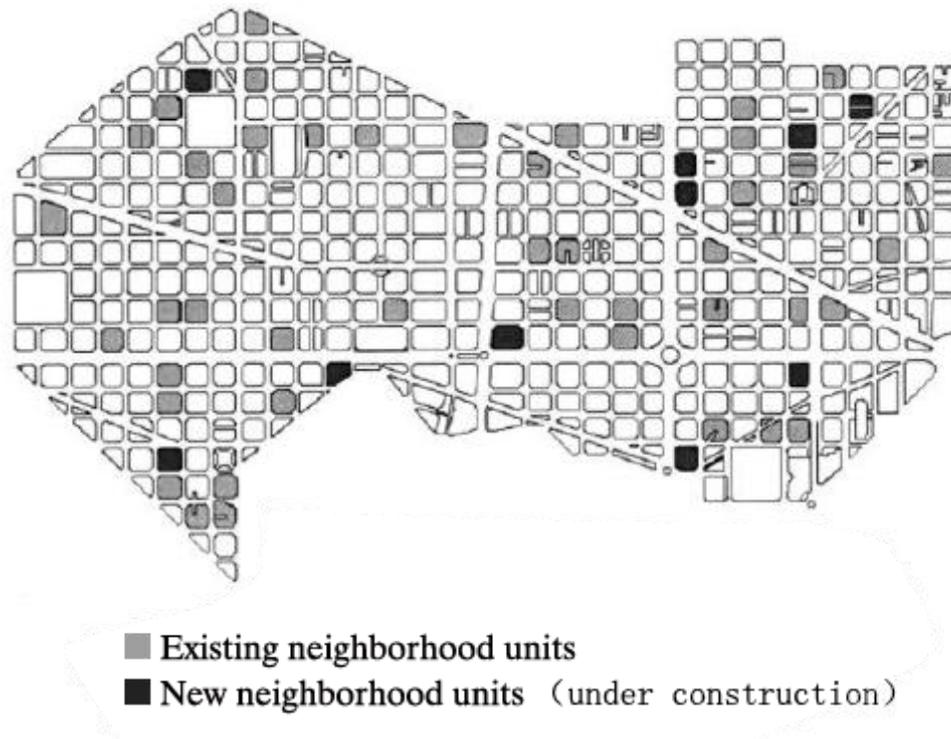


Figure 2.27 The map of the distribution of neighborhood units in Barcelona

Source: Zhang, Ruijie. The research of neighborhood units in Barcelona[D]. Tianjing:Tianjin University Press, 2013. 34

I will exemplify the Eiaxmple district with three neighborhood unit project.

A. Royal Plaza(Plaça Real): the Royal Plaza is a neighborhood unit located in the center of Gothic District (a historic district in Barcelona).(Figure 2.28 Location of Royal plaza in Barcelona) The plaza was designed by Francesc Daniel Molina i Casamajó in 1948. Based on neighborhood unit principles, the planner, he designed this plaza. In 1981, the Royal Plaza was remodeled by two architects. The plaza is 4400 m<sup>2</sup> in area. In a relatively closed environment, the shape of the plaza is square. The plaza boundary is formed by the four arcades under the old buildings, the only exit is located on the La Rambla Street. The designer seeks to contribute towards a stable relationship between building and neighborhood unit. To maintain a homogeneous atmosphere with the surrounding tranquility. And not stand out in the landscape, the pavement and facilities are also in the same style as that of the surrounding buildings. (Figure 2.29 A view of the Royal plaza)

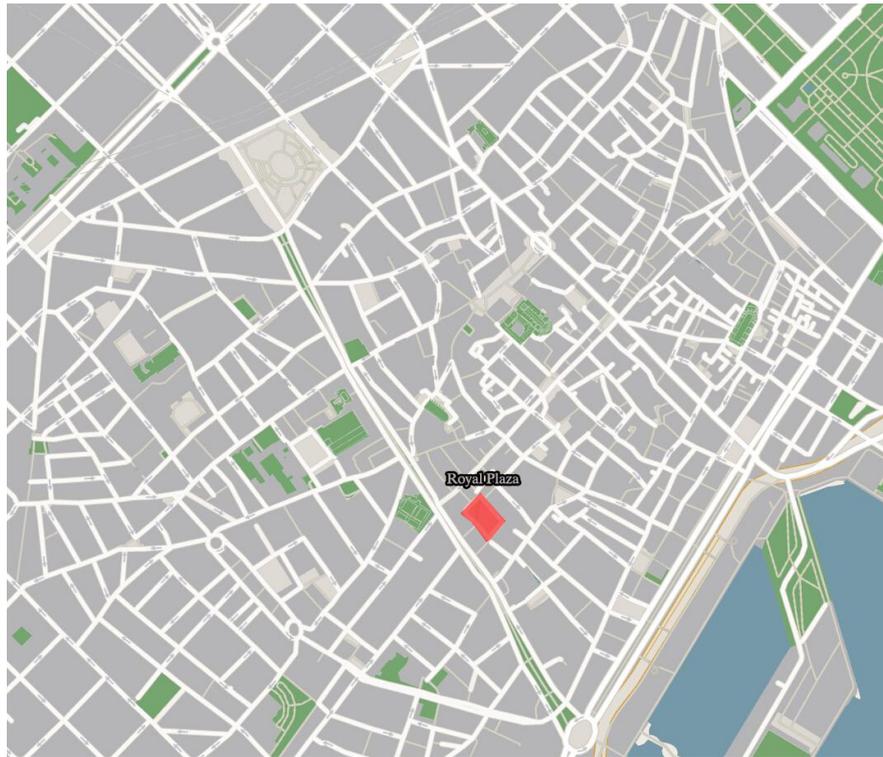


Figure 2.28 Location of Royal plaza in Barcelona

Source: Author



Figure 2.29 A view of the Royal plaza

Source: <https://de.pinterest.com/pin/124412008429733076/>

Streetlights, benches and fountain are the three elements that constitute Royal Plaza, despite their limited number, which has some certain practicability and beauty. The benches are used as a boundary of Royal Plaza, which keeps distance with arcades. The plaza was obviously designed as a background of arcades. Therefore, the designer changed the arrangement of tiles. The pavement can enhance the centripetal force. the fountain is not the focal point of the Royal Plaza, it is just in order to achieve the balance between the

surrounding buildings and the Royal Plaza.<sup>69</sup>(Figure 2.30 Aerial view of the Royal plaza)



Figure 2.30 Aerial view of the Royal plaza

Source: Google Maps

B. Merce Plaza(Plaça de la Mercè): the Merce Plaza is located in Gothic District, Barcelona. The Plaza has an area of about 2000 m<sup>2</sup>.(Figure 2.31 Location of the Plaça de la Mercè in Barcelona) The plaza is close to a chapel. The shape of this plaza is square, bordered on one side by a chapel, and on the other three by a series ancient buildings.(Figure 2.32 A view of the Plaça de la Mercè) The architectural styles of buildings and plaza are unified. The government has demolished part of the urban load density historic district to free up some space. Meanwhile, From the result of different perspectives, the plaza reflects the requirement of residents and neighborhood unit principle. The plaza fully respects the original environment, incorporates the original sidewalks, decreases the density of population, and improves the environmental quality and ventilation. Based on above understanding, for various neighborhood unit environments, we should take different design methods to provide maximum resident comfort and happiness.

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<sup>69</sup> SiTu Ya. Research of contemporary urban public space in Barcelona[D]. Shanghai:Tongji University, 2005. 30-35

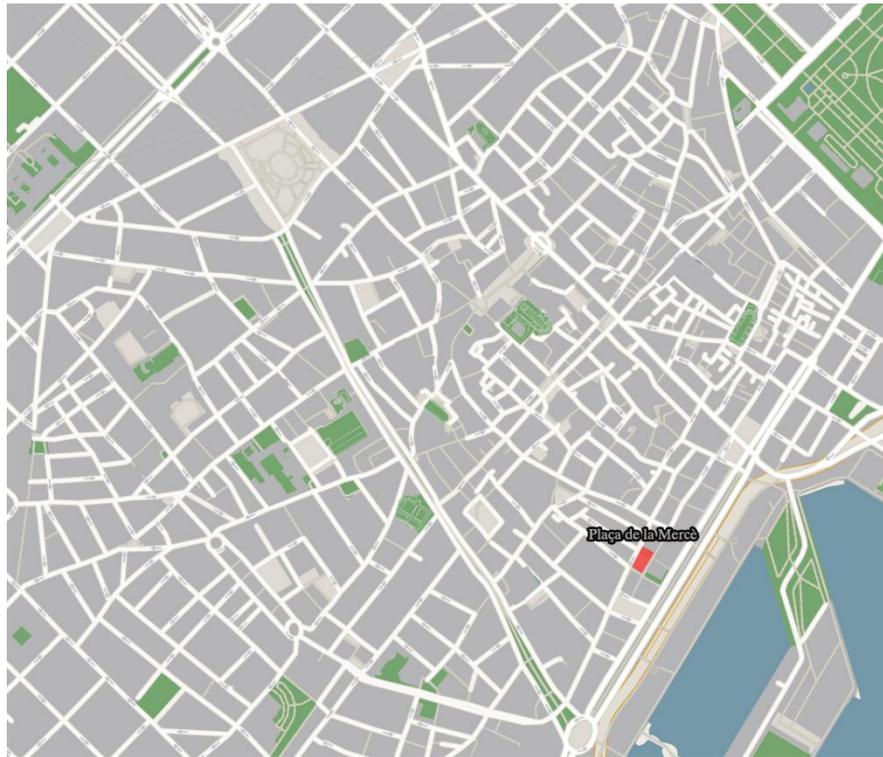


Figure 2.31 Location of the Plaça de la Mercè in Barcelona

Source: Author



Figure 2.32 A view of the Plaça de la Mercè

Source: <https://de.pinterest.com/pin/122723158570863035/>

Plazas based on the principles of systematic unity. The scene that we see now is the plaza after removal of some dangerous buildings. The round window of the chapel as the outstanding and main design element in the plaza. Therefore, through the selection and control of materials, the designer designed a rectangular platform on the plaza, the round window's curved shape responds gracefully to the rectangular platform. Thus creating a

harmonious and balanced environment.<sup>70</sup> (Figure 2.33 Aerial view of the Royal plaza)



Figure 2.33 Aerial view of the Royal plaza

Source: Source: Google Maps

C. Sunshine Plaza(Plaça del Sol): the Sunshine Plaza is in the center of Gràcia, Barcelona. Sunshine Plaza was a product of Cerda plan. It was finished in 1985. The plaza surrounded by old buildings, and it is encircled by roads and divided into a rectangle shape. The Sunshine plaza covers an area of about 1500 m<sup>2</sup>.(Figure 2.34 Location of the Plaça del Sol in Gràcia, Barcelona) By the method of design, selection of materials, and the principle of neighborhood unit, the plaza reflects the universal respect for the surrounding buildings and atmosphere of calm and order. The plaza is combined the traditional design method and modern public facilities. This plaza provides the theoretical foundation and value standard for the protection and development of the historic district.<sup>71</sup>

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<sup>70</sup> SiTu Ya. Research of contemporary urban public space in Barcelona[D]. Shanghai:Tongji University, 2005. 43

<sup>71</sup> Zhang Ruijie. Research of small urban public spaces in Barcelona[D]. Hangzhou:Zhejiang University, 2013. 33

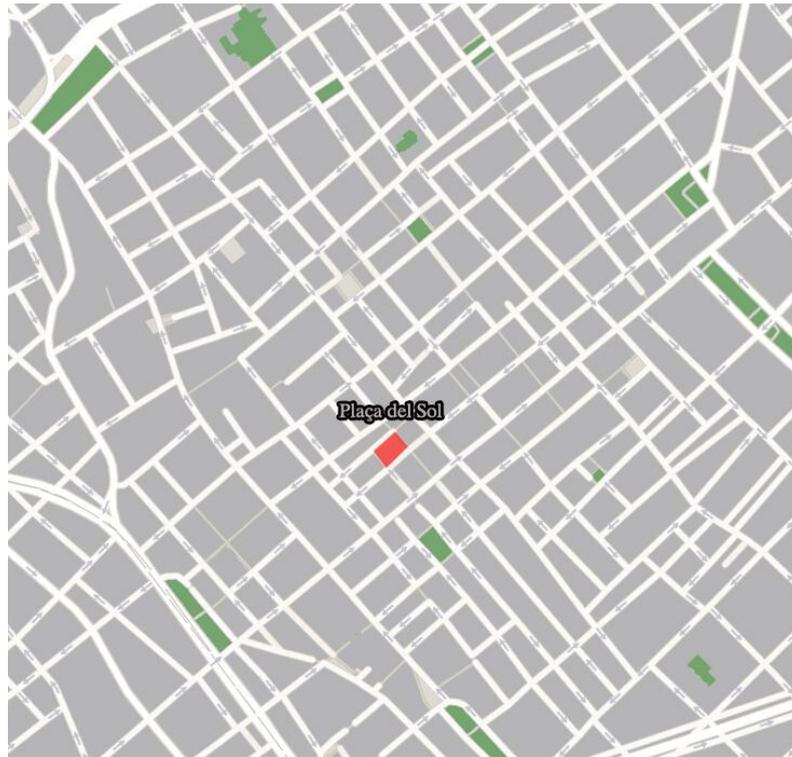


Figure 2.34 Location of the Plaça del Sol in Gràcia, Barcelona

Source: Author

The plaza designs appear quite simple on the design methods but include many public facilities. The plaza can improve the local environment, and provide additional recreation areas for residents. The plaza boundary is formed by the tree blocks. The Sunshine Plaza is higher than the streets. So the plaza has six steps in different levels and leads visitors from the street to the platform of the Sunshine Plaza. The plaza with different functions and different materials can create diverse artistic conceptions and bring us diverse feelings.(Figure 2.35 A view of the Plaça del Sol) The most distinctive feature of the site is the underground garage of the Sunshine plaza. The entrance of underground garage is bounded by a corridor of Sunshine plaza. In the center of the city, because of the high cost of land, the use of underground space has become an important direction.(Figure 2.36 The underground car park in Plaça del Sol) The Sunshine Plaza uses vertical space of the city, this design method can improve the urban environment, use urban land efficiently and improve the quality of public life.(Figure 2.37 Aerial view of the Plaça del Sol)



Figure 2.35 A view of the Plaça del Sol

Source: <https://de.pinterest.com/pin/124130533456033189/>



Figure 2.36 The underground car park in Plaça del Sol

Source: Source: <https://de.pinterest.com/pin/442056519647280949/>



Figure 2.37 Aerial view of the Plaça del Sol  
Source: Source: Google Maps

### **2.2.3 Underground space development in developed countries**

#### **Montreal, Canada**

Montreal is the second largest city in Canada, has a population of 1.65 million. Place Ville Marie is a large commercial complex located in the underground of central Montreal. The Place Ville Marie was designed by Henry N. Cobb and Ieoh Ming Pei. It was completed in 1962, the area of underground space developed in the year was 500,000 m<sup>2</sup>.(Figure 2.38 The La Ville underground shopping mall) The underground complex was used into an underground shopping plaza, it is also a nexus of the underground city of Montreal. There are the subway station, shopping center and hotels in the underground complex.<sup>72</sup>

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<sup>72</sup> Paul André Linteau. Place Ville Marie: Montreal's Shining Landmark[M]. Montreal:Michel Viau and Anne Marie Fortin, 2012. 12-13

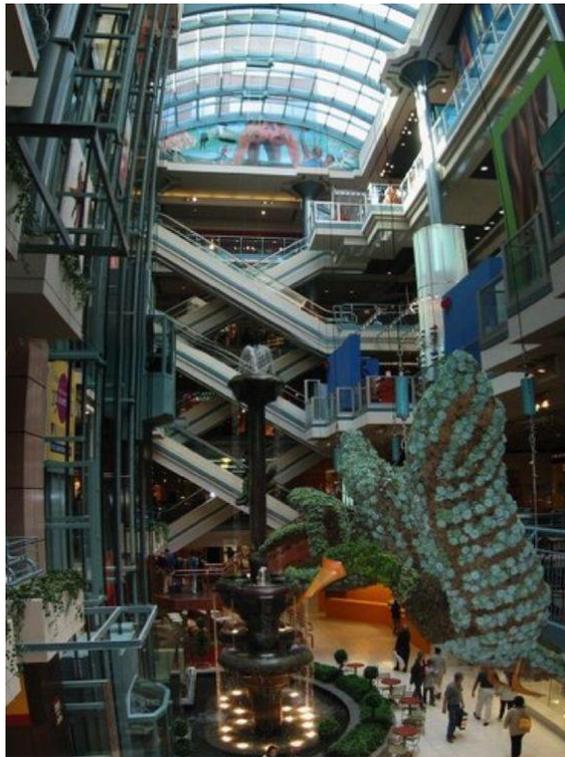


Figure 2.38 The La Ville underground shopping mall  
 Source: Source: <https://de.pinterest.com/pin/2814818492553990/>

Underground traffic network: Montreal metro system has extended over 4 lines. In the Montreal underground city, there are seven metro stations, two train stations and a bus terminal. It connects more than 80% public space in downtown Montreal. Which have pushed forward the development of Montreal's underground space.<sup>73</sup>(Figure 2.39 Montreal's underground city map)

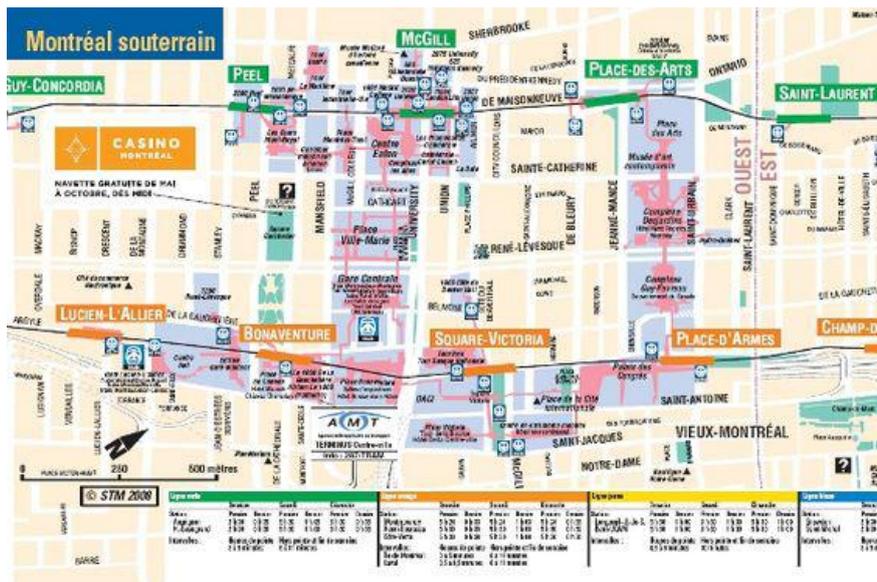


Figure 2.39 Montreal's underground city map

<sup>73</sup> Montreal, Transit, Corporation. Public Transport Network of Montreal[EB/OL].  
<http://www.stm.info/en/info/networks/maps>. Jun,2016

Source: Source: <https://de.pinterest.com/pin/1266706121390617/>

Montreal underground city: This project is the largest underground network in the world. In addition, they have complete supporting facilities including restaurants, cafes, hotels, shops, clinics, supermarkets, cinemas and even universities. Originally, the most of the underground complex projects established separately and the absence of essential coordination and communication among different underground spaces. As time went on, the population of concentrated flow to underground spaces, the independent underground spaces can not meet demand. Therefore, urban planners did plenty of master plan and repair work, the government had all the underground spaces joined up in order to improve environment and efficiency. The office buildings also have entrance to the underground complex allowing employees and visitors to bypass the traffic and avoid the cold winter temperatures.<sup>74</sup> (Figure 2.40 The plan of Montreal's underground city)

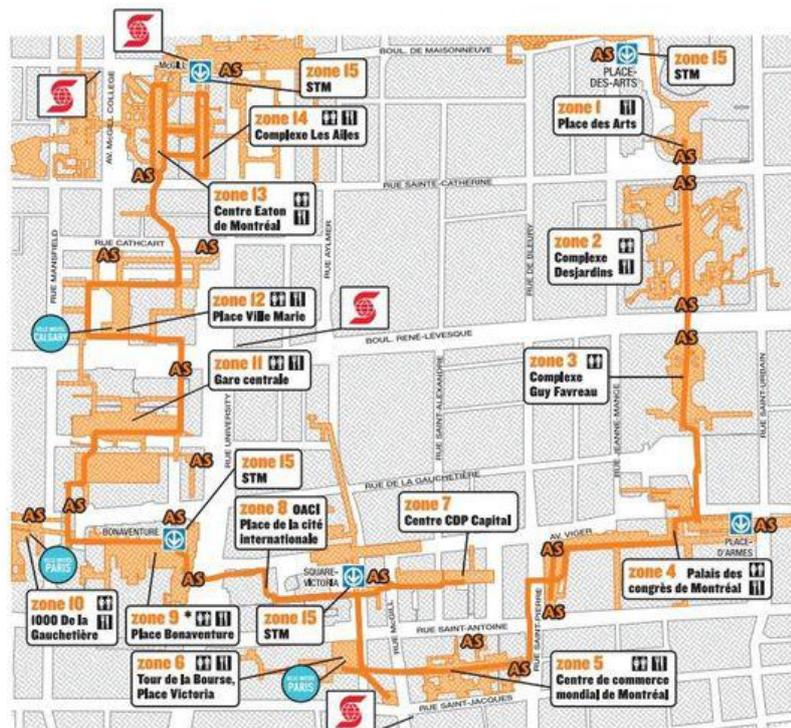


Figure 2.40 The plan of Montreal's underground city

Source: Source: <https://de.pinterest.com/pin/438256607465217861/>

Montreal located in the southeast Canada, in the high latitudes of the northern hemisphere. The minimum temperature in winter was  $-34\text{ }^{\circ}\text{C}$ , it has a distinct four-season continental

<sup>74</sup> Montreal Underground City. Discover Montreal from the Underground City[EB/OL]. <http://montrealundergroundcity.com/>. Jun,2016

climate with warm summers and cold snowy winters.<sup>75</sup> Because of the extreme weather conditions, only the underground city can open to the public all times, therefore, the underground complex attracts a lot of citizens. The Montreal underground city has become the most popular place for shopping and leisure.(Figure 2.41 A view of Montreal's underground city)



Figure 2.41 A view of Montreal's underground city

Source: Source: <https://de.pinterest.com/pin/295267319301236573/>

After decades of development, the Montreal underground city has become the largest underground complex in the world. According to statistics, the Montreal underground city covers 36 km<sup>2</sup>, which is 10% of the downtown's total. Its 32 km of tunnel cover more than 41 city blocks. Recent studies show that about 500,000 people enter or exit each day. With drilling technology gradually mature and the rapid development of underground transit, the underground complex has become the mainstream trend in underground space development.<sup>76</sup>

## Paris, France

Les Halles was one of the largest market in Paris, it is located in the center of Paris city.

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<sup>75</sup> Government, of, Canada. Canadian Climate Normals 1981-2010 Station Data[DB/OL].

[http://climate.weather.gc.ca/climate\\_normals/results\\_1981\\_2010\\_e.html?stnID=5415&autofwd=1](http://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?stnID=5415&autofwd=1). Jun,2016

<sup>76</sup> Tong Linxu. Underground space and urban modernization development[M]. Beijing:China Architecture& Building Press, 2005. 24-40

The total area for the Forum des Halles is 60,000 m<sup>2</sup>. (Figure 2.42 Location of the Les Halles in Paris) The market was transformed into a most important transport hub and a modern shopping mall in 1971.<sup>77</sup> The reasonable utilization of underground space is the greatest feature of this project. The landscape architect Philippe Raguin transformed the fresh food market into a multifunctional public plaza.(Figure 2.43 Les Halles fresh food market, 1967) The Forum des Halles embodies the combination of the four functions, such as transport, business, leisure and distribution. The Les Halles sits in a sunken plaza which is surrounded by the glass pavilions.<sup>78</sup> The Les Halles plaza is two floors above ground, four floors underground. The main features are all arranged in the sunken plaza.(Figure 2.44 Map of the Les Halls' garden today)

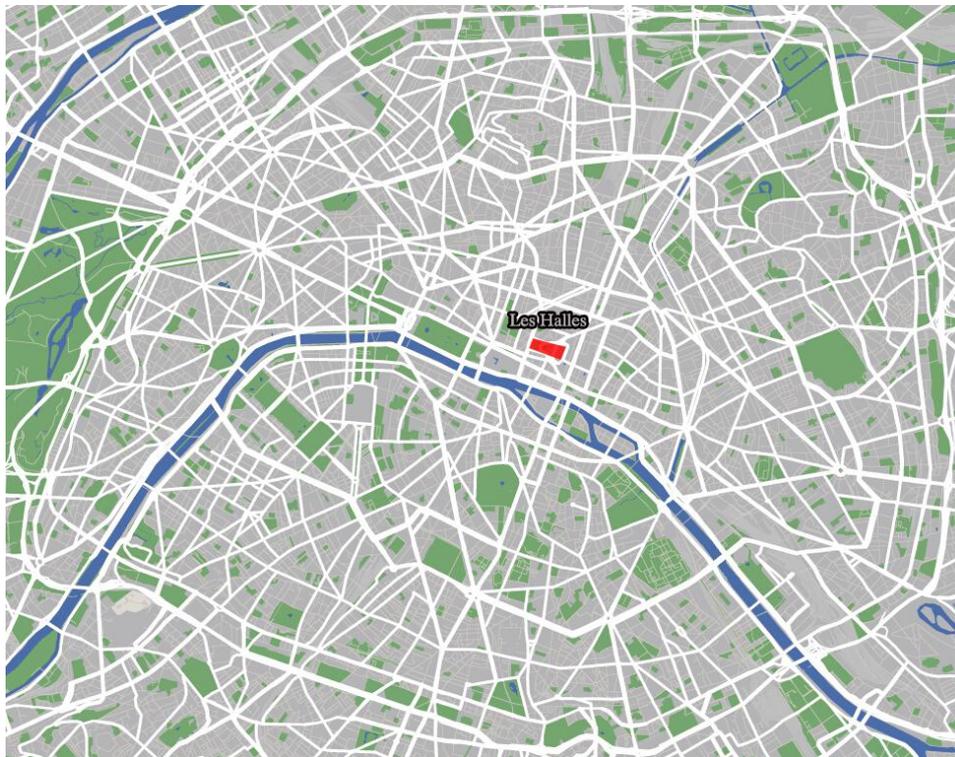


Figure 2.42 Location of the Les Halles in Paris

Source: Author

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<sup>77</sup> Parisleshalles. Les Halles, the New Heart of Paris[EB/OL].

<http://www.parisleshalles.fr/sites/default/files/2014-07-Plaquette-Halles-web-UK.pdf>. Jun,2016

<sup>78</sup> Alan Riding. For Paris, the Newest Look Is a Canopy[N]. The New York Times, 7 Jul,2007



Figure 2.43 Les Halles fresh food market, 1967

Source: <https://de.pinterest.com/pin/389983648964052253/>



Figure 2.44 Map of the Les Halles' garden today

Source: Florence Bougnoux, Jean Marc Fritz, David Mangin, Philippe Raguin. Les Halles, The New Heart of Paris[Z]. Paris: Patrick Berger and Jacques Anziutti,2014.

In the course of ground construction planning, they have canceled the international trade center project. The construction site was turned into a public green space, the public green space was linked with the existing public garden.<sup>79</sup> The public green space in front of Les Halles already become a largest public activity space of Europe.

The Les Halles is located in the center of a historic district, it is an excellent case of

<sup>79</sup> PacisLesHalles. Les Halles redevelopment project[EB/OL]. <http://www.parisleshalles.fr/00371>. Jun,2016

composite exploitation of underground space and green public place of the historic district. Through underground space development and utilization, the new Les Halles has changed the originally sole function. This underground complex has achieved by the three-dimensional and modern traffic system, which has played a very positive role in environmental improvement and environmental capacity improvement. The Les Halles has jumped into the most popular plaza in Paris that more than 150,000 of people come to visit it every day.<sup>80</sup>

#### **2.2.4 The application of green wall in global**

Today, the vertical greening technology has matured, the green wall is widely used in the green renovation of existing buildings<sup>81</sup>. In order to control the waste of resource, to create a good living space for the plants, and to realize the sustainable development, the landscape architects improve the vertical greening technology very active. They made full use of the latest achievements in vertical greening technology, and gradually formed some distinctive patterns.

At present, the green wall researches mainly focus on two aspects: the artificial planting material and supporting structure of the green wall. As these new techniques maturing, popularizing, and creating a more natural growth environment for the green wall. Based on green wall types, there are two basic types of the green wall:

A. Structural Media: this system most major characteristic is that the planting method of the plant is parallel to the ground. The benefits for landscape architects are obvious. The structural medium green walls are prone to more layers and more density, the results showed us that the high-density green wall is better than the low-density green wall for the greening effect. Therefore, whether from the technical skills or device, structural media has put forward the update and higher requirements. The structural medium green wall is composed of three parts, support structure, plant module and irrigation system. The approach is to put the plants into plant modules, then, the workers fastened the plant modules to the exterior wall of a building with the support structures. Based on the different structures, the structural medium green wall can be classified into the framed

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<sup>80</sup> Florence Bougnoux, Jean Marc Fritz, David Mangin, Philippe Raguin. Les Halles, The New Heart of Paris[Z]. Paris: Parimage,2014.

<sup>81</sup> Greenroofs. The International Greenroof & Greenwall Projects Database[EB/OL]. <http://www.greenroofs.com/projects/>. Jun,2016

vessel type, pot type and pipeline type.

## Shanghai, China

The Zhongtai illuminating company's office called Z58 was located in Shanghai, and it was designed by a Japanese architect Kengo Kuma.(Figure 2.45 The green wall of Z58 in Shanghai, designed by Kengo Kuma) The framed vessel type's green wall is used as exterior in this project.<sup>82</sup>(Figure 2.46 The structure chart of Z58's green wall) The most important characteristic of the framed vessel type's green wall is that the plants growth direction are parallel to the ground, which is different from previous planting patterns. This structure has greatly increased the amount of green area and avoids the bad visual effect by containers. (Figure 2.47 plants in containers) The container is a very important role in framed vessel type structure. Each container was a plant module, the plant modules are watered by the drip irrigation systems. The drip irrigation system halted the soil erosion. The framed vessel type's green wall is held onto the exterior walls of the building with steel frames. This structure requires constant maintenance, with high maintenance costs and price, this structure often used to decorate the exterior wall of a small building.



Figure 2.45 The green wall of Z58 in Shanghai, designed by Kengo Kuma

Source: <https://de.pinterest.com/pin/20125529563245363/>

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<sup>82</sup> Fu Bin. Preservation and Rebirth of the Old Industrial Building Z58 in Shanghai[EB/OL].  
[http://blog.sina.com.cn/s/blog\\_592391b30102v66v.html](http://blog.sina.com.cn/s/blog_592391b30102v66v.html). Jun,2016

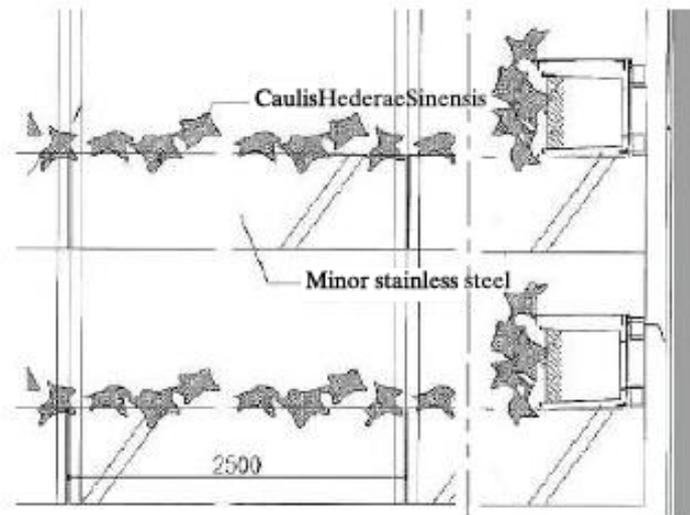


Figure 2.46 The structure chart of Z58's green wall

Source: Author



Figure 2.47 plants in containers

Source:

[http://images.google.de/imgres?imgurl=http://www.r-green.jp/puresu\\_gazo/pixel.jpg&imgrefurl=http://www.toho-leo.co.jp/puresu/pixel.html&h=250&w=170&tbnid=c2UQz3YesQKltM&tbnh=200&tbnw=136&usg=\\_\\_BFiLVcr2sxHfTqwdz17B1YiLnss=&hl=en-DE&docid=J20Z-oc7KEaQ6M](http://images.google.de/imgres?imgurl=http://www.r-green.jp/puresu_gazo/pixel.jpg&imgrefurl=http://www.toho-leo.co.jp/puresu/pixel.html&h=250&w=170&tbnid=c2UQz3YesQKltM&tbnh=200&tbnw=136&usg=__BFiLVcr2sxHfTqwdz17B1YiLnss=&hl=en-DE&docid=J20Z-oc7KEaQ6M)

During the Shanghai Expo, the pot type's green wall have been introduced. Each plant module with 2 m<sup>2</sup> is composed by 60 plant pots with a diameter of 15 cm.<sup>83</sup>(Figure 2.48 The pot type's green wall in Shanghai) The characteristic of the pot type's green wall is that the plant pot inserts into plant module at an angle (~20°).(Figure 2.49 The structure chart of the opt type's green wall) The biggest advantage of pot type's green wall is the thicker plant module,

<sup>83</sup> China News, Service. Expo green wall in the center of Shanghai[EB/OL]. <http://2010.qq.com/a/20100329/000061.htm>. Jun,2016

more soil can be added to improve plants growth. The plant pot is fixed on a plant module and is attached to a frame. When the plants need to be adjusted, the landscape architect just needs to take the plant pots out of plant modules, and they do not need to make a new plant module. The pot type's green wall has the advantages of more compact structure, more strong stability and higher strength. Therefore, the pot type's green wall can be applied in almost all construction projects.(Figure 2.50 A wooden pot type's green wall)



Figure 2.48 The pot type's green wall in Shanghai

Source: <http://news.yuanlin.com/detail/20091218/60336.htm>

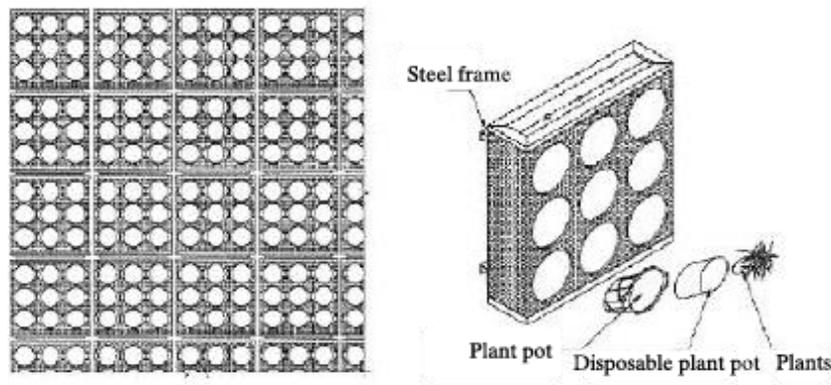


Figure 2.49 The structure chart of the pot type's green wall

Source: Author



Figure 2.50A wooden pot type's green wall

Source: <https://de.pinterest.com/pin/511088257688118886/>

### **Sant Vicente, Spain**

The six-stories green wall is installed on the exterior wall of a new children's library, which located in the Sant Vicente town square. This project designed by architect Jose Maria Chofre.<sup>84</sup> (Figure 2.51 Green wall at Children's library in Sant Vicente, Spain) The plant modules of this green wall is supported by a stainless steel pipeline structure. The plants modules are installed in the middle of the gap between pipeline frames. The inner part of the pipeline structure is provided with an irrigation system. The architect designed the optimum combination tactics of different plants in different stories. The flowers and perennials are planted in the upper part of the green wall, the ferns and vines are grown at the lower part. The major feature of the pipeline type's green wall is that the plants growth rates were the independence of plant pot. (Figure 2.52 Pipeline type's green wall module)

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<sup>84</sup> Bridgette Meinhold. Six-Stories Vertical Garden Sprouts in San Vicente Town Square[EB/OL]. <http://inhabitat.com/beautiful-vertical-garden-in-san-vicente-town-square/>. Jun,2016



Figure 2.51 Green wall at Children's library in Sant Vicente, Spain

Source: <https://de.pinterest.com/pin/355854808026078382/>

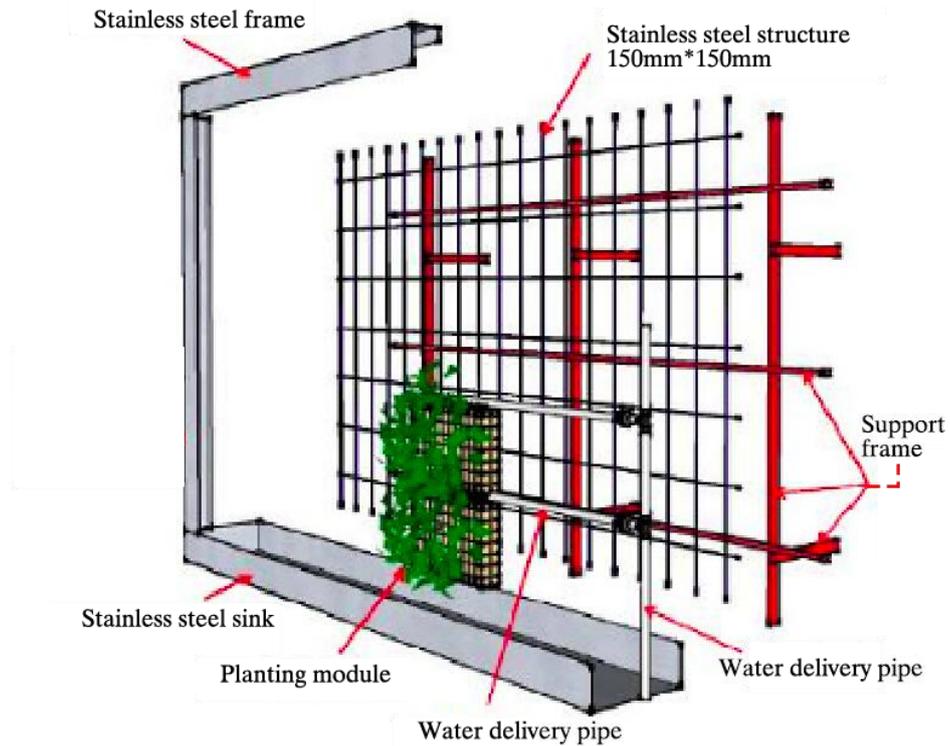


Figure 2.52 Pipeline type's green wall module

Source: <http://www.serengeseba.com/w/>

B. Living wall: the living wall has successfully been used in recent years for green walls. The French botanist Patrick Blanc is a pioneer in the practice of living wall. Through his observations of natural plants he developed a new method to create artistic green walls that were both lightweight and needed little maintenance.<sup>85</sup>

<sup>85</sup> Kelly Hart. Living Walls[EB/OL]. <http://www.greenhomebuilding.com/articles/livingwalls.htm>. Jun,2016

## Madrid, Spain

CaixaForum Madrid is a museum near Atocha station, Madrid. It was designed by two senior architects Jacques Herzog and Pierre de Meuron.<sup>86</sup> The impressive green wall of this building was designed by French landscape botanist Patrick Blanc.<sup>87</sup> Everyone gravitates toward this green wall because it's so huge and beauty. The “soil-on-a-shelf” type system is different from the traditional types, the major structure of this green wall is only a 5 cm thick. It's no wonder many people don't believe that there are real plants.(Figure 2.53 Green wall at the CaixaForum Madrid, designed by Patrick Blanc) The “soil-on-a-shelf” type system is a special planting method. Therefore, Patrick Blanc noticed that any type of wall would be able to support the weight of a vertical garden, this method can be used for planting the suitable plants on any surface of the building. It was a technical revolution of green wall. The green wall materials are mainly of *Lolium perenne*, *Asparagus cochinchinensis*, *Sedum sarmentosum*, *Ophiopogon japonicus* and *Dichondra repens*. The way to build this type's green wall is to mix growth matrix with soil binder, then use the mixture to cover the exterior wall of the building. The plants will grow on the exterior wall. The “soil-on-a-shelf” type system does not need any additional frameworks. The depth of growth matrix is about 10 cm. Compared with the traditional green wall, the “soil-on-a-shelf” type system has the advantages of environment protection and energy conservation. The living walls are suitable for cities, they are suitable in arid areas, as the circulating water on a green wall is less likely to evaporate than in horizontal gardens, they are also suitable for large construction projects. (Figure 2.54 Construction methods of the living wall)

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<sup>86</sup> Jackie Craven. Jacques Herzog and Pierre de Meuron, Modern Architects[EB/OL]. <http://architecture.about.com/od/architectsaz/p/herzogdemeuron.htm>. Jun,2016

<sup>87</sup> Patrick Blanc. CaixaForum, Madrid[EB/OL]. <http://www.verticalgardenpatrickblanc.com/node/1414>. Jun,2016



Figure 2.53 Green wall at the CaixaForum Madrid, designed by Patrick Blanc

Source: <https://de.pinterest.com/pin/539024649132969969/>



Figure 2.54 Construction methods of the living wall

Source: <https://de.pinterest.com/pin/539024649132969969/>

### 2.3 Assumption of spatial reconstruction method used in China

Due to historical and social cultural differences, the process of urban development in China is different from that in European countries. The Chinese ancient city structure always in chessboard shape, that is the product of 3,000 years of the feudal hierarchical system.<sup>88</sup> (Figure 2.55 Presumptive map of Taiyuan ancient city) There are a number of plazas in European ancient city, because of the innovation and humanity are characteristics of the urban development of humanism in Renaissance.(Figure 2.56 Plaster model of ancient Rome) The urban development of European ancient cities mainly on the extroversive pattern. But,

<sup>88</sup> Michael Laurie. An Introduction to Landscape Architecture[M]. New York:Elsevier, 1986. 18

the Chinese ancient cities' development are based on the introversive pattern. After entering the 20<sup>th</sup> century, the dominant direction of urban development in China is converting to extroversive pattern.<sup>89</sup> For all the differences between Chinese historic district and western historic district, but people are the key element in urban development, people make the difference more than the buildings and urban plans. Only when the people live in the city as a subjective existence, then the city becomes meaningful and specifically orientated. As the center of the city, the problem is serious in the historic district. The development and protection in the historic district have been received great attentions in developed countries. Due to the characteristics of the historic district, the public green spaces are increased through the construction of neighborhood units. Because, compare with large city park and square, the neighborhood units are more suited to the historic district. But, I still think that the existing public space of the historic district did not fully be used. If I can rational planning and make full use of the existing public space in the spatial structure, it will greatly improve the utilization rate of neighborhood units.

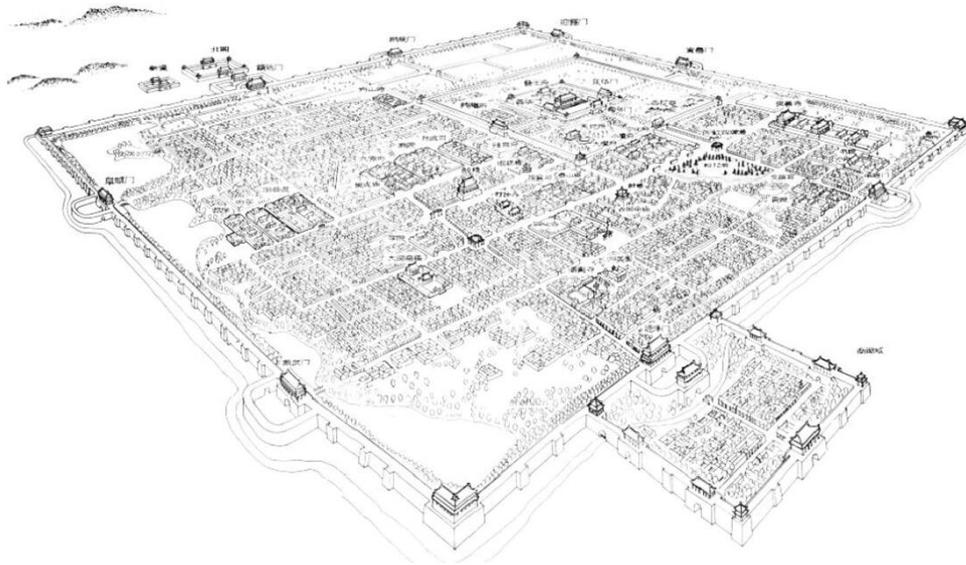


Figure 2.55 Presumptive map of Taiyuan ancient city

Source: <https://de.pinterest.com/pin/168181367307525401/>

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<sup>89</sup> Yang Zhen, Xu Miao. Research on urban public space in China[J]. International Urban Planning, 2008, 23(4): 35-40

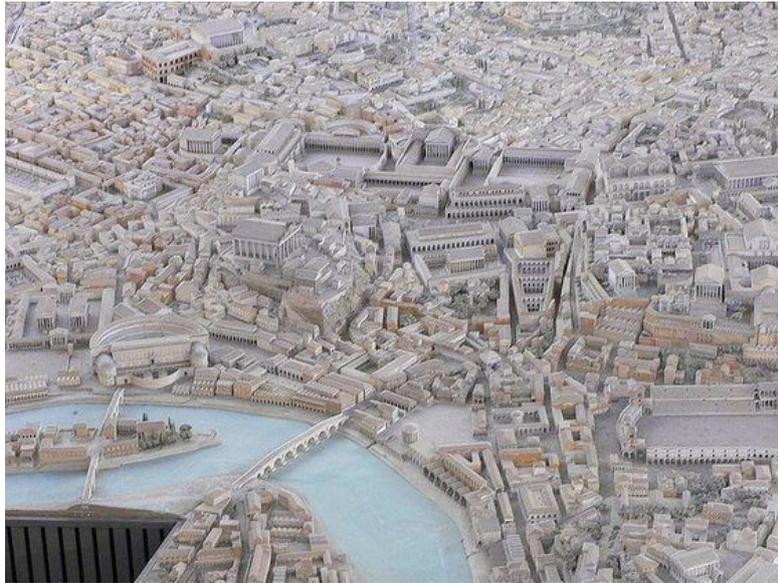


Figure 2.56 Plaster model of ancient Rome

Source: <https://de.pinterest.com/pin/355643701797155670/>

From the development process of cities, we can see that the historic district has always been on the edge for a long time. Until the 1840s, with the industrial revolution, urbanization became the trend of the world. Large numbers of people poured into the city, the existence of a large number of people has brought a serious of urban disease, which damaged and reduced the environmental quality of the city. Since the 1920s, people started to reflect upon the real meaning of city, landscape architects have put the construction of neighborhood unit on the important position in steps. Today, western developed countries have the mature theory and practice experiences of neighborhood unit construction in the historic district. According to the analysis and study of the previous cases, I have summed up the major features of spatial reconstruction in historic district:

A. Non- design and homogenization: people usually go to the city parks or large squares on weekends, and few people go to the city park every day, in addition to the seniors and children. But, we can see that the neighborhood units are more often used on weeknights. As we can see from the Eixample district, the neighborhood unit as an essential section of residents' daily life. The design of neighborhood units was simple, practical and easy to be popularized.

B. Local government pays attention to protecting and developing the historic district: the urban culture is developing along with the urban development. The combination of traditional culture and times feature that is most important part of the essence of urban

culture. With the development of city, neighborhood units, as the carriers of urban culture, plays a very important role to carrying forward the urban culture and history. The neighborhood unit, as the existence of urban public space, it is a large and wide system which involves the whole city. Which is a combination of the local history with city space environment, from the case studies.

C. Public participation: during the design process, the planner should follow the residents' idea, and to meet their reasonable demands. The questionnaire is the simplest way to ask for advice.(Figure 2.57 The local residents are filling the questionnaires)



Figure 2.57 The local residents are filling the questionnaires

Source: Author

D. The public space should be harmony with the architectural style of surrounding areas. The public space is an important part of the historic district, the traditional architectural style of the feature is basically through the materials, pavements and public facilities. The cases have in common that the pavements, materials and public facilities were all designed based on the continuation of traditions.(Figure 2.58 Taiyuan food street)



Figure 2.58 Taiyuan food street

Source: Author

E. Innovations of the historic district development model: from these cases, we can see that the development model of the historic district is not only restricted to government investment. The government should take measures to encourage enterprises to invest in spatial reconstruction projects.

F. The development of underground space plays a positive role in the protection and development of the historic district. Underground space development has special advantages in historic district protection and development, other ways can not replace it.

G. The green walls can improve the quality of the urban public space, and make the landscape have a higher public recognition and affinity. The neighborhood unit, urban underground space and green wall, the three methods build up the rich and colorful scenes of the urban public space.

## **2.4 SUMMARY**

Though the research of literature and excellent cases, you can find that all excellent cases in the world according to the actual situation of the local environment, history and culture adopted different design methods. A successful design proposal, which has an important meaning for the reconstruction of a historic district, is obtained by analyzing the comprehensive local situation. The successful master plan can avoid the destruction of irrational development in the historic district, enables the government has the internal

motivation to truly protect the historic district, and also promote local economic and tourism development. Protecting the historic district, and in the meantime make full use of existing land resources to improving the living environment, and bring their recreational, educational and ecological functions into play is a good alternative to removing them. This is an important way to achieve the sustainable development of the historic district.

While European countries show the mature theory and practical experience in the historic district spatial reconstruction, in China has great practical significance, but more should be based on the conditions and characteristic of China, there is a difference between western architecture and eastern architecture. In China, the land belongs to the country, it is biggest different between China and other countries in development and protection of historic district, which determines that the development and protection of historic districts are only by the wishes of the government. But these cases still can be used for reference to my design proposal of spatial reconstruction in Yongding Road historic district. The historic districts in China are very abundant, it has laid a good foundation for historical and cultural inheritance. But, we can see from the practices of historic district development in China that there is so many problems with urban development. Especially during the fast development of the urban construction period in China, local governments also lack the consciousness and measures in protecting and develop the historic district in accordance with their characteristics.

### 3. INFORMATION OF YONGDING ROAD HISTORIC DISTRICT

#### 3.1 SITE CHARACTERISTICS

##### 3.1.1 Location and climate

###### The location of Taiyuan

Taiyuan is the capital of Shanxi province, which is located in the Taiyuan basin and the central region of China. The city covers an area of 1,460 km<sup>2</sup>. Taiyuan is a heavy industrial city with a population of 3 million. The city is surrounded on three sides by mountains and the Fenhe River runs through the city from north to south. The superior geographical position and rich history make Taiyuan one of the economic, political and cultural centers of Northern China.<sup>90</sup>

Taiyuan has a history over 2500 years, in a long historical period, it was the capital or secondary capital of the central dynasty.(Figure 3.1 Timeline of Taiyuan as a capital of China) Therefore, the city has a close relationship with Beijing, the capital of China.<sup>91</sup>

Timeline of Taiyuan as a capital of China

Dynasty	Zhao	Qianqin	Dongwei	Beiqi	Tang		Houtang	Houhan	Houjing	Beihan
A. D.	453 BC-425 BC	385-386	534-550	550-557	692-705	723-907	925-936	936-938	947-951	951-979
Years	29 years	2 years	16 years	28 years	14 years	185 years	12 years	3 years	4 years	29 years

Figure 3.1 Timeline of Taiyuan as a capital of China

Source: Author

###### The location of Yongding Road historic district

Yongding Road district (Figure 3.2 The plan of Yongding Road district) is an area in Taiyuan, on the east bank of the Fenhe River, and the river surface was higher than the area. The north of the area is drained by the Xisha River, it is the main channel connecting the Fenhe River and the Longtan Lake. The lake is in a city park, where located in the west of Yongding Road district.(Figure 3.3 The view of the existing site) The Yongding Road district is like a

<sup>90</sup> Taiyuan municipal government. Taiyuan City[EB/OL].

<http://www.shanxigov.cn/n16/n8319541/n8319597/16555621.html>. Jul,2016

<sup>91</sup> Chinese Dictionary. The three capital:San Jing[EB/OL]. <http://www.zdic.net/c/9/3/5786.htm>. Jul,2016

small island surrounded by shopping centers and housing estates.(Figure 3.3 The land use of Yongding Road district's surrounding area) This area from Dongerdao Alley to the Chengfang Dong Street between the Jiefang Road and Xiaoqiang Road. This district now has 7737 residents,<sup>92</sup> with a total area of 260,500 square meters, including the residential estate covers 102,100 square meters (39.2%), the public facilities covers 103,100 square meters (39.6%), the shabby buildings cover 9,900 square meters (3.8%), the historic buildings covers 108,300 square meters (7%), the heritage buildings covers 4,000 square meters (1.5%), the roads cover 23,100 square meters (8.9%).(Figure 3.4 The land use of Yongding Road district) In this district spread many historic buildings. For example, the Taiyuan Catholic Church named Archidioecesis Taiüenensis (Figure 3.5 Taiyuan catholic church) is a heritage building with a beguiling Roman flavor.<sup>93</sup>

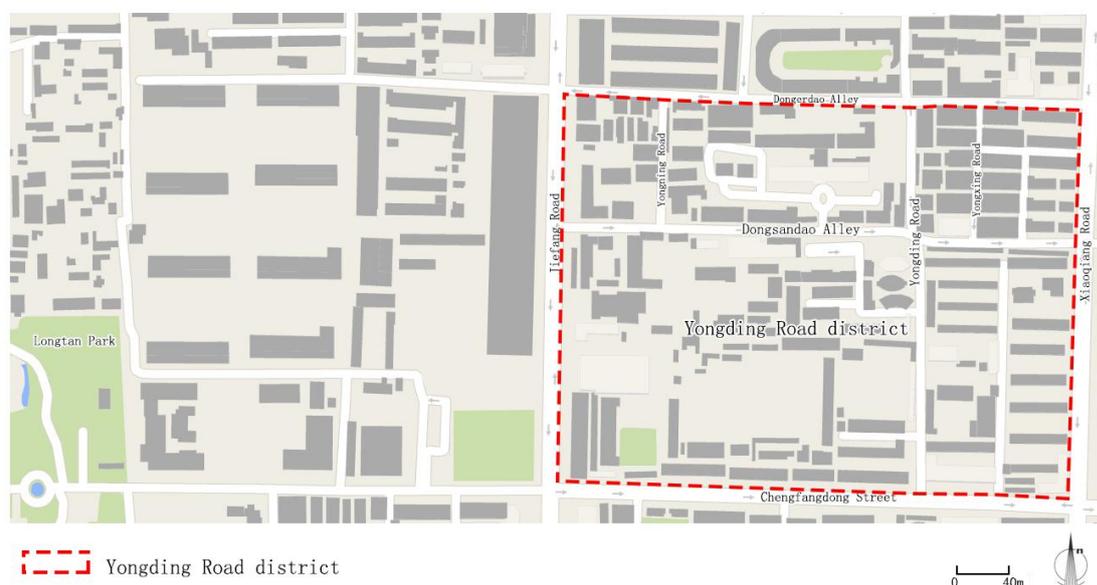


Figure 3.2 The plan of Yongding Road district

Source: Author

<sup>92</sup> National Bureau of Statistics. The Six National Census [R]. Beijing:China Statistic Press, 2010.

<sup>93</sup> Wang Fuhua. The Heritage Building Protection List of Taiyuan City[R]. Taiyuan:Taiyuan Institute of Urban Planning and Design, 2005. 19



Figure 3.3 The view of the existing site

Source: Author

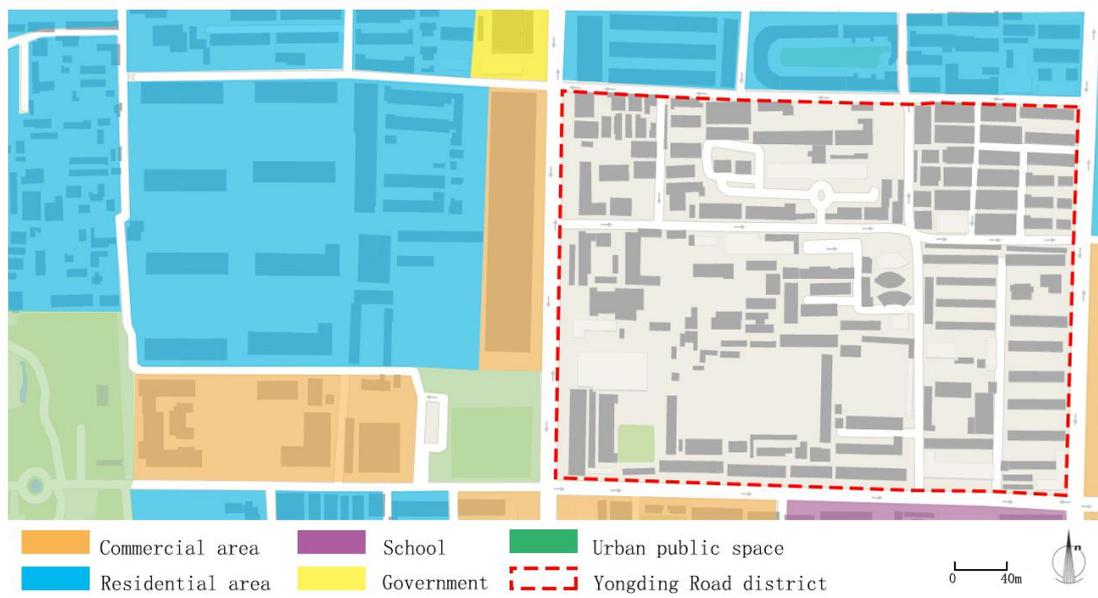


Figure 3.3 The land use of Yongding Road district's surrounding area

Source: Author



Figure 3.4 The land use of Yongding Road district

Source: Author



Figure 3.5 Taiyuan catholic church

Source: Author

Yongding Road historic district (Figure 3.6 The plan of Yongding Road historic district) is a part of the Yongding Road district, the historic district covers an area of about 82,600 square meters, from Dongerdao Alley to the Dongsandao Alley between the Jiefang Road and Xiaoqiang Road, the area has an estimated population of 2,000. Consisting of Yongding Road historic district, Yongning Road, Yongding Road, Yongxing Road three parallel

ancient alleys, and there are five kinds of areas: residential areas, ancient folk houses, slums, hospital as well as Church.(Figure 3.6 The historic district hatched in red and the Yongding Road district boundary indicated by the red line)



Figure 3.6 The historic district hatched in red and the Yongding Road district boundary indicated by the red line

Source: Author

## The weather in Taiyuan

Taiyuan is in the mid-latitudes of the northern hemisphere, and it has a temperate continental climate. Due to the basin climate and the external climate was separated geographically, it is hot and rainy in summer, cold and dry in winter. The yearly average temperature in Taiyuan is about 9.96 °C.<sup>94</sup> (Figure 3.7 Climate data for Taiyuan) Due to geographical, climatic conditions and historical reasons, these factors lead to the unique style of the architectures and the gardens here. Taiyuan is well known as its large number of ancient heritage in China and named as a treasure house of Chinese architecture.<sup>95</sup>

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	1.8 (36.2)	5.4 (41.7)	11.5 (52.7)	19.8 (67.6)	26.6 (79.9)	28.6 (83.5)	29.3 (84.7)	28.6 (82.4)	23.7 (74.7)	17.8 (64)	9.5 (49.1)	3.1 (37.6)	17.0 (62.6)
Average low °C (°F)	-11.6 (11.3)	-8 (18)	-2 (28)	4.8 (40.6)	10.5 (50.9)	15.1 (59.2)	18.2 (64.8)	16.9 (62.4)	10.8 (51.4)	4.0 (39.2)	-2.7 (27.1)	-9.2 (15.4)	3.9 (39)
Average precipitation in (inches)	3.2 (0.126)	5.2 (0.205)	13.4 (0.528)	19.9 (0.783)	33.3 (1.311)	55.9 (2.201)	102.1 (4.02)	197.0 (7.756)	51.6 (2.031)	25.6 (1.008)	10.7 (0.421)	3.2 (0.126)	431.1 (16.973)
Average precipitation days (≥ 0.1 mm)	1.9	2.9	4.4	4.3	5.7	9.3	12.4	11.2	8.1	5.4	3.3	1.4	70.3
Average relative humidity %	50	47	50	47	50	61	73	77	74	67	62	56	59.5
Mean monthly sunshine hours	173.4	174.0	202.3	229.8	265.1	250.9	228.6	223.8	209.6	206.9	174.6	162.6	2,501.6
Percent possible sunshine	57	58	55	59	61	57	51	53	56	60	57	55	56.6

<sup>94</sup> China Meteorological Administration. Climate data for Taiyuan (1981–2010)[EB/OL].

<http://data.cma.cn/data/detail/dataCode/A.0029.0005.html>. Jul,2016

<sup>95</sup> China Travel. Shanxi Travel Guide[EB/OL]. <http://www.chinatravel.com/shanxi/>. Jul,2016

Figure 3.7 Climate data for Taiyuan

Source: <http://www.cma.gov.cn/>

Because of the temperature and long frost-free period, the “Siheyuan” are known as courtyard houses, which is the form of ancient architecture that was popularly used in Taiyuan region.<sup>96</sup> The Siheyuan are made of a series of rooms located around a private rectangular courtyard. The roof is generally used in a pitched roof that has better heat insulation effect and drainage effect. The courtyard is formed by inward-facing houses on four sides, and can be divided into four parts: the main house, two wing rooms and a southern room. (Figure 3.8 3D Siheyuan model)



Figure 3.8 3D Siheyuan model

Source: <https://de.pinterest.com/pin/395542779743627120/>

### 3.1.2 History and culture

Yongding Road historic district is one of Taiyuan’s historical and cultural reserves, together with a series of Siheyuan and Taiyuan Catholic Church reserve. The history of Yongding Road historic district can be dated back to the Qing Dynasty (1644-1911). At that time, the area was a Catholic community within the Taiyuan City. (Figure 3.9 Taiyuan catholic church, 1907) The best known of this district is the Taiyuan Cathedral, it was founded in 1870. Because of the Boxer Rebellion, the Taiyuan Massacre occurred, reports at the time alleged that mayor of Taiyuan ordered the killings a number of western

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<sup>96</sup> UNESCO. Ancient Residences in Shanxi and Shaanxi Provinces[EB/OL]. <http://whc.unesco.org/en/tentativelists/5322/>. Jul,2016

Christian missionaries and Christians who lives here.<sup>97</sup> The church was burned in 1900. It has been completely reconstructed by Qing government in 1905. The church still remains today and is open to the public.(Figure 3.10 Church service at Taiyuan catholic church) The catholic district includes a cloister, a printing house, a middle school, a primary school, a hospital, a convent, a nursery and gardens. The catholic district came first and the Yongding Road district followed not long after. The catholic district area gradually expanded, then the changes over time to formed today's Yongding Road historic district.



Figure 3.9 Taiyuan catholic church, 1907

Source: <http://tieba.baidu.com/p/280809648?pn=2>



Figure 3.10 Church service at Taiyuan catholic church

Source: Author

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<sup>97</sup> Roger R Thompson. Reporting the Taiyuan Massacre: Culture and Politics in the China War of 1900[M]. New York:Tiedemann. Rowman & Littlefield publishers, INC , 2007. 65-89

After the establishment of the People's Republic of China in 1949. All the property of the church was nationalized. Now, the church cover a total area of 8,128 m<sup>2</sup> . Only the Yongding Road's street layout have gone through the course of urban development a hundred years and remain until now. A large number of Siheyuan in Yongding Road historic district were constructed in the Ming and Qing Dynasties. The street layout did not change significantly from that in the Qing dynasty. The street layout is mainly in the chessboard pattern. We can see that the traditional T-crossing is retained.

As time passed by, the Catholicism declined in Taiyuan and only the Yongding historic district were left. It is a microcosm of the city's history as well as a deep mark in local people's memory.

## **3.2 SITE ANALYSIS**

### **3.2.1 Resident living situation**

The forming and developing of social formation needs a long-term course and public environment. The neighborhood unit can provide a platform for exchange, communication and cooperation between local residents. That is why the historic districts are more personable than the new housing estate. The social networks are important to the historic districts. We need to know more about social networks, which will help the neighborhood units that better appeal to local residents.

A. Supporting facilities: the Yongding Road historic district mainly includes residential areas, a hospital, a primary school, a middle school, a fresh food market, a bank, convenient stores and restaurants. The district has complete facilities around. Meanwhile, the city park and the Taiyuan's largest shopping center are not far from the Yongding Road historic district. But in the historic district, we can see some stores that are hundred of years old, where the modernity and history mix. From the population composition of Yongding Road historic district, it is dominated by the local residents. But, more and more foreigner come to this district to found accommodation.(Figure 3.11 The land use of Yongding Road historic district)

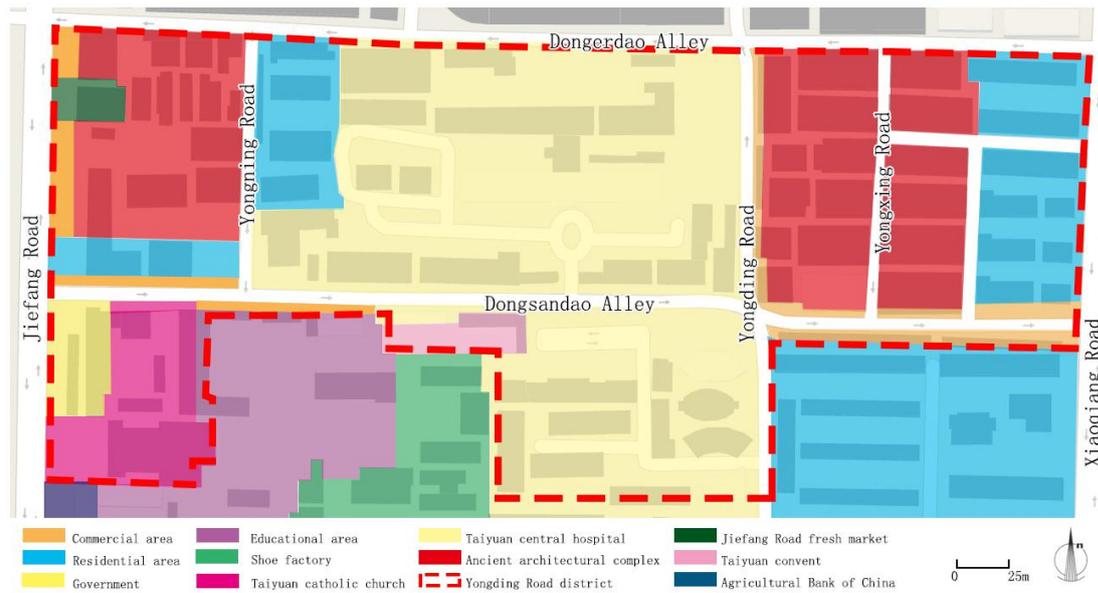


Figure 3.11 The land use of Yongding Road historic district

Source: Author

B. Residents' life style: in the Yongding Road historic district, the neighborhood units are based on the Siheyuan's courtyards and streets. The district is an old residential district, and most of the residents are seniors and children. The seniors do not want to move out of their home. Usually, the parents leave their children to the grandparents and go to work. Many of residents are the old man can barely walk, they should also take care of their children. So, they may only use the nearby public spaces, such as streets and courtyard. Therefore, the neighborhood units are automatically formed. The life of residents are quite colorful and full, they usually do morning exercises in the street. After exercises, they went to the market to buy some fresh food, and then cooked a breakfast. In the morning and afternoon, they usually chat with their neighbor and invigilated the activities of their grandchildren as they played in the courtyard. The shopkeepers in the historic district are mostly foreigner, many of them youths. They have been on good terms with their neighbors.(Figure 3.12 The harmonious relations between local residents and visitors)



Figure 3.12 The harmonious relations between local residents and visitors

Source: Author

C. The social role: the courtyards of Siheyuan and streets plays the important social roles in the Yongding Road historic district. In the Yongding Road historic district, the local residents have the totally different living way from the modern residential areas. The streets and courtyards have many uses in the residents' life, and also seen as the transitional space between the metropolis and historic districts. The streets and courtyards are also the important and necessary parts of the historic district, they are used for the entertainment and communication. (Figure 3.13 The residents usually take a rest in the courtyard.)



Figure 3.13 The residents usually take a rest in the courtyard.

Source: <https://de.pinterest.com/pin/90283167501164526/>

After development for a century, the streets and public spaces of Yongding Road historic

district formed an appropriate space scale and layout. The historic district with the narrow streets, where children can enjoy themselves in the street or courtyard and the seniors and sit at the front door of Siheyuan and gossip. Once you are here, you will full of memories and imaginations. It is quiet compared to the other side of the Jiefang Road. (Figure 3.14 The contrast between the Yongding Road historic district and the shopping mall across the Jiefang Road) In this place, the streets were lined with restaurants and convenience shops. The traffic function of the street has been reduced, the streets are more like the “public living room”. Although there is a general feeling of dissatisfaction with the existing environment, people hope the government can improve the environment. However, many feel that the neighborhood units should be preserved. (Figure 3.15 The Jiefang Road market)



Figure 3.14 The contrast between the Yongding Road historic district and the shopping mall across the Jiefang Road

Source: Author



Figure 3.15 The Jiefang Road market

Source: Author

D. The sense of belonging: the Yongding Road historic district, there is no visible landmark, but it still makes you feel like you belonged to this ancient city. The Yongding Road historic district retained a large number of Siheyuan, that view is rarely seen nowadays in Taiyuan. As a historic district, there is a strong cultural atmosphere and forms a stable cultural circle. Compared with other antique-style districts, the Yongding Road historic district has unparalleled charm.

### **3.2.2 Existing street and space**

#### **The street space**

The streets and public spaces of Yongding Road historic district are complicated. In the eastern part of this district, it consists of the hospital's dormitory and the ancient buildings. The middle part is the Taiyuan central hospital. The western area is dotted with ancient buildings, the Taiyuan catholic church, a company dorm and the district government. There are lots of traditional Siheyuan, there are still people who live in these ancient buildings. However, The ancient relics protection of Taiyuan due to a late start, many ancient buildings are damaged during the process of urban development.

Dongsandao Alley, it is 600 meters long and 12 meters wide, it is a short distance to the shopping mall. The shops along the roadsides were usually changed from the southern room of Siheyuan. (Figure 3.16 A view of the Dongsandao Alley)



Figure 3.16 A view of the Dongsandao Alley

Source: Author

Yongning Road is 110 meters long and 7 meters wide. The traditional Siheyuans on the west side of this road, the Taiyuan central hospital locates on the east side of the Yongning Road. (Figure 3.17 A view of the Yongning Road)



Figure 3.17 A view of the Yongning Road

Source: Author

Yongding Road is 426 meters long and 7.6 meters wide, which is the main street through Yongding Road district center. Along the axis of this district where two main street meets, runs into an intersection. The Taiyuan central hospital is on the west side of Yongding Road. So, there was much activity in this streets, many shops along the road. (Figure 3.18 A view of the Yongding Road)



Figure 3.18 A view of the Yongding Road

Source: Author

Yongxing Road is 146 meters long and 6 meters wide. There are lots of Siheyuans of historical value and cultural value, especially those of Qin Dynasty. The street was narrow, which cars were not allowed to go into. Therefore, this road is very quiet here. (Figure 3.19 A view of the Yongxing Road)



Figure 3.19 A view of the Yongxing Road

Source: Author

A. The grade of the road: the rectangular street system in this district is the true fragment of Taiyuan ancient city.(Figure 3.20 Map of Taiyuan ancient city, 1935) According to the different width of the streets, we divided them into three grades: main street, alley and lane.



Figure 3.20 Map of Taiyuan ancient city, 1935

Source: [http://blog.sina.com.cn/s/blog\\_86b04fc80102vca9.html](http://blog.sina.com.cn/s/blog_86b04fc80102vca9.html)

The Dongsandao Alley and Yongding Road are the main streets of this district, there is the place where the social activities are mainly conducted. The narrow streets and the towering wall constitutes a comfortable community space. (Figure 3.21 A view of the major intersections in Yongding Road historic district)



Figure 3.21 A view of the major intersections in Yongding Road historic district

Source: Author

Because of some historical reasons, many T-alley has been formed, such as Yongning Road and Yongxing Road. At the end of T-alley, the intersection of two streets forms a fork. It is a typical intersection of Taiyuan. It is very popular in the forks because there are many shops and restaurants. Generally, the width of T-alley is 3m to 5m, and the 4m walls on both sides of the street, it can take more comfortable experience on visual and psychological for people. (Figure 3.22 A view of the T-junction between the Dongsandao Alley and the Yongning Road)



Figure 3.22 A view of the T-junction between the Dongsandao Alley and the Yongning Road

Source: Author

The lanes as the branches of the main street and alley, which forms a multiple networks. The length of lanes is about 15m, the narrowest width of lanes is about 2m. This type of environment can easily cause tension and uncomfortable feeling of people.(Figure 3.23 The lines connecting the main streets with the courtyards)



Figure 3.23 The lines connecting the main streets with the courtyards

Source: Author

B. The type of road space: according to different characteristics, we can divide the road space into five types: linear space, L-space, T-space, and polygon.

Linear space: the linear space can be divided into two types. These space exists on the main streets, alleys and lanes. It is mainly used as a consumption place in the Dongsandao Alley and the Yongding Road. In the Yongning Road and Yongxing Road, the width of linear space is general between 3 to 5m. The linear space here is an ideal place for morning exercises, because of which cars were not allowed to go into. The linear spaces of the lanes are 3m. The linear space is transition region of Private spaces and public space, people usually play chess here. (Figure 3.24 two types of linear space)

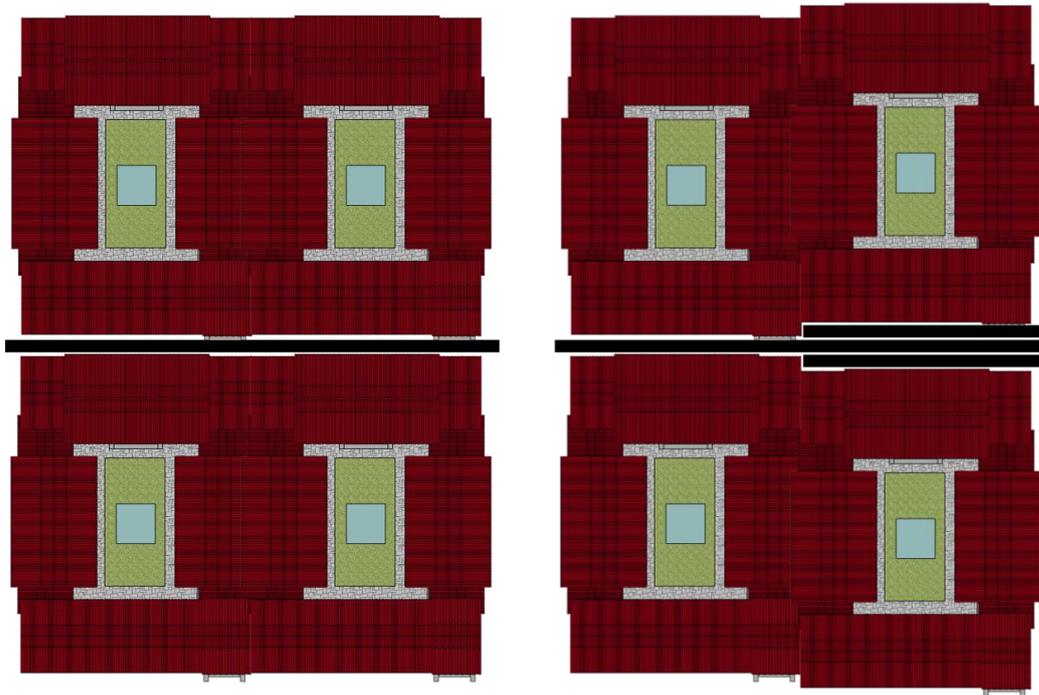


Figure 3.24 two types of linear space

Source: Author

L-shaped space: the L-spaces, which are more common in lanes. People usually spontaneously to exercise here. These places are the places where people can talk with their neighbors.(Figure 3.25 L-shaped space)

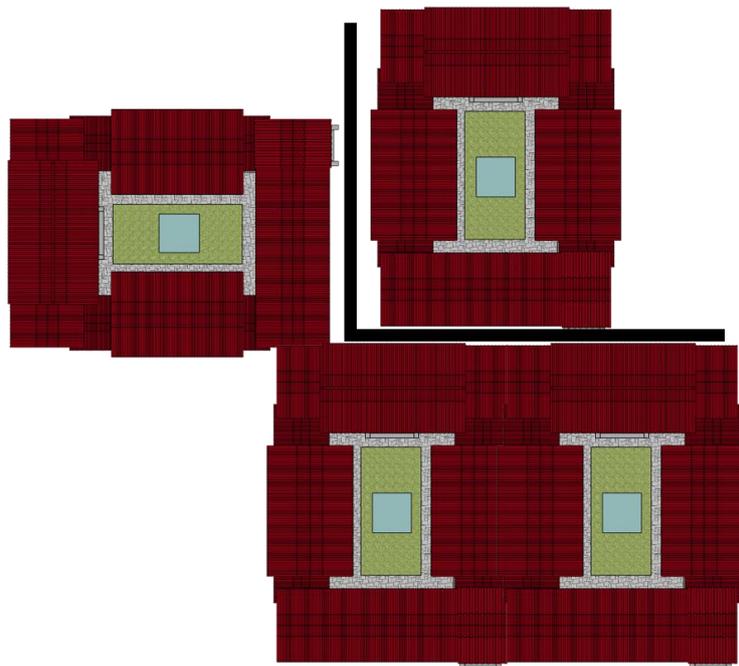


Figure 3.25 L-shaped space

Source: Author

T-space: These street spaces are located in the main streets and alleys, the majority of marketing going on in these places.(Figure 3.26 T-shaped space)

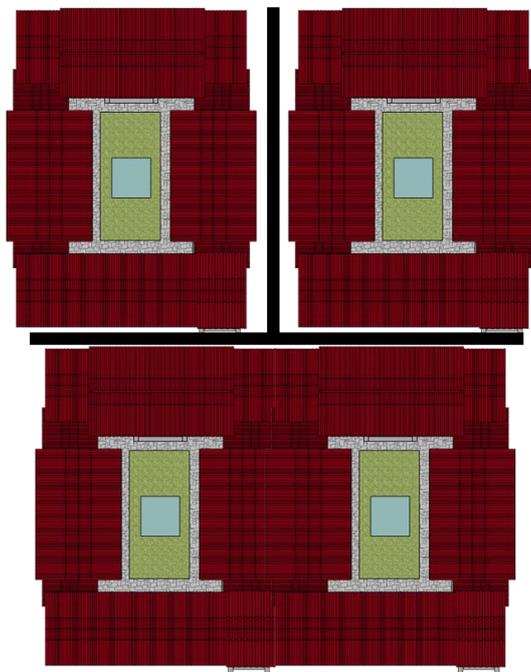
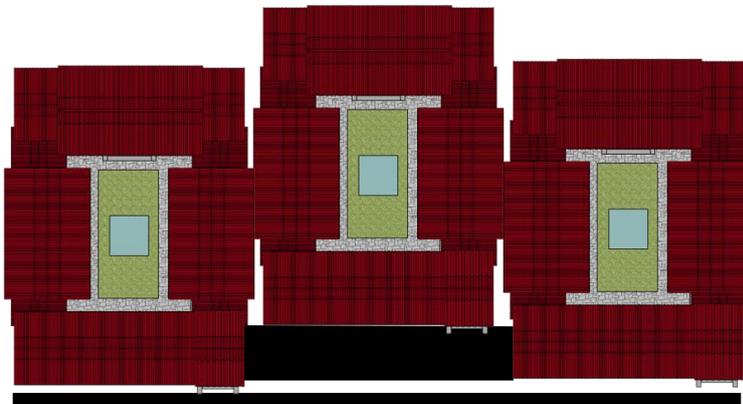
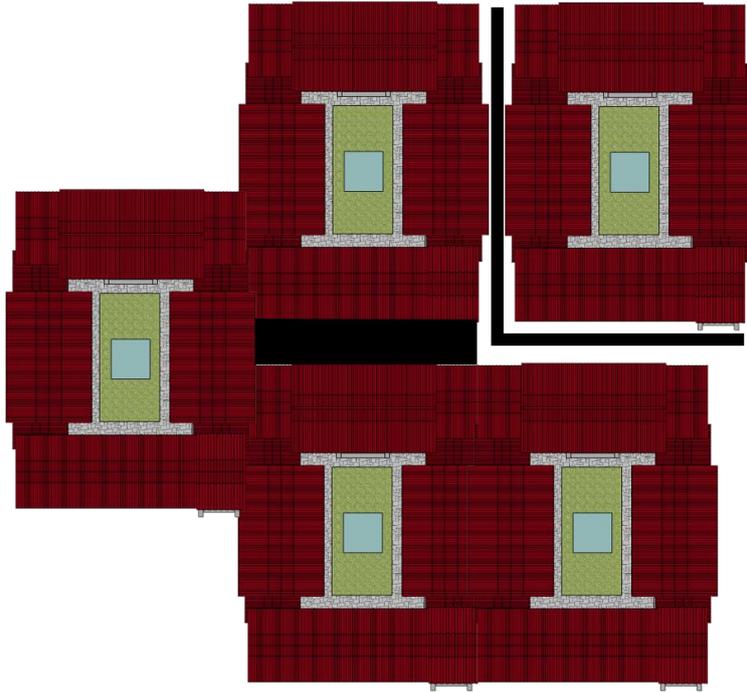


Figure 3.26 T-shaped space

Source: Author

Polygon: According to the shape of the polygon, the polygons can be classified into four types. They are normally found in intersections the main streets and alleys. The polygon is commonly used as parking lots.(Figure 3.27 Polygon )



9.5

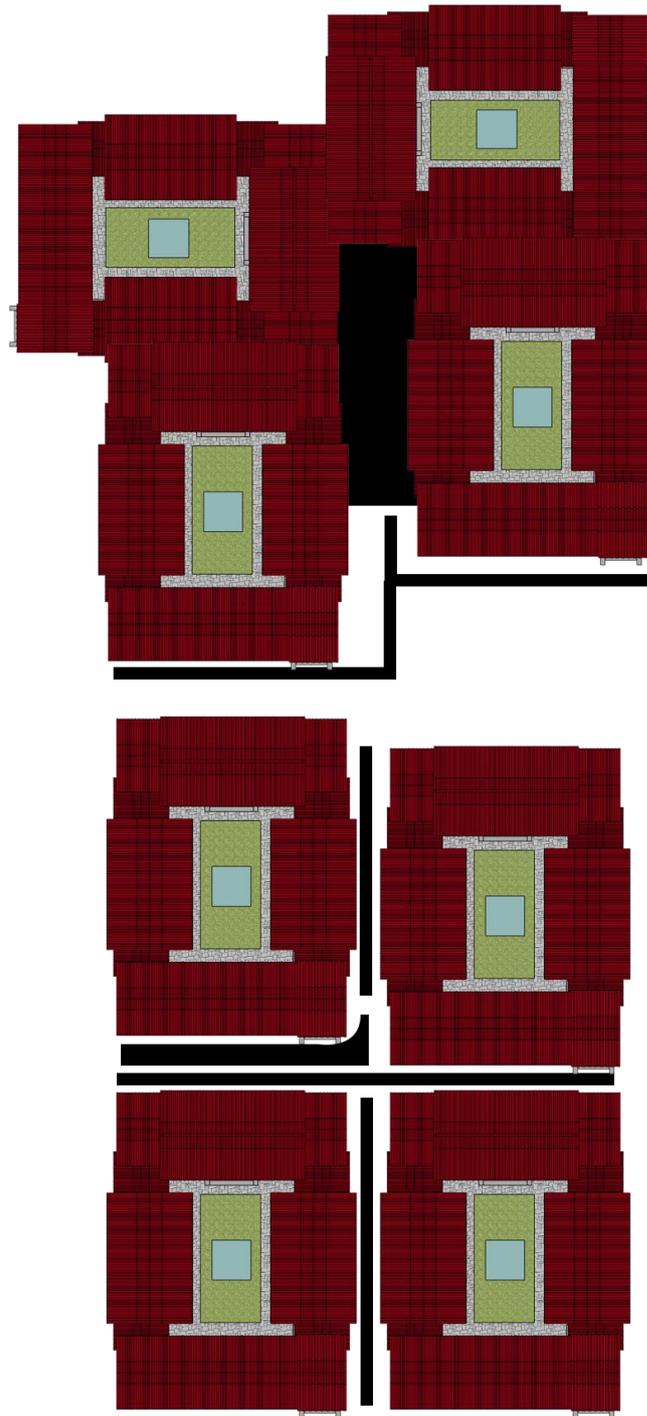


Figure 3.27 four types of Polygon

Source: Author

The street spaces were rich of cultural, historical and economic significance because of their regions and society.

### **The courtyard of Siheyuan**

As the winters in Taiyuan are dry, dusty and windy. The Siheyuan architectural forms are widely used in the residence construction. The Siheyuan was commonly used for residences, palaces, temples, family businesses and government offices. According to the social hierarchy of ancient times, there are four types of Siheyuan: single courtyard, two halls with two courtyards, three halls with three courtyards, four halls with three courtyards.(Figure 3.28 The different types of Siheyuan) Today, lots of Siheyuans are still used as housing complexes. But, with the lack of modern facilities, many young people moved away from the historic district. Meanwhile, other residents have privately to rebuild their rooms, which led to the destruction of Siheyuans. Now, 10 Siheyuans are complete protected. More than 30 Siheyuans are destroyed to varying degrees.

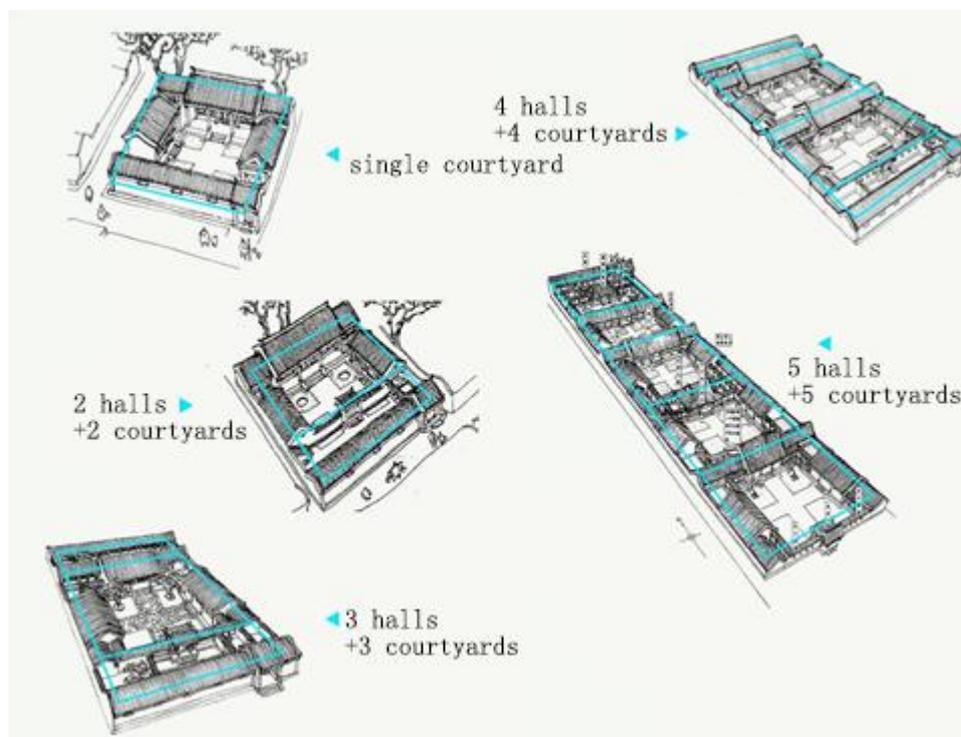


Figure 3.28 The different types of Siheyuan

Source:

<http://mmbiz.qpic.cn/mmbiz/h5qxt1KdFQ0YDz6AVDTXFALFqibvG0tWImSWbK8B54ZB2thAAvfDyZrp4q1WZo9THfr5pS94Ic0a829o7ZFkT8g/0>

### 3.2.3 Access and servicing

The parking lot of Taiyuan central hospital are currently accessed Dongsandao Alley and Yongding Road by the entrances and exits. In addition, this is the only one parking lot that is used for all residents, visitors and patients. It forms the central commercial area of this historic district, the Taiyuan catholic church is also not far from here.(Figure 3.29 Current access arrangements) The Dongsandao Alley is the main road in this district, it is used for deliveries to all the alleys of this district. It also forms the access points for Dongsandao

Alley to Yongding Road, Yongning Road, Yongxing Road and even urban main roads. The most convenient shops and restaurants occur along the Dongsandao Alley and Yongding Road.(Figure 3.30 Many shops and restaurants along the Dongsandao Alley) Along the Yongning Road and Yongxing Road, there are compounded by Siheyuans, poor building stock, abandoned buildings and old residential districts.(Figure 3.30 The current access arrangements)



Figure 3.29 Current access arrangements

Source: Author



Figure 3.30 Many shops and restaurants along the Dongsandao Alley

Source: Author

### 3.3 INVESTIGATION AND ANALYSIS

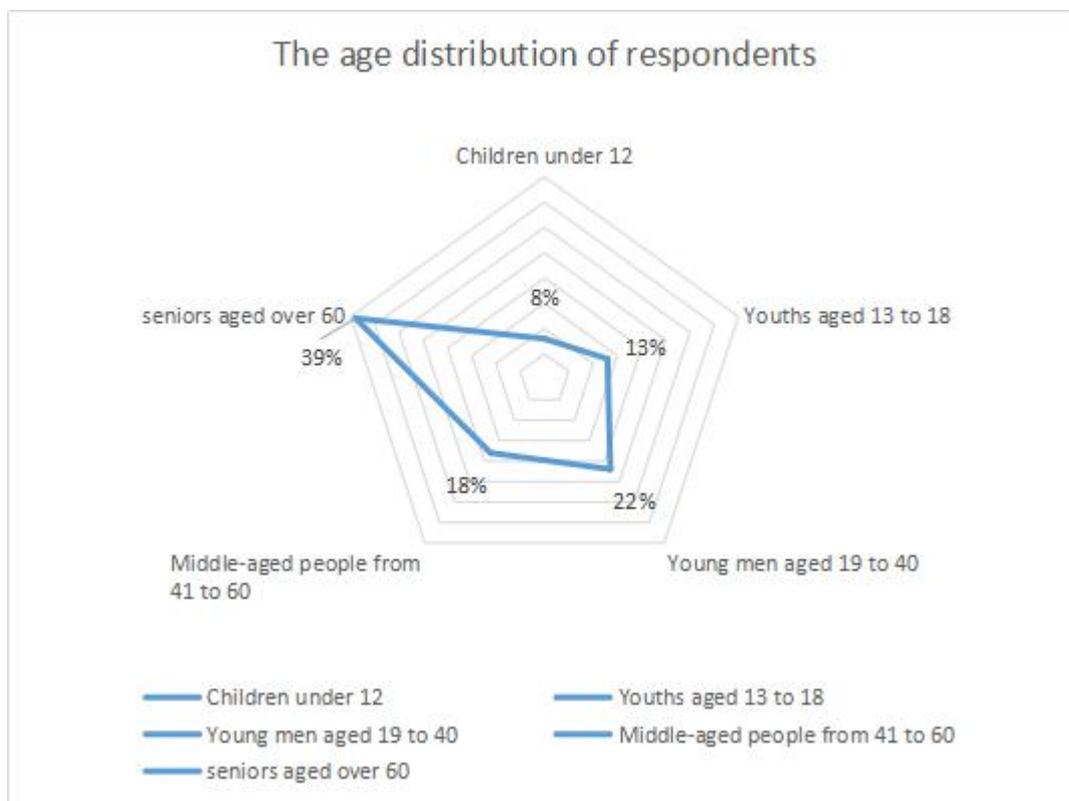
According to the principle of social participation during the design process. I sent out

questionnaires to 400 local residents and strangers. (Appendix: The questionnaire of the spatial reconstruction in Yongding road historic district) In order to guarantee the accuracy of the survey results, the participants were divided into two-time points to interview. This method can reflect the real opinion of local residents. The study investigates the people's perceptions of the historic district reconstruction. Finally, we have recovered 368 questionnaires, the recovery rate is 92%. There 358 questionnaires which are effective questionnaires, efficient rate is 97.3%.

### Analysis on the investigation results

#### A. The age distribution of respondents

Among 358 respondents, the children under 12 years old accounted for 8%, the youths at the age of 13 to 18 years old accounted for 13%, the young men from 19 to 40 years old accounted for 22%, middle-aged people made up 18% and the age of respondents over 60 years was 39%. We can see from the data, most of the residents or visitors here are seniors. (Graph 3.1 The age distribution of respondents)



Graph 3.1 The age distribution of respondents

Source: Author

## B. The time needed for a journey

As shown in the table, 56% of people spend less than 3 minutes to get there, 23% people need to take 5 minutes to get there, 14% people could be there in 10 minutes and 7% people lives more than 10 minutes away from there.(Graph 3.2 The time needed for a journey)

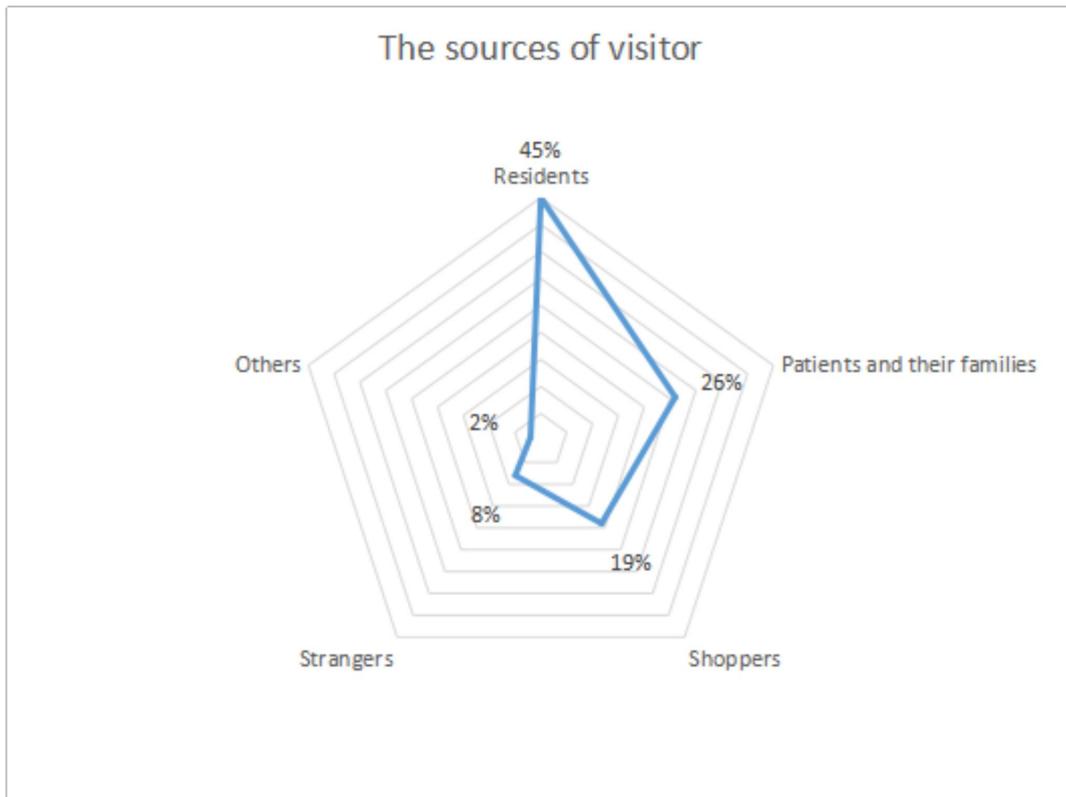


Graph 3.2 The time needed for a journey

Source: Author

## C. The sources of visitor

The next table shows the sources of visitors. The local residents from Yongding Road district account for 45% of the total. Patients and their families from the hospital accounted for almost 26%, 19% of the visitors come from nearby buildings, 8% of visitors are strangers and other visitors accounted for 2%. We can notice that the subject of visitors is mainly the local residents, followed by patients and their families. The relatively closed road system is the main factor which affects the composition of visitors in Yongding Road historic district.(Graph 3.3 The sources of visitor)

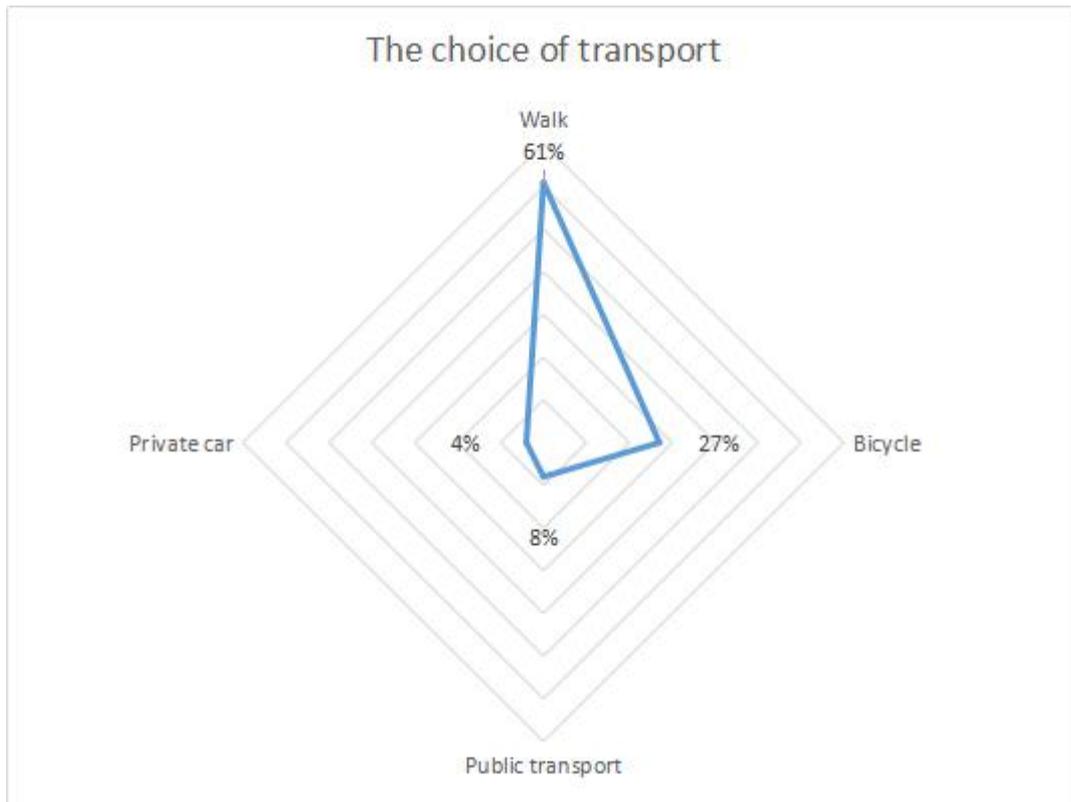


Graph 3.3 The sources of visitor

Source: Author

#### D. The choice of transport

When people were asked to choose a convenient and fast way to get to Yongding Road historic district. There almost 61% people selected walking, 27% people choose to go to this place by bicycle, 8% people opted to take public buses to get go this place and only 4% people choose to go by car. In the general population, people are still choosing to walk or cycle to go to this place. It means that the Yongding Road historic district had less influence in the whole city. The percentage of people choose to take bus or car is small, this result means that due to its central location, the traffic is heavy here. On top of this, there really aren't enough parking lots, so the road system of this district can not connect with the urban road system very well.(Graph 3.4 The choice of transport)

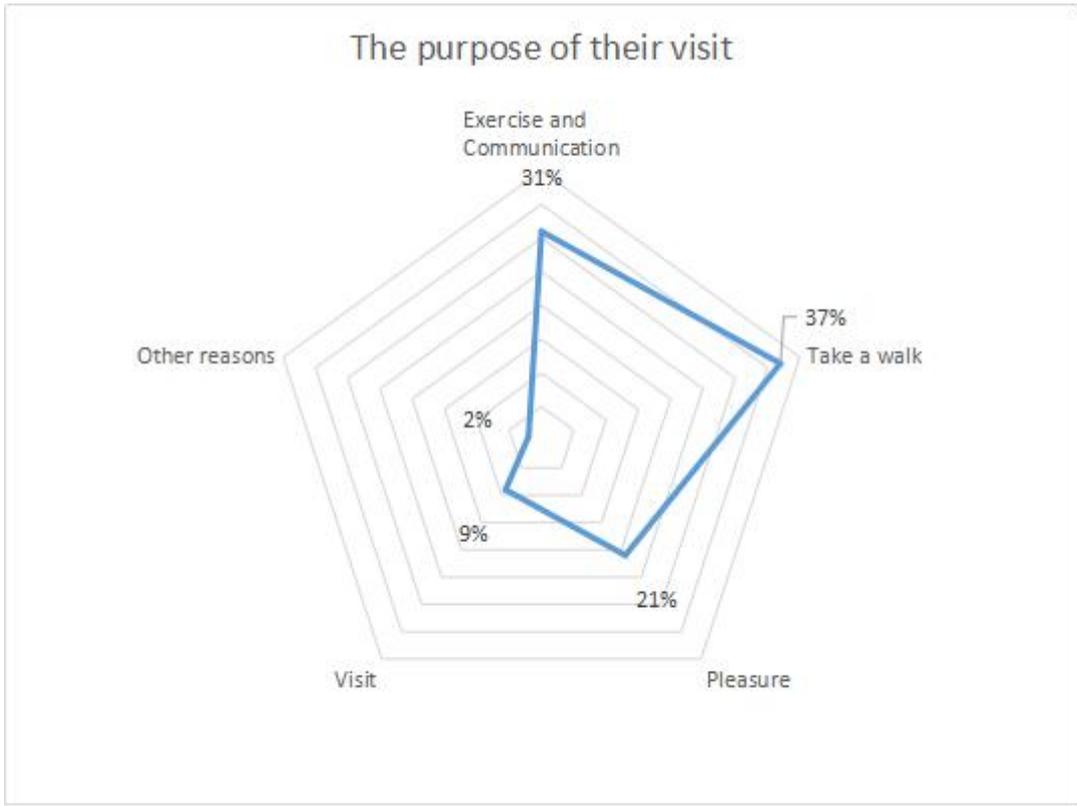


Graph 3.4 The choice of transport

Source: Author

#### E. The purpose of their visit

Among the visitors surveyed, 31% respondents usually come to this place for exercise and communication. 37% people went to the Yongding Road historic district for the sake of strolling there, 21% people who are here for pleasure, tourists account for about 9%, and 2% people come to here because of other reasons. Data shows that with the resident living standard improving, people's demand for public spaces is enormous. Because of higher land costs here, how to use limited land resources to play a greater benefit is the issue we must solve.(Graph 3.5 The purpose of their visit)

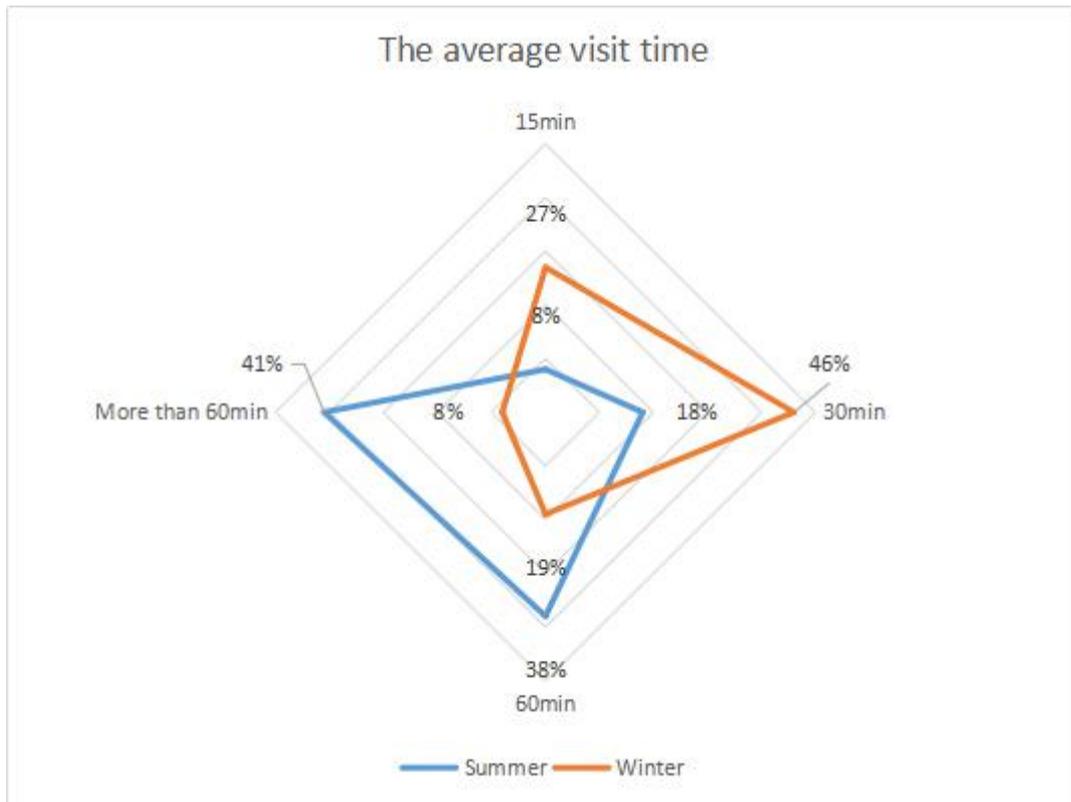


Graph 3.5 The purpose of their visit

Source: Author

F. The average visit time

During the summer, 8% people usually stay here for 15 minutes. 18% people stayed here for 30 minutes. 38% people stayed here for an hour and 41% people usually spend hours in this place. In the winter, 27% visitors only spend 15 minutes in this place. 46% people stayed 30 minutes here. 19% people can stay here for an hour. 8% people spends hours in this place. The reached conclusion shows that the climate is the primary factor to influence the use of neighborhood units in Taiyuan. (Graph 3.6 The average visit time)

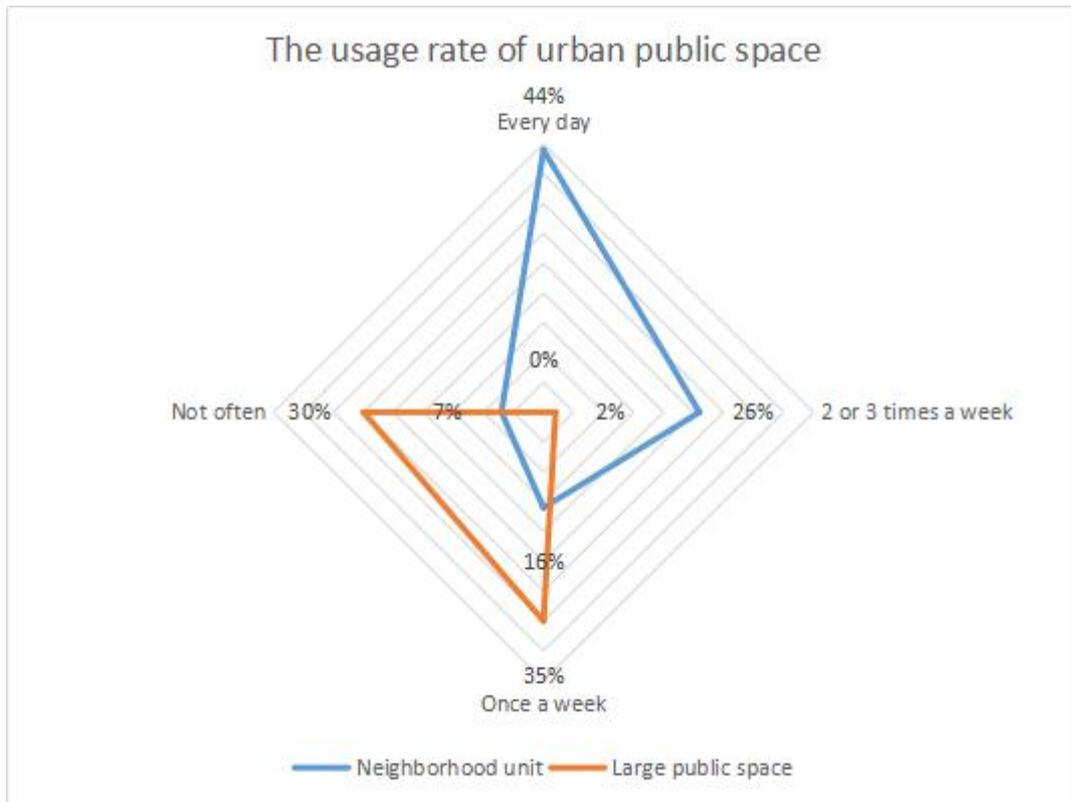


Graph 3.6 The average visit time

Source: Author

### G. The usage rate of urban public space

Among the 358 respondents of the investigation, 44% people went every day to the neighborhood units. 26% people usually go to the neighborhood unit 2 or 3 times a week. 16% people go to the neighborhood unit once a week. 7% people do not go there often. The usage rate of large public space shows that nobody goes there every day, 2% people went 2 or 3 times a week to the city park. 35% people go there once a week. 30% people go there at irregular intervals. From the comparison between the neighborhood unit and large public space, the neighborhood unit as an important part of urban public space has profound effects on residents' everyday life. (Graph 3.7 The usage rate of urban public space)

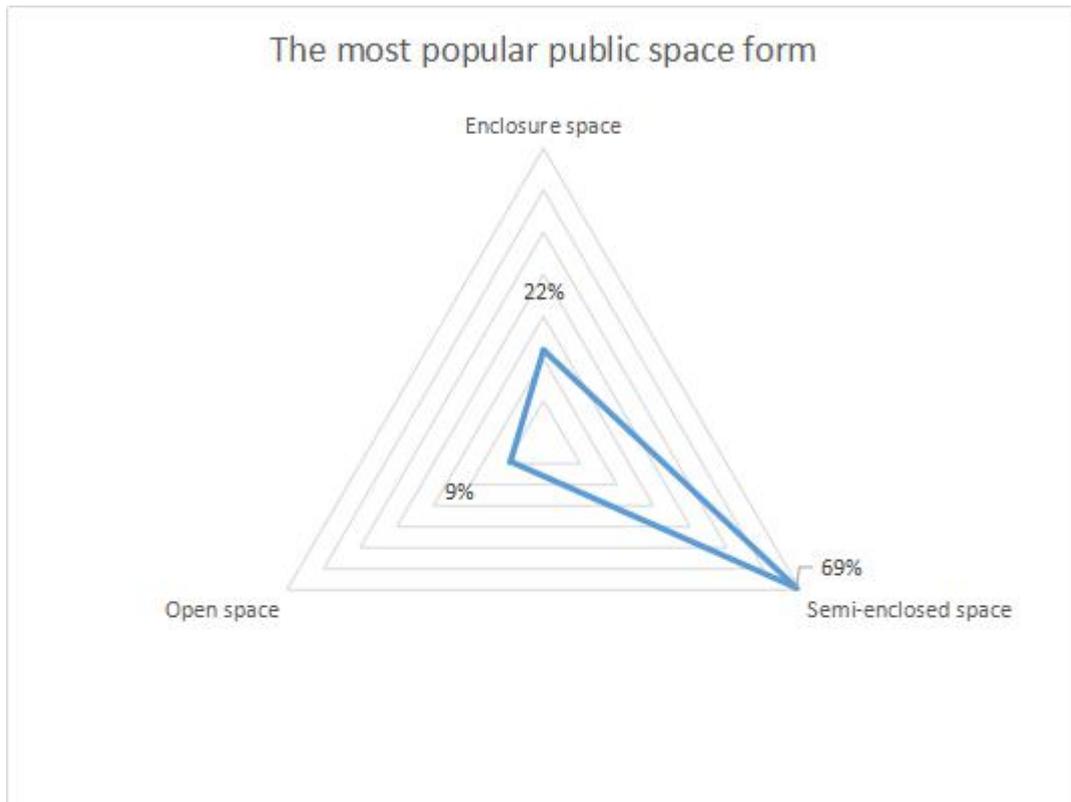


Graph 3.7 The usage rate of urban public space

Source: Author

#### H. The most popular public space form

The survey found that almost 22% people choose the enclosure space. 69% people choose to stay in a semi-enclosed space. 9% people choose the open space. The survey result accords with the traditional Chinese education and culture. In ancient China, the enclosure space was its traditional courtyard form. With the development of times, the Chinese people are becoming more open. Thus, the semi-enclosed space has become the most popular public space form.(Graph 3.8 The most popular public space form)

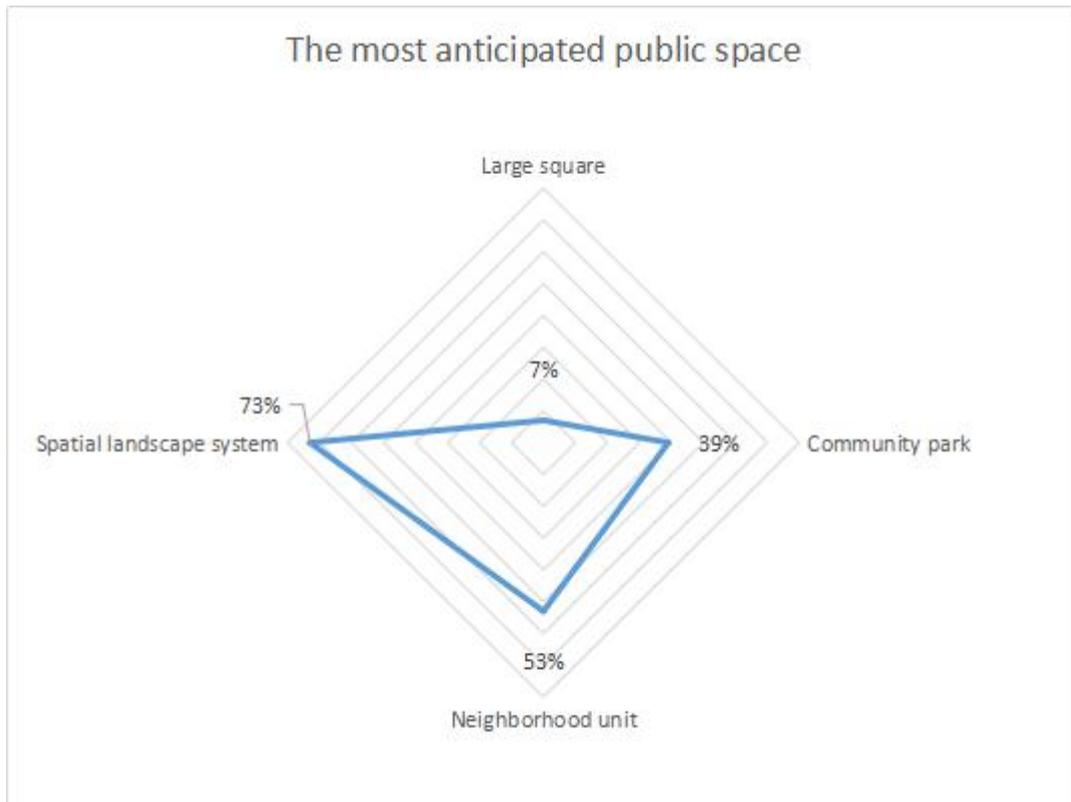


Graph 3.8 The most popular public space form

Source: Author

### I. The most anticipated public space in Yongding Road historic district

According to investigation, 7% people want the government to build a large square in this area. 39% people want the landscape architect can design a practical community park. 53% people wants to have a neighborhood unit near their home in the future. 73% people agree with me, we want to reconstruct the existing public space, and make full use of the land resource. Therefore, we want to use the design method of spatial reconstruction to build a spatial landscape system in this area. Most people chose the spatial landscape system. This is because as people's lives get richer, people are looking forward to improving the living environment. meanwhile, people are really trying to fully use the solid space of existing public space it could reduce the destruction of the historic district.(Graph 3.9 The most anticipated public space)

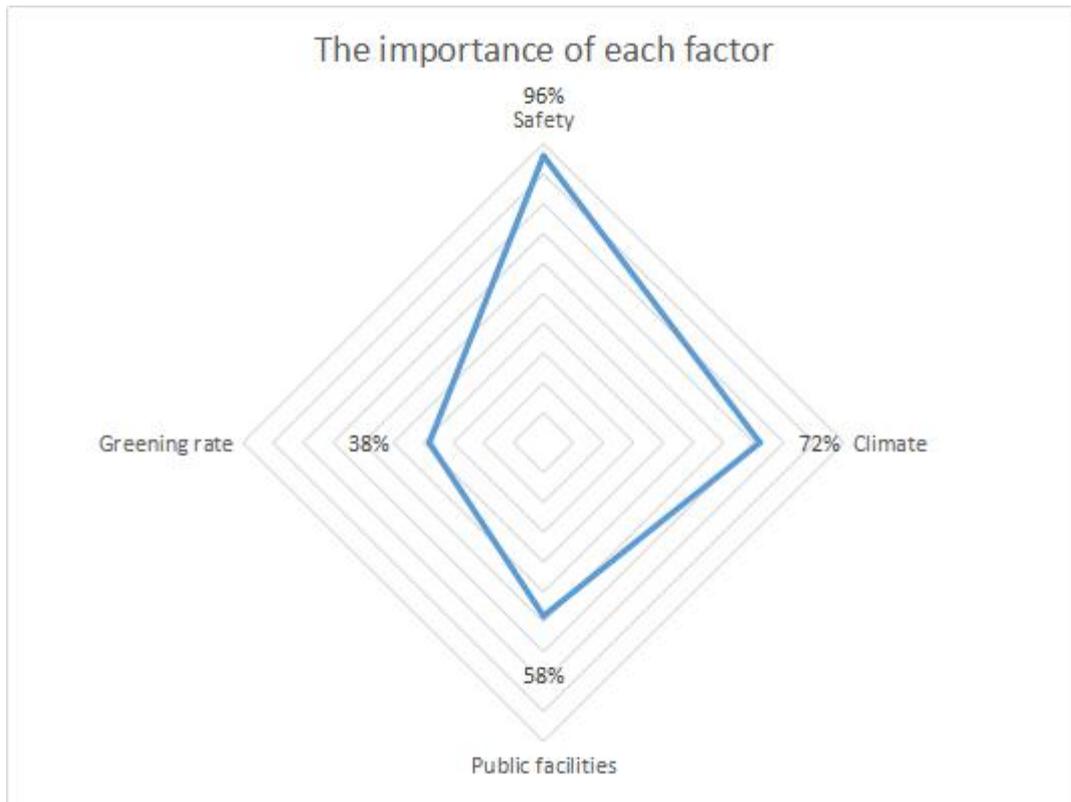


Graph 3.9 The most anticipated public space

Source: Author

#### J. The importance of each factor in the Yongding Road historic district

According to the survey, 96% people thought the safety factor is the main factor that affects the use of public space. 72% People thought the climate factor is a very important factor. 58% people also thought the public facilities should be taken into account. 38% people believed that the greening rate is an important factor that affects ecological environment construction. Thus, the result shows that the safety factor and climate factor are the most important factors.(Graph 3.10 The importance of each factor)



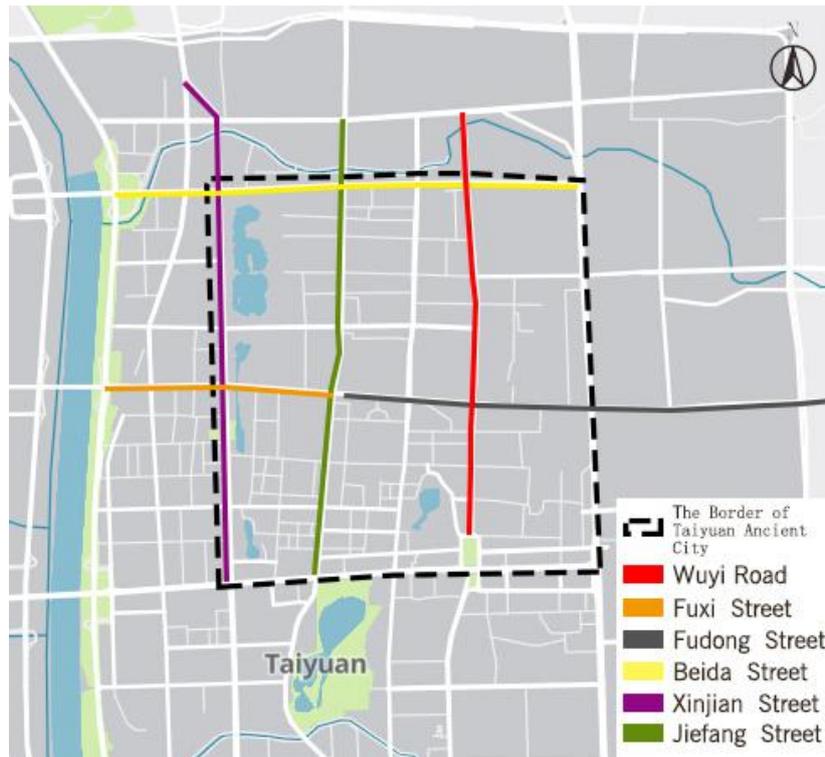
Graph 3.10 The importance of each factor

Source: Author

### 3.4 PROBLEMS AND COUNTERMEASURES

#### The existing problems

After a long period of development, the Yongding Road district formed gradually and developed. In nowadays, under the Background that Taiyuan urbanization develops rapidly, even this historic district are also facing the danger of being disappeared gradually. (Table 1 Construction and reconstruction of main roads in Taiyuan) Meanwhile, the Yongding Road historic district are faced with many new problems in today, such as the bad living environment and lack of living facilities. Therefore, the government has launched an old city transformation plan, its main aim was to improve the residents' living environment of historic districts. But, unfortunately, the style and features of historic district have changed out of recognition after transformation. There are three main reasons.(Figure 3.31 A view of Wuyi Road after reconstruction)



Street Name	The time of reconstruction	The situation of reconstruction	Disappearance of streets
Wuyi Road	1940s	Xinkai Road connects Hongshi Street and Xinminzhong Street in 1942.	The Wuyi Road was composed of Shouyimen Street , Songhuapo Street , Hongshi Street , Xinkai Road , Jingyingzhong Street , Baling Road , Xiaobeimen Street ( 7 streets has disappeared )
	1950s	Wuyi Road connects Balingbei Street and Beiyi Street in 1955.	
Fuxi Street	1950s	Fuxi Street connects Yuchi Street and Xinjian Road in 1957. The roads has been widened to 30m in 1958.	The Fuxi Street was composed of Huishi Street , Xianqian Street,Shiertousan Street(3 Streets has disappeared)
	1980s	The roads has been widened to 50m in 1989.	

Fudong Street	1960s	Fudong Street connects Wuyi Road in 1960.	The Fudong Street was composed of Fudong Street , Dudu Street , Longwangmiao Street , Bugong Street , Xindao Street , Linquanfu Street, Tianditan Street, Daomen Street, Dadongmen Street
	1980s	Fudong Street connects Jianshebei Road in 1980.	
Beida Street	1970s	Beida Street connects Xinjian Road in 1972. Beida Street connects Jiefang Road in 1973.	The Beida Street was composed of Xinkai Alley , Jiefangdong Street , Jiefangdong Alley , Jiefang Market , Chengbei Street ( 5 streets has disanneared)
	1990s	The roads has been widened to 50m in 1989. Beida Street connects Wuyi Road in 1990. Beida Street connects Jianshebei Road in 1995.	
Xinjian Road	1950s	Xinjian Road was built in 1954. The roads has been widened to 30m in 1955.	
	1980s	Xinjian Road connects Shengli Street in 1985.	
Jiefang Road	1950s	Jiefang Road was built in 1950. Jiefang Road connects Dananmen Gate and Fuxi Street in 1952. Jiefang Road connects Shengli Street in 1954. The roads has been widened to 30m in 1954. Jiefang Road connects Fuxi Street and Chengfang Street in 1955.	The Jiefang Road was composed of Dananmen Gate , Nanshi Street , Huoniushi Street , Mashi Street , Fumenqian Street, Shifan Street, Xiaocang Alley , Dabeimen Street, Tumen
	1980s	The roads has been widened to 50m in 1981.	

Table 1 Construction and reconstruction of main roads in Taiyuan

Source: Author



Figure 3.31 A view of Wuyi Road after reconstruction

Source: <http://sx.people.com.cn/GB/199333/348559/>

A. The government ignored the relationship between people's lifestyle and the public space. This makes the road systems of the historic district are very difficult to connect with the city road system.

B. In order to realize the convenient traffic environment, many of streets were widened, also many of streets disappeared in historic districts. These widened streets destroyed the original road system, which destroys the integral landscape of Taiyuan.

C. The traditional neighborhood units have been replaced by resettlement residential area. Most of the ancient buildings have been torn down, some of them are filled up with preservation value and featured with historical scene streets of Taiyuan.

## The countermeasures for the sustainable development of historic districts

The Taiyuan government published the 5 historic districts to the public, in 2010.(Figure 3.32 Five historic districts in Taiyuan) Among them, the Yongding Road historic district is the core protection area.<sup>98</sup> The architecture within the Yongding Road historic district covers different periods of history. Today, this area still retains its traditional layout and road system, such as the T- crossing and the Siheyuans. As the one of the symbols of Taiyuan, the Yongding Road historic district condensed the history and culture, which is the most important carrier to emerge the regional characteristics and the urban history. Therefore, the improvement of the living environment should be combined with the protection of the historic district.

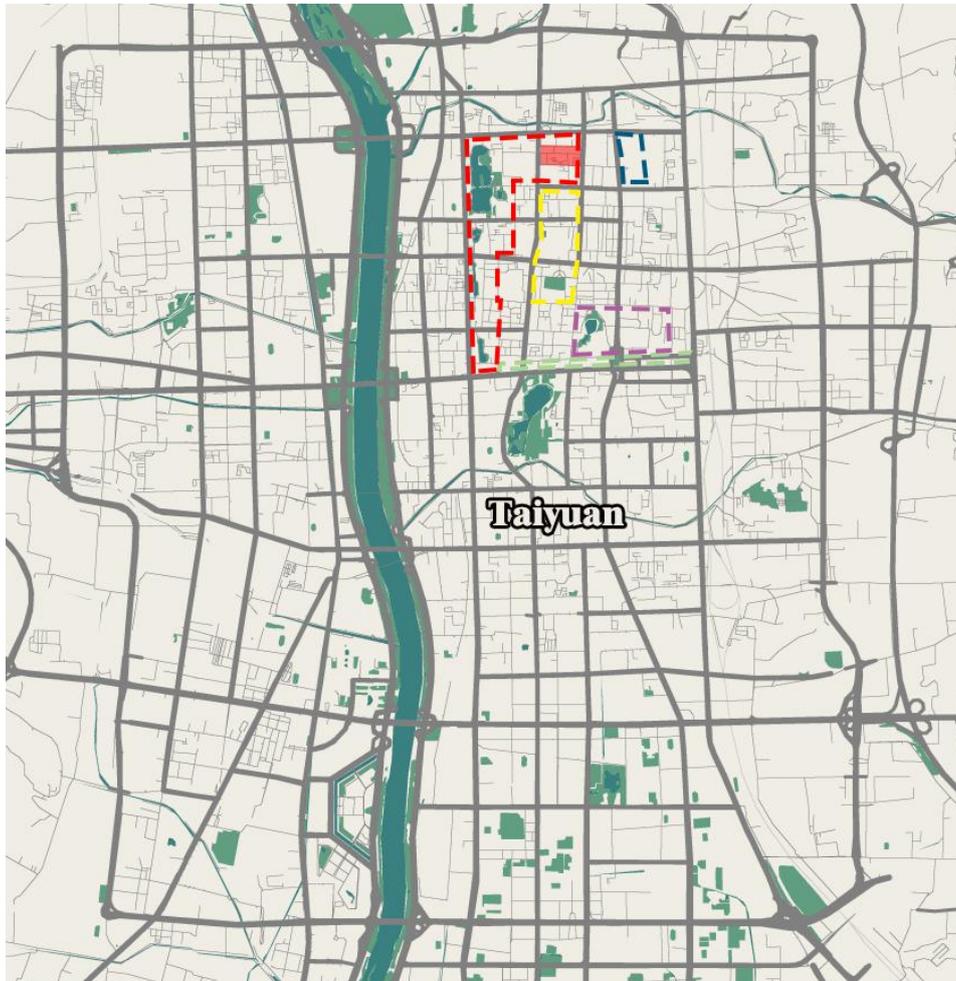


Figure 3.32 Five historic districts in Taiyuan

<sup>98</sup> Zhao Zhidan. The Introduction to the 5 Historic districts [N]. Taiyuan Evening, 11, Feb, 2010.

Source: Author

After the comprehensive analysis of Yongding Road historic district, I summed up the countermeasures to improve the living environment while the traditional layout is not destroyed.

A. Links: In the view of urban development, we hoped that we can reduce the damage to the traditional road system on the basis to meet the needs of development of urban transportation.

B. Protection: From the perspective of historic district protection. In order to retain the traditional flavor in the historic district. The Yongding Road historic district should be protected, it not only keeps the ancient buildings but also keeps the existing streets and public spaces. (Figure 3.33 The Architectural/historical value)



Figure 3.33 The Architectural/historical value

Source: Author

C. Heritage: From the perspective of environmental development in this area. During the process of landscape reconstruction in this area, we should pay special attention to the protection of Siheyuans, monuments and old trees, etc. The historical relics can enrich the content of tourism landscape.(Figure 3.34 The location of the ancient

buildings which are to be retained within the new proposals)

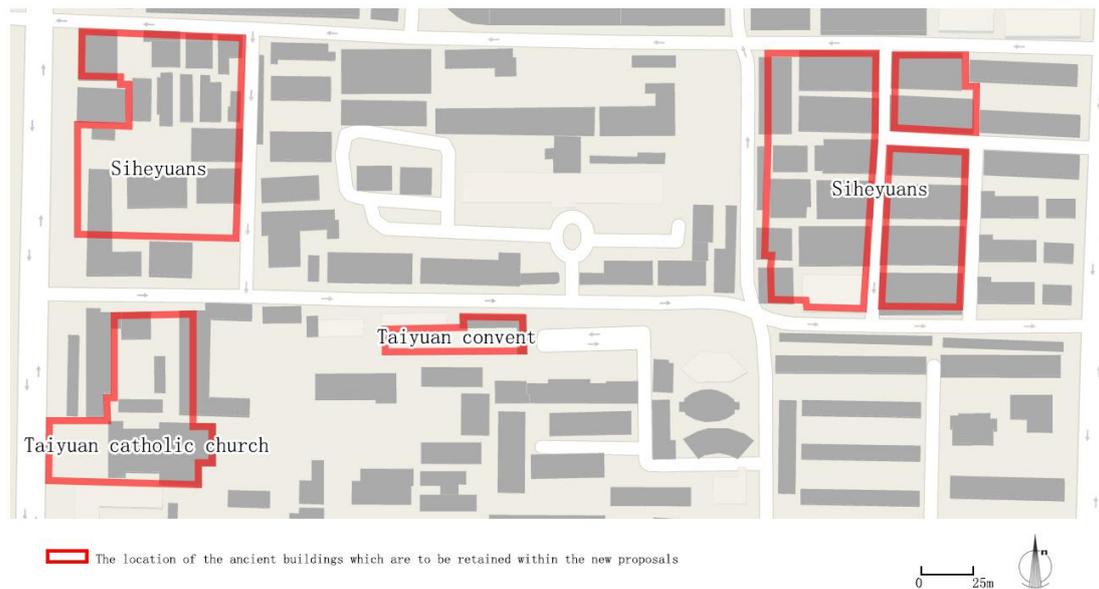


Figure 3.34 The location of the ancient buildings which are to be retained within the new proposals

Source: Author

D. Neighborhood units: Stand on the point of neighborhood units development, we need to increase the quality and quantity of neighborhood units in Yongding Road historic district, and at the same time strengthen the contact between the neighborhood units and the nearby city park, such as increase the numbers of neighborhood units, increase the density of road network, and also use the pedestrian streets to connect to each neighborhood units in this area. Thus, the neighborhood units can fully develop the potential of neighborhood units.

Meanwhile, when we reconstruct the neighborhood units in this area, we should ask the public for comments so that the projects will satisfy the needs of people. In the Yongding Road historic district, we try to reconstruct the existing public space, at the same time not to harm the interests of residents.

E. Underground spaces: Under the premise of protecting the historic district, we should take some measures to promote the underground space development in this

place, such as to build the underground car parks or build the underground tunnel system, which can solve both historic district protection and environmental development problems. Meanwhile, we can improve the underground space development, for instance, to build an underground complex. Well, application of underground space can reduce the damage to the historic district. At the same time, it also provides the space for construction of modern public facilities.

F. Green walls: With the rapid development of Taiyuan, large crowds of people move into the city. Yongding Road historic district acts as the city's center area, there are more and more tall buildings. Now, the Yongding Road historic district is surrounded by the tall buildings, so we can not see the sky and green plants from this area. In such an environment, you are going to feel some pressure. On this, we should build the green walls on the exterior wall of buildings. The green wall of tall buildings can make the Yongding Road historic district full of vitality, they can also give us the feeling of graduation and the feeling of rhythm.

## 4. FRAMEWORK AND PROPOSALS

### 4.1 DESIGN OBJECTIVES

The Yongding Road historic district (Figure 4.1 The plan of Yongding Road historic district) is mainly made up of residential area, ancient architectural complex, hospital, schools as well as a catholic church. The bulk of the ancient architectural complex is provided along Yongning Road and Yongxing Road within ancient Siheyuans. (Figure 4.2 The conservation area boundaries in red. Asterisk denote proposed landmark building.) The Taiyuan central hospital is located between the Dongerdao Alley and the Dongsandao Alley. (Figure 4.3 The public services owned land within the blue boundaries) However, access to the hospital is a problem, as the entrance is located in the center of the Yongding Road historic district. The Yongding Road historic district covers an area of about 82,600 square meters, from Dongerdao Alley to the Dongsandao Alley between the Jiefang Road and Xiaoqiang Road, the area has an estimated population of 2,000. (Figure 4.4 The residential area within the green boundaries) Consisting of Yongding Road historic district, Yongning Road, Yongding Road, Yongxing Road three parallel ancient alleys.



Figure 4.1 The plan of Yongding Road historic district

Source: Author

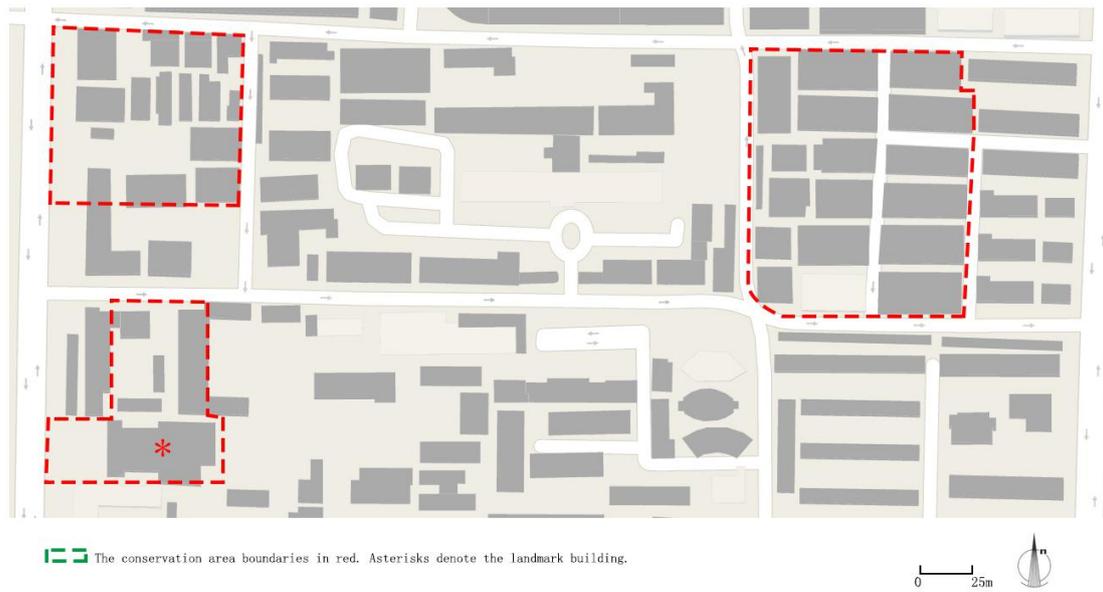


Figure 4.2 The conservation area boundaries in red. Asterisk denote proposed landmark building.

Source: Author

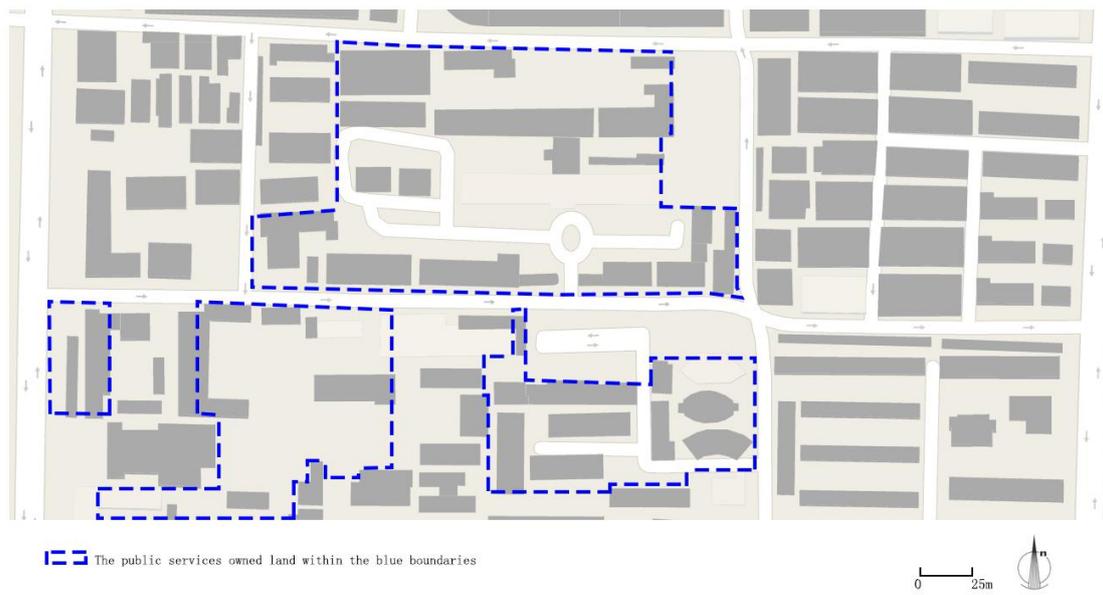


Figure 4.3 The public services owned land within the blue boundaries

Source: Author

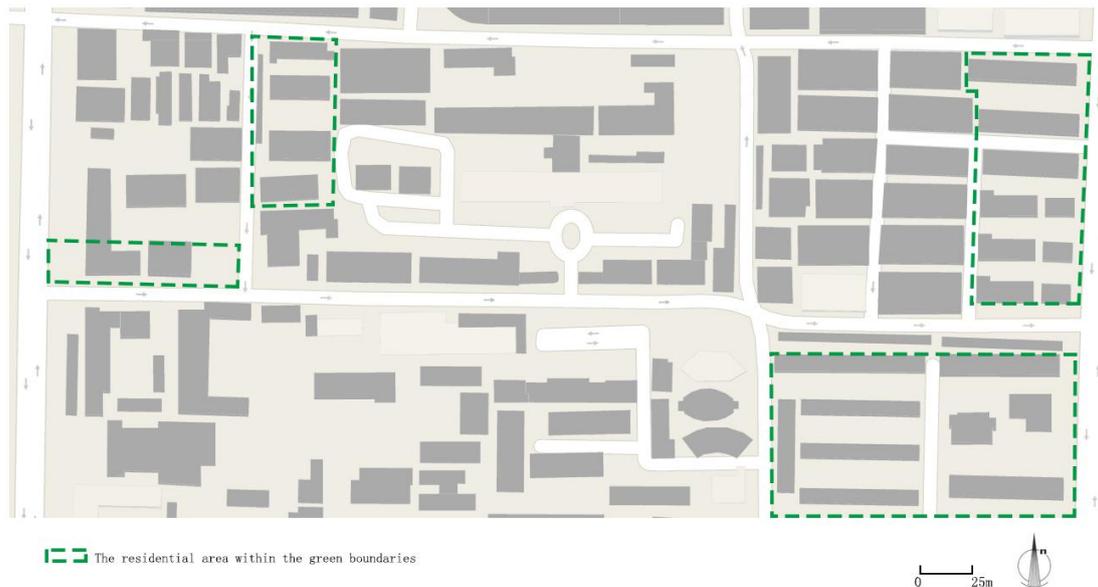


Figure 4.4 The residential area within the green boundaries

Source: Author

The goal of spatial reconstruction is to protect the historic district while improving the residents' living environment and promoting economic development.(Figure 4.5 The masterplan of Yongding Road historic district) Finally, we will recreate the Yongding Road historic district full of vitality and attraction.(Figure 4.6 Land use plan) Thus the aim of spatial reconstruction can be summed up in four words: protection, integration, development and stereovision. Under the premise of historic district protection, we need to explore the connotations of historical culture, and at the same time, we need to strengthen the integration of neighborhood units and city park. In order to make full use of land resources, we should endeavor to promote the underground space development of public space. We also need to build some green walls on the exterior wall of tall buildings, and ultimately achieve the purpose of sustainable development in this area.(Figure 4.7 Masterplan of the Yongding Road historic district)



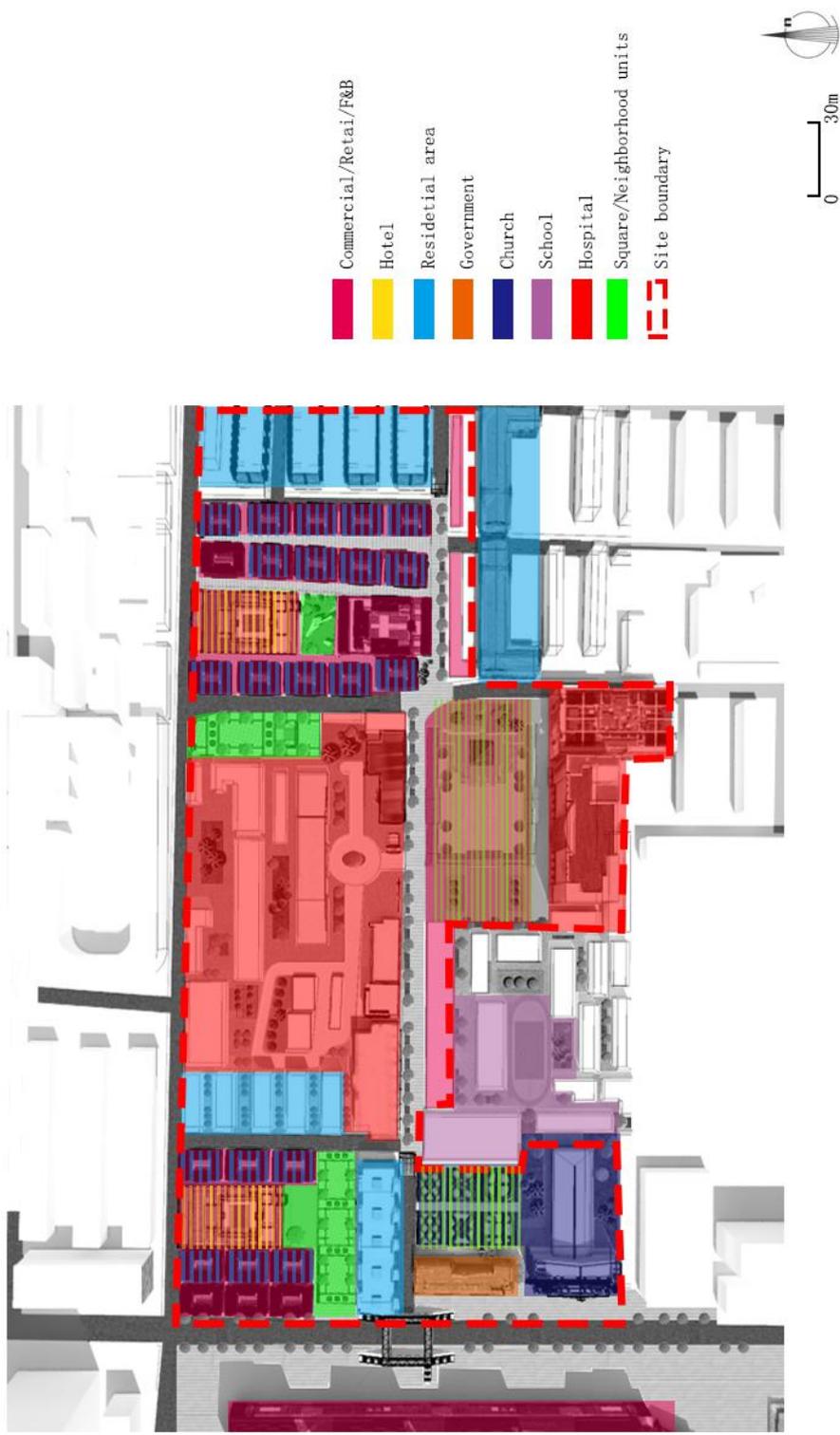


Figure 4.6 Land use plan

Source: Author

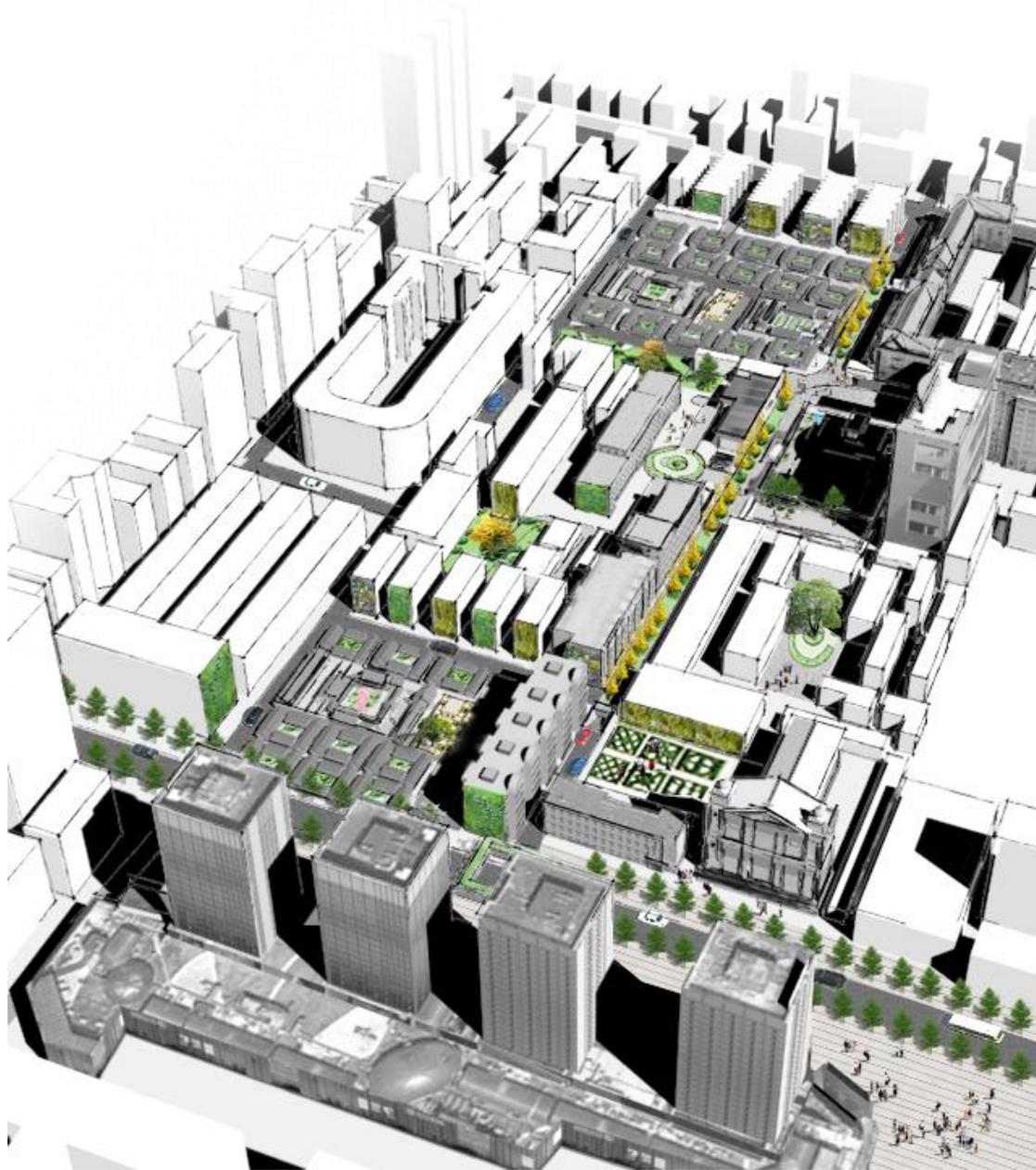


Figure 4.7 The Yongding Road historic district after spatial reconstruction

Source: Author

## **4.2 STRATEGY 1: DONGSANDAO ALLEY CULTURE CORRIDOR**

Multicultural coexistence is a characteristic of this community. For example, the Catholicism represented by the Taiyuan catholic church, the citizen culture represented by the Siheyuans, and the district government building which is the

symbol of governmental power. These elements constitute the multicultural atmosphere in this area. Therefore, the spatial reconstruction in this area is a multi-level and multi-angle systematic project.

I think that the Taiyuan government currently pay too much attention to the skyscrapers and event-grade architectural styles and ignored the quality of life in the historic district. They think that spending money on reconstructing the historic district is a waste. Under the mistaken notion, the government dismantled a number of historic districts and replaced with the modern residential area. However, the city belongs to the people, the people are the foundation of the city. The shortage of public facilities led to the decline of historic districts, and also triggered a series of social problems.

The main characteristic of Yongding Road historic district is regarded as a witness of the Taiyuan's history and retains dozens of Ming and Qing dynasties buildings. Therefore, the direction of this project is to integrate existing neighborhood units, roads, landmark buildings, city park and create a multicultural culture corridor between the Yongding Road historic district and surrounding areas.(Figure 4.8 Open space plan) This road from the Longtan Park through Taiyuan catholic church to the Yongding Road historic district. Meanwhile, this road will connect the Yongding Road historic district with the Taiyuan catholic church and the shopping areas. Because of the Yongding Road historic district and the shopping area are separated by the Jiefang Road, so we are going to build a pedestrian bridge over the Jiefang Road. The benefit is that the pedestrian bridge can attract more the visitors from the shopping areas and the Longtan park. Finally, as we pass through the Yongding Road historic district toward the JieFang Road, the buildings on both sides of the road will be transformed from to Ming and Qing dynasties styles to the modern style. This road fully reflects our subject. At the same time, we will build a new community square with an underground market and an underground car park on the foundation of the hospital's parking lot. Then we are planning to build a tunnel that will link the

underground car park to the outside of this area. In this way, we can turn the Dongsandao Alley into a pedestrian street and at the same time relieve the traffic pressure and improve the living environment. (Figure 4.9 The plan of Dongsandao Alley culture corridor)

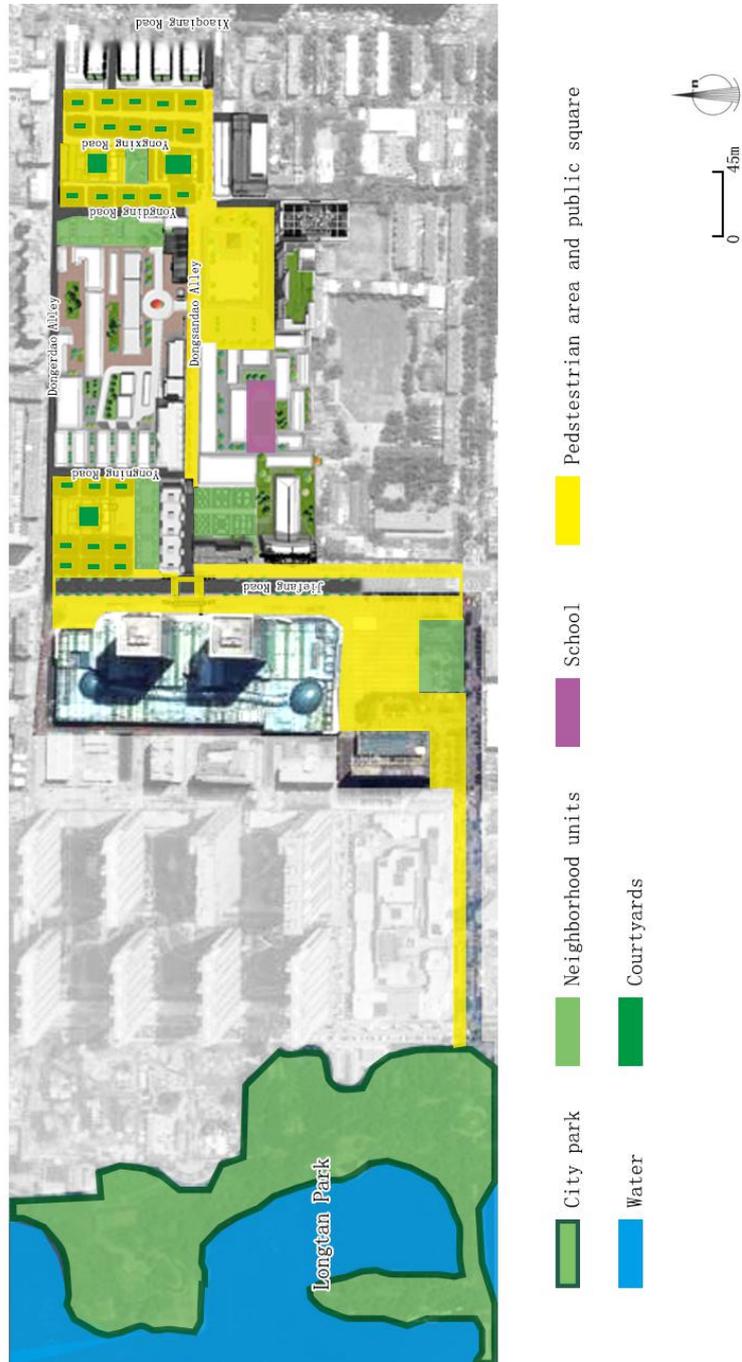


Figure 4.8 Open space plan

Source: Author



Figure 4.9 The plan of Dongsandao Alley culture corridor

Source: Author

#### **4.2.1 Dongsandao Alley culture corridor**

The Yongding Road historic district is located in the center of Taiyuan. Thus we

suggest breaking down the border between the Yongding Road historic district and the city, and at the same time, we encourage pedestrian through routes from shopping area to Yongding Road historic district by a pedestrian bridge.(Figure 4.10 Plan showing the main entrance to the pedestrian street) (Figure 4.11 Section of the Jiefang Road) This will also bring new impetus to the local economy and increase job opportunities for the unemployed. The Dongsandao Alley will be transformed into a pedestrian street.(Figure 4.12 The structure map of Dongsandao Alley culture corridor) (Figure 4.13 The pedestrian bridge above the Jiefang Road) The Yongding Road historic district where we will promote a commercial and the residential car free environment.(Figure 4.14 Movement strategy)

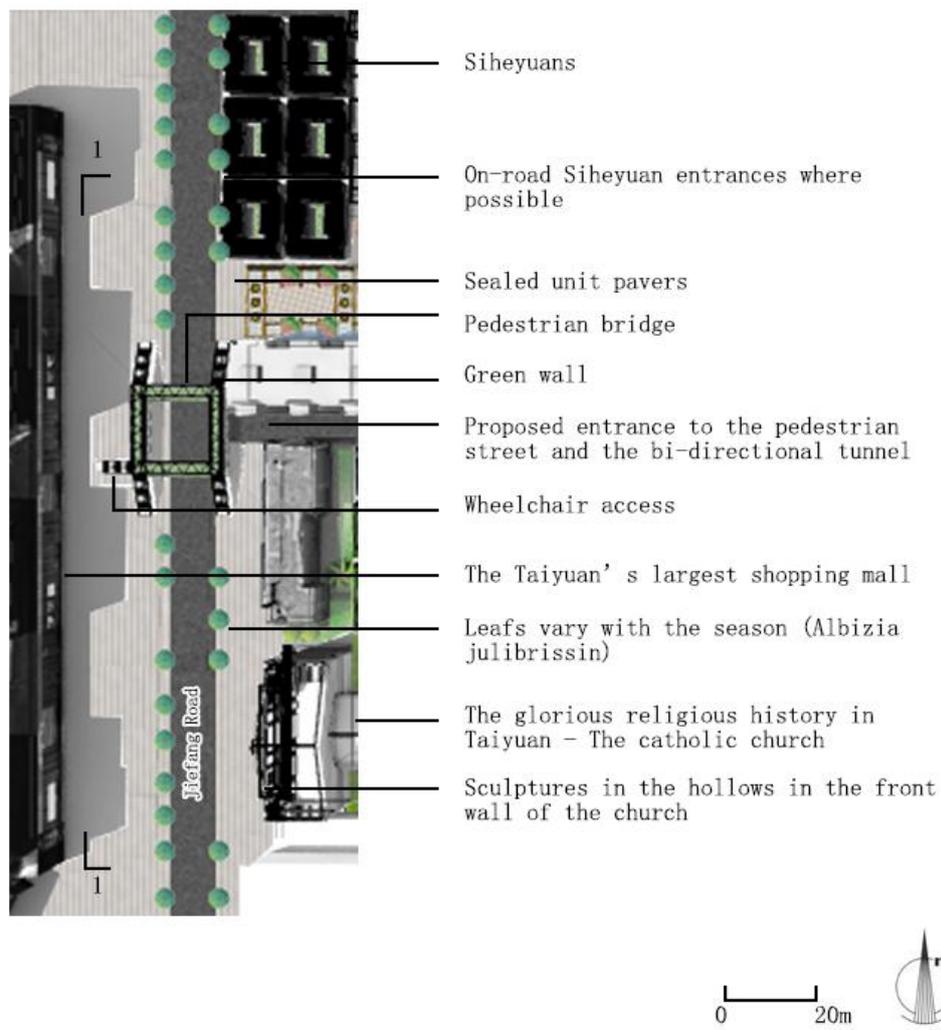


Figure 4.10 Plan showing the main entrance to the pedestrian street

Source: Author

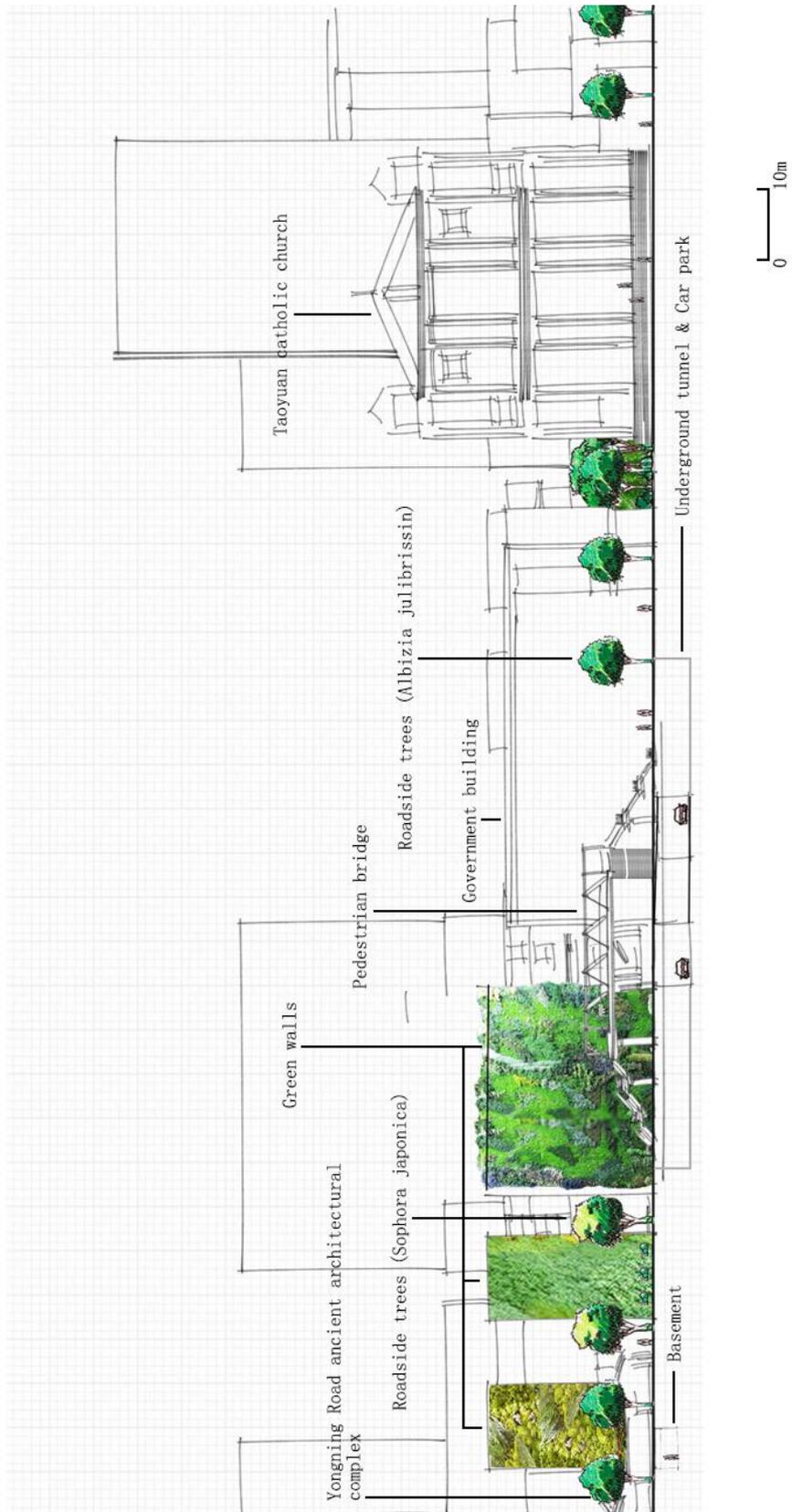


Figure 4.11 Section of the Jiefang Road

Source: Author



Figure 4.12 The pedestrian bridge above the Jiefang Road

Source: Author



Figure 4.13 The structure map of Dongsandao Alley culture corridor

Source: Author

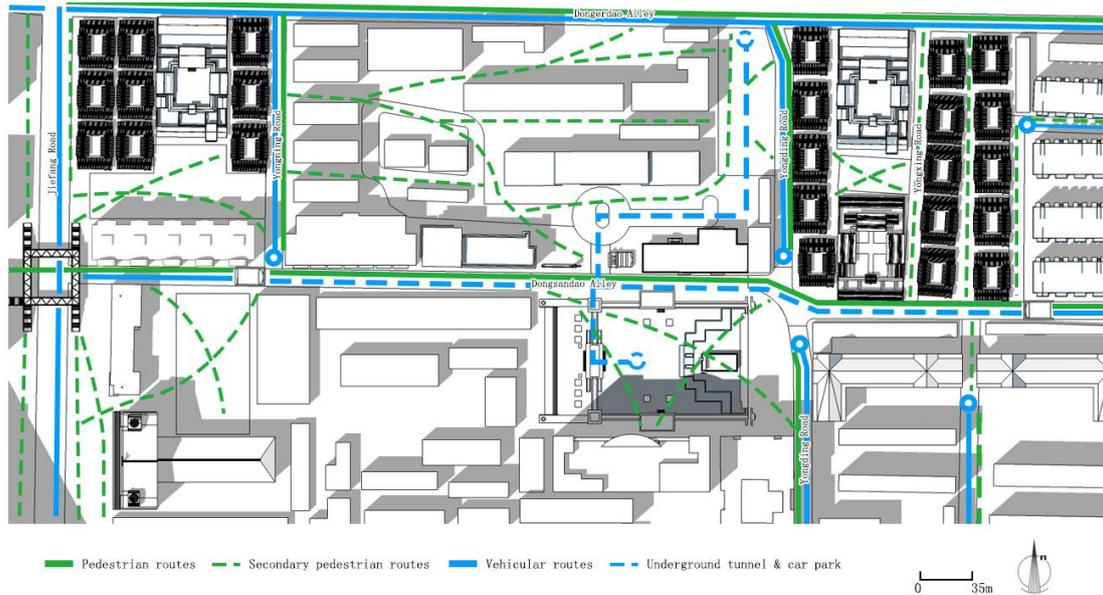


Figure 4.14 Movement strategy

Source: Author

The sound of the car is at its most intensive around the Taiyuan central hospital, It has seriously influenced the patients and residents' life. The new pedestrian street will be built from the Jiefang Road along the Dongsandao Alley to the Beixiaoqiang Road.(Figure 4.15 The Dongsandao Alley pedestrian street) All the noises fade away because of we built a tunnel which is under the Dongsandao Alley. Therefore, the Yongding Road historic district can be very quiet due to lack of cars. (Figure 4.16 The Underground tunnel and car park in Yongding Road historic district)



Figure 4.15 The Dongsandao Alley pedestrian street

Source: Author



Figure 4.16 The Underground tunnel and car park in Yongding Road historic district

Source: Author

#### 4.2.2 A new community square

A new community square will build on the site of the hospital's parking lot. The new

community square is a landmark in the center of the Yongding Road historic district.(Figure 4.17 Plan showing proposed community square) Meanwhile, the feature of the square may be consists of the square and weekend market. The operation of the new community square will be enhanced by the traditional design of hard landscaping and the setting-out of trees and planting to help define the square and market.(Figure 4.18 The community square) The specification of antique public facilities and waste management solutions will be required as designs develop.(Figure 4.19 The corridor and bench is located in the community square) The new community square will provide several benefits for the Yongding Road historic district, for example:

A. The new center of social activities, the new community square will be linked with the Yongning Road ancient architectural complex, the Yongxing Road architectural complex and the surrounding housing blocks.

B. Provide a new destination for visitors

C. Provide a new underground market to Yongding Road historic district. The nearby fruit shops, restaurants, and convenient shops can be integrated into the underground market. This can improve the environment of the Yongding Road historic district and protect the ancient buildings.

D. The new community square has solved the problem of how to build a public square in this area.

E. Create a beautiful environment for the patients in front of the hospital.

F. Additional public facilities and a new underground car park for the Yongding Road historic district.

G. Opportunities for group activities.

H. Provide an option is the opportunity for an underground car park. It can effectively solve the parking problems.

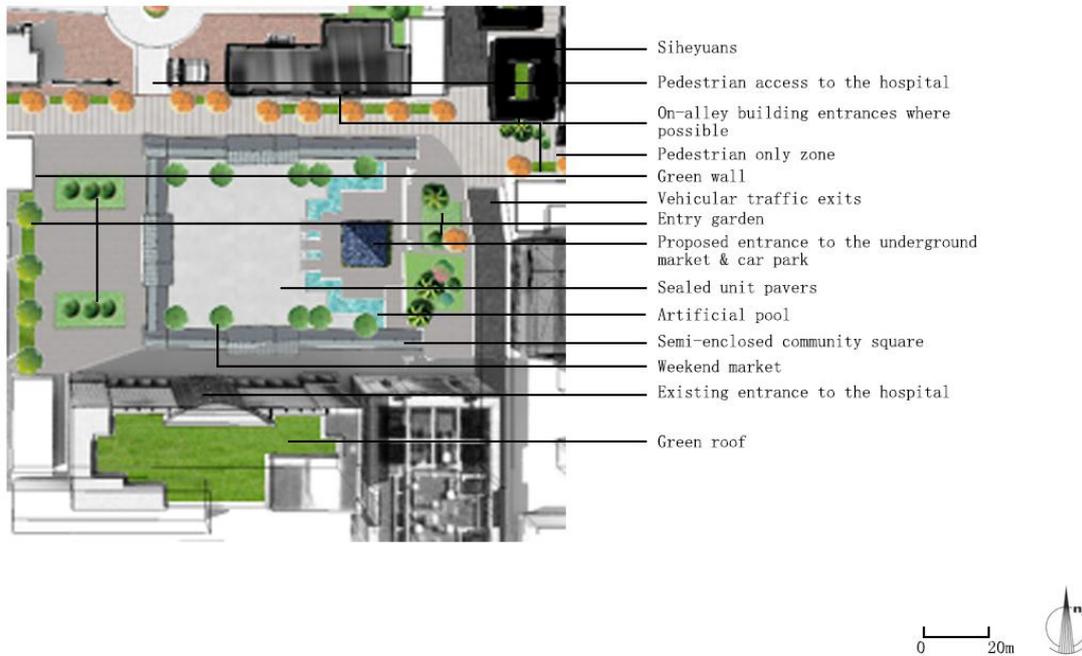


Figure 4.17 Plan showing proposed community square

Source: Author

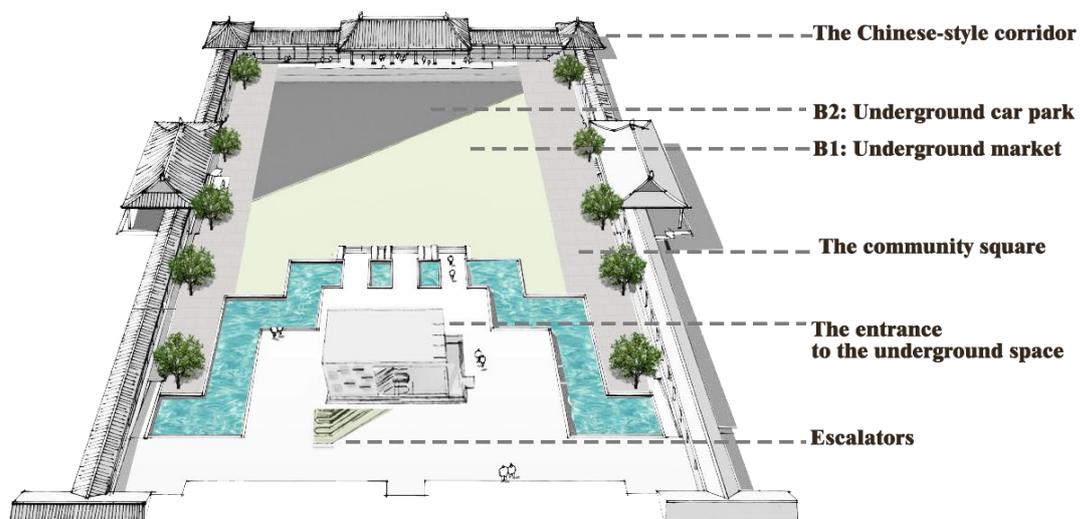


Figure 4.18 The community square

Source: Author



Figure 4.19 The corridor and bench is located in the community square

Source: <https://geolocation.ws/v/P/11946280/long-corridor-in-the-summer-palace/en>

### 4.2.3 A new underground car park

There is the main parking lot in Yongding Road historic district. We consider that with the increase of the quantity of private cars, the future parking requirements is getting more and more serious.(Figure 4.20 The parking lot of the existing site) In order allow the community square to come forward. We will seek to ensure all parking spaces that are lost through the development of community square. Therefore we are seek the underground space to build a new underground car park.(Figure 4.21 The car park is located under the community square) The local residents and the hospital require that there should have appropriate provision for cycle access and parking. Consideration should also be given to cycle parking and cycle storage on the Dongerdao Alley for the visitors and residents.(Figure 4.22 The map of car parks)

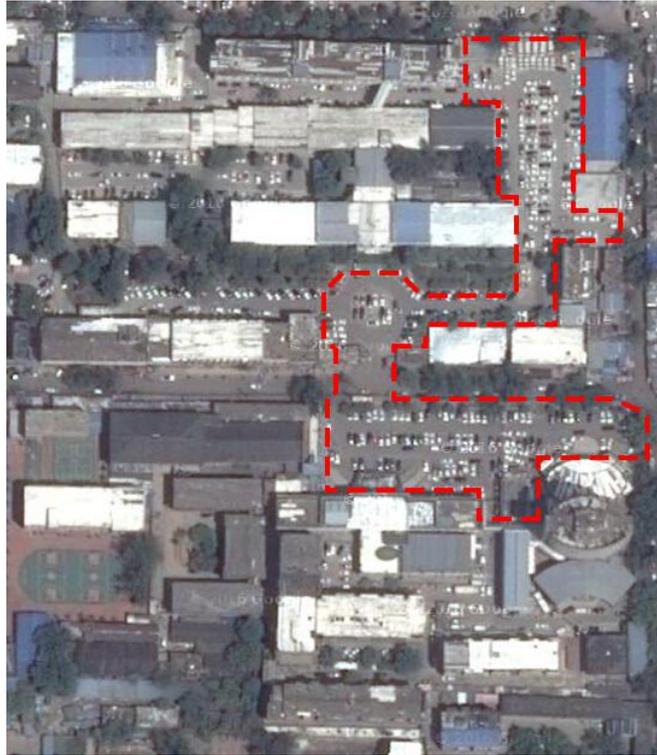


Figure 4.20 The parking lot of the existing site

Source: Google Maps



Figure 4.21 The car park is located under the community square

Source: <https://de.pinterest.com/pin/501095896021502160/>

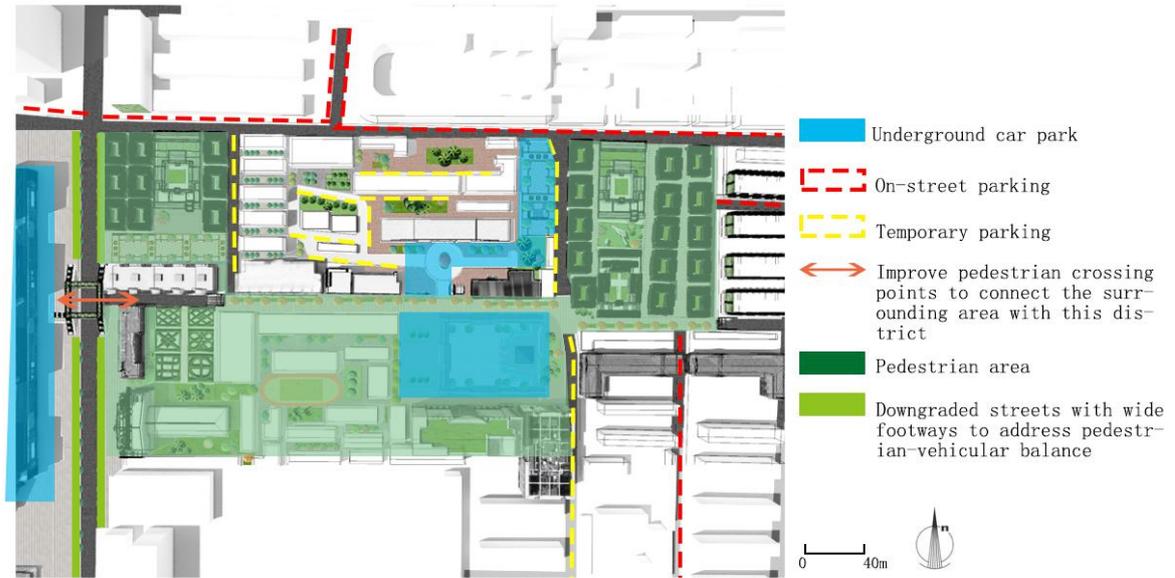


Figure 4.22 The map of car parks

Source: Author

Provision should be made for convenient and secure cycle parking on the street in combination with cycle parking within residential and mixed-use developments in order to encourage greater cycle usage.(Figure 4.23 Bike racks)



Figure 4.23 Bike racks

Source: <https://de.pinterest.com/pin/548594798332214862/>

#### 4.2.4 Taiyuan catholic church

There are a number of ancient buildings have been identified as having an important role in the reconstruction of the Yongding Road historic district, and could bring a positive impact to this area. Among them, the most representative are Taiyuan catholic church.(Figure 4.24 The plan of Taiyuan catholic church) There are a number of the characteristics that make the Taiyuan catholic church an interesting and unique place. The residents and citizens identify the Taiyuan catholic church and its original Baroque garden as the heart and focus of the Yongding Road historic district. In the front of the church where many couples take their wedding photos.(Figure 4.25 A wedding ceremony at the Taiyuan catholic church)

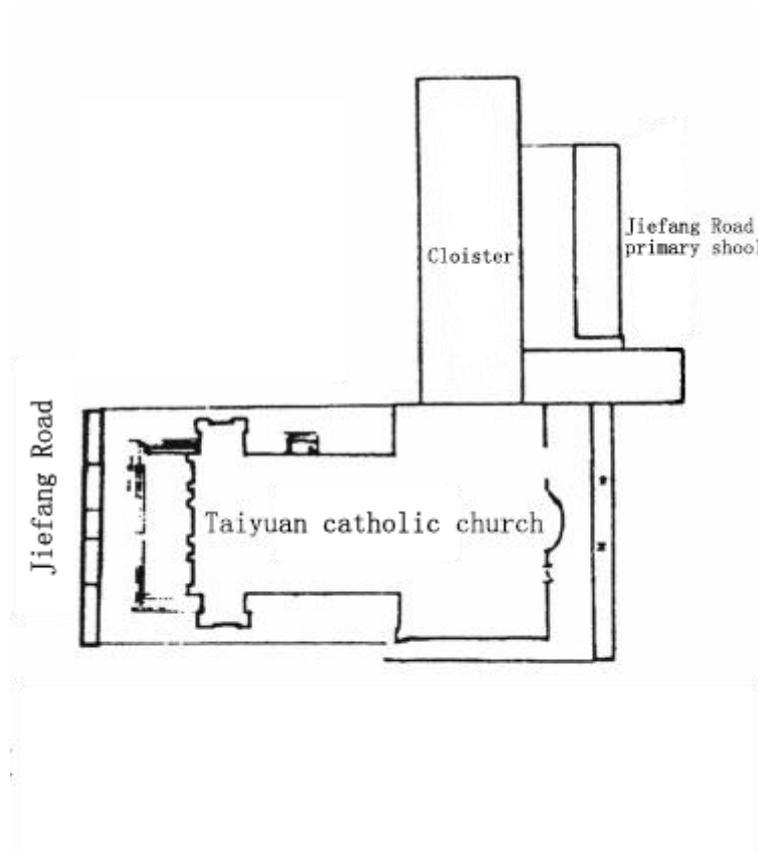


Figure 4.24 The plan of Taiyuan catholic church

Source:

<http://www.cnki.net/KCMS/detail/detail.aspx?QueryID=0&CurRec=1&dbcode=CJFQ&DBName=SCPD0009&FileName=TYGY200602032>



Figure 4.25 A wedding ceremony at the Taiyuan catholic church

Source: <http://zhangfengshan202.blog.163.com/blog/static/6235728620117501624106/>

The Taiyuan catholic church is located in the western part of the Yongding Road historic district, which is the one of the famous ancient monument. It is the only one which keeps the original Baroque garden within the Taiyuan city and is an important amenity space for the local residents and patients of the Yongding Road historic district.(Figure 4.26 Figure 4.14 Baroque garden in the Herrenhäuser Gärten) The Taiyuan catholic church with its Baroque garden has been identified as a major element in the success of the development of the Dongsandao Alley culture corridor.(Figure 4.27 The garden of Taiyuan catholic church) (Figure 4.28 Section of Taiyuan catholic church)



Figure 4.26 Baroque garden in the Herrenhäuser Gärten

Source: Author

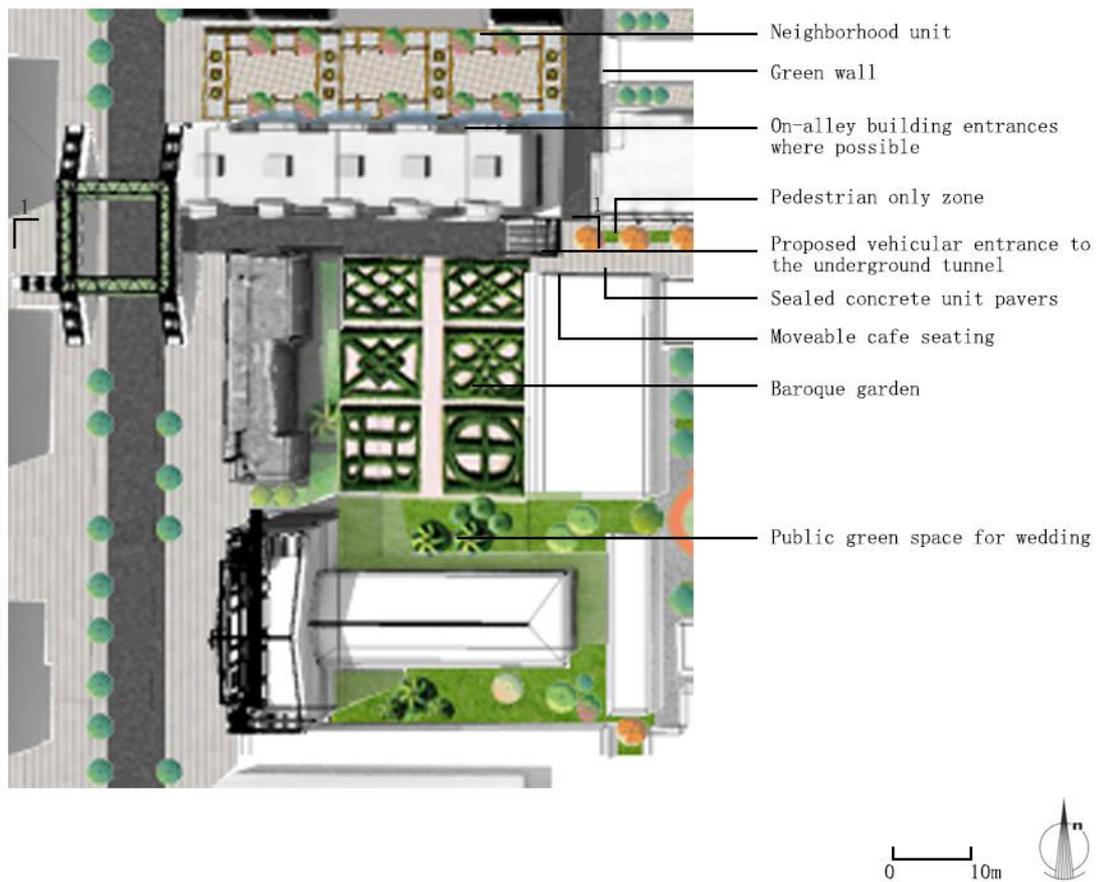


Figure 4.27 The garden of Taiyuan catholic church

Source: Author

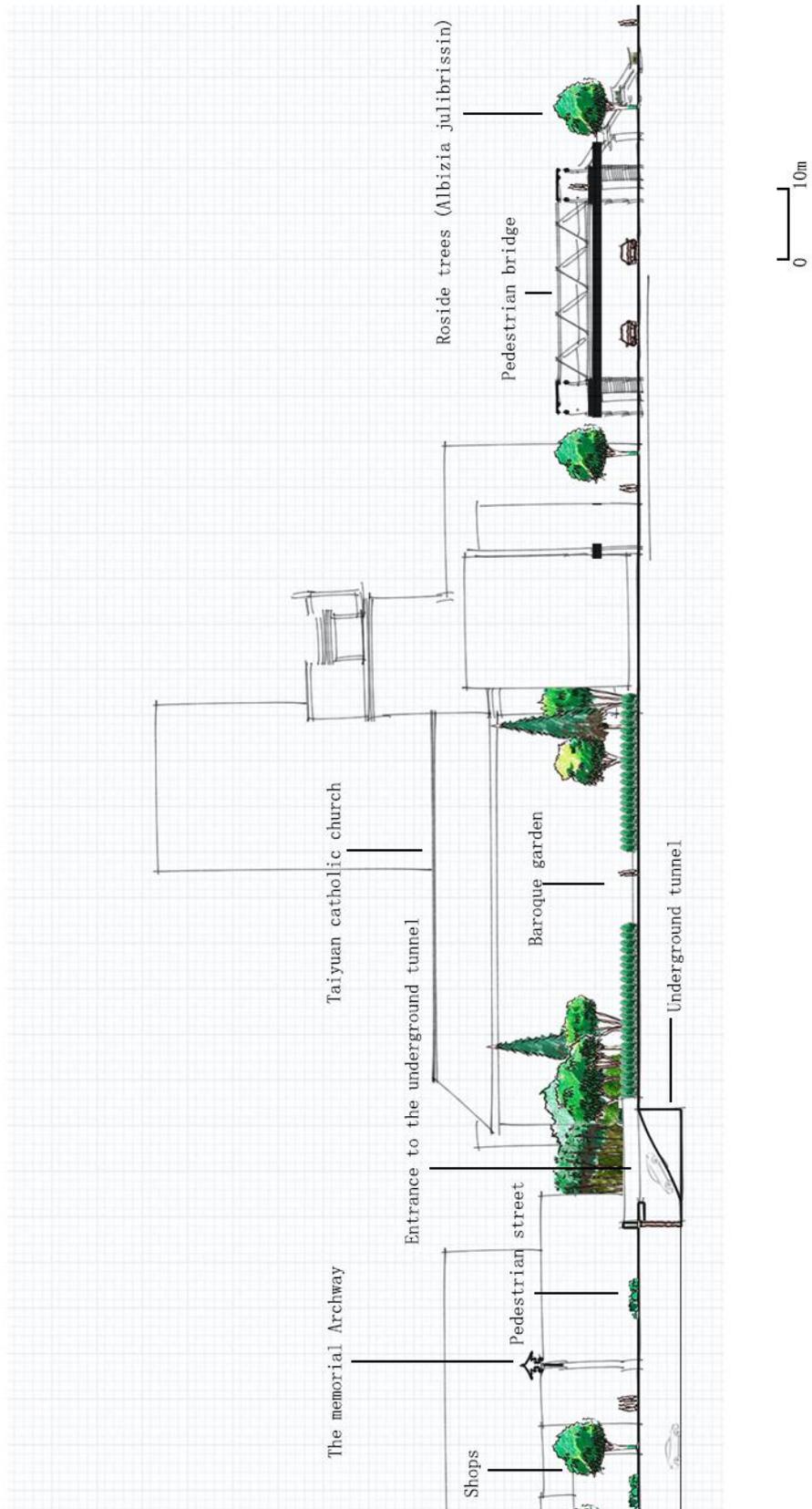


Figure 4.28 Section of Taiyuan catholic church

Source: Author

### 4.3 STRATEGY 2: SPATIAL RECONSTRUCTION OF THE COURTYARDS

How to deal with the relationship between historic district protection and environmental development has become a concern of the whole society. I suggest processing reconstruct action under the premise of historical protection. The courtyards should be enclosed with the rooms and boundary wall to create sheltered and returned to its original pattern. Sun and shade should determine to plant design for different Siheyuans. (Figure 4.29 A Siheyuan after reconstruction) So we must take some measures to reconstruct the courtyard of Siheyuans, and at the same time, we should try to develop the underground space in the courtyards. It will be able to realize the sustainable development and reasonable protection in the Siheyuans. The measures of courtyard reconstruction consist of two parts: the Yongxing Road ancient architectural complex and the Yongning Road ancient architectural complex.



Figure 4.29 A Siheyuan after reconstruction

Source: <https://de.pinterest.com/pin/47991552258660026/>

### **4.3.1 The Yongxing Road ancient architectural complex**

The Yongxing Road ancient architectural complex is an important symbol of the traditional residential complex in Taiyuan and the key point of historic district protection.(Figure 4.30 View looking northwards at the reconstructed Yongxing Road) However, the urban development in Taiyuan was no obvious changing rule, the Yongxing Road ancient Siheyuans are damaged to varying degrees. The infrastructure of Siheyuan has been completely unable to meet the basic needs of residents. Through interview and investigation, we find they are not satisfied with current situation. They hope the government to improve their living situation under the premise of the historic district protection. Therefore, historic district protection should be based on the sustainable development. (Figure 4.31 Illustrative plan showing the Yongning Road ancient architectural complex)

The specific method is to develop the underground space of courtyards. Through the development of underground space can improve the utilization rate of land resource and the quality of life.(Figure 4.32 Section of the Yongxing Road ancient architectural complex) For example, the bunkhouses which destroyed the building structure should be demolished, but the courtyard should be protected and repaired.(Figure 4.33 The Bunkhouses are located in the courtyard) Furthermore, we should develop the underground space under the courtyard, and put the kitchen and the bathroom into the basement. Thus the living environment can be improved as much as possible on the premise of historic district protection.(Figure 4.34 Develop and utilize the underground space in Siheyuan)



Figure 4.30 View looking northwards at the reconstructed Yongxing Road

Source: Author

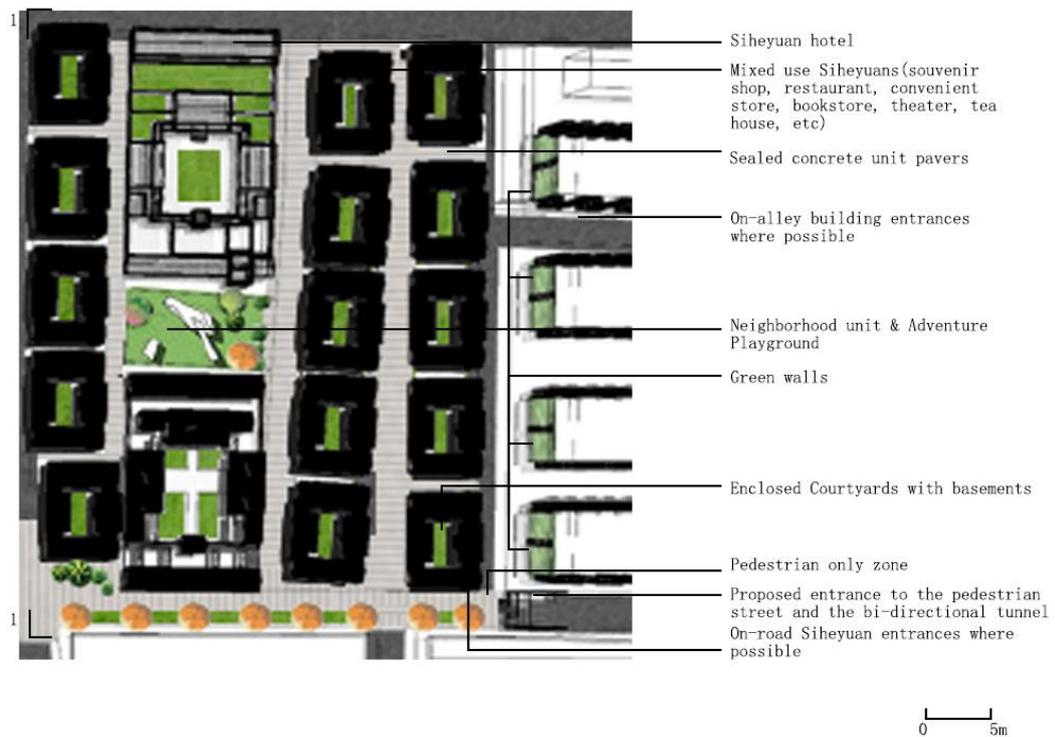


Figure 4.31 Illustrative plan showing the Yongning Road ancient architectural complex

Source: Author

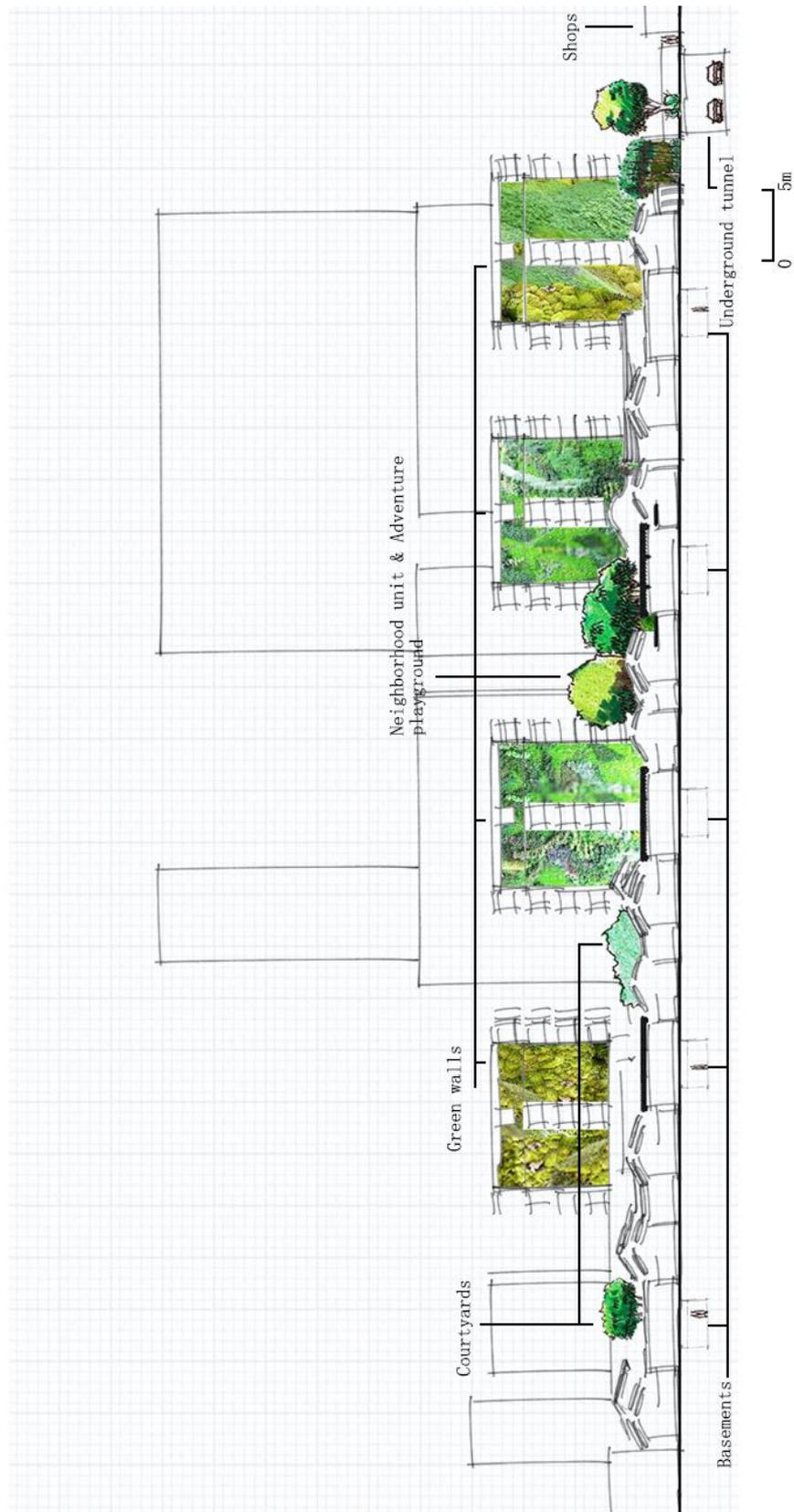


Figure 4.32 Section of the Yongxing Road ancient architectural complex

Source: Author



Figure 4.33 The Bunkhouses are located in the courtyard

Source: Author

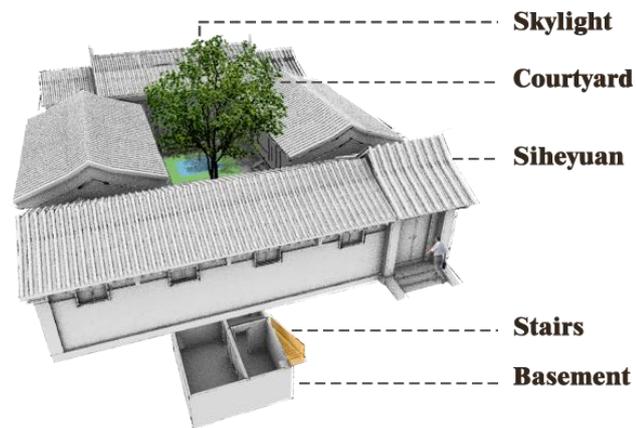


Figure 4.34 Develop and utilize the underground space in Siheyuan

Source: Author

### 4.3.2 The Yongning Road ancient architectural complex

The most Siheyuan has formed a “shop in front and the factory at the back” pattern because of the Yongning Road ancient architectural complex that is situated

immediately adjacent to the urban main road. For the spatial reconstruction of this area, my advice on this is to build a basement under the courtyard and then we can put the factory into the basement.(Figure 4.35 Section of the Yongning Road ancient architectural complex ) We will restore the original Ming and Qing dynasty architectural complex and transform it into the shopping area, such as souvenir shop, restaurant, convenient store, bookstore, theater, tea house and so on.(Figure 4.36 Illustrative plan showing the Yongning Road ancient architectural complex) The Yongning Road ancient architectural complex already has a fresh food market, I suggest that the fresh food market should be removed and a community square should be built in its place.(Figure 4.37 The market was demolished and replaced with a square)

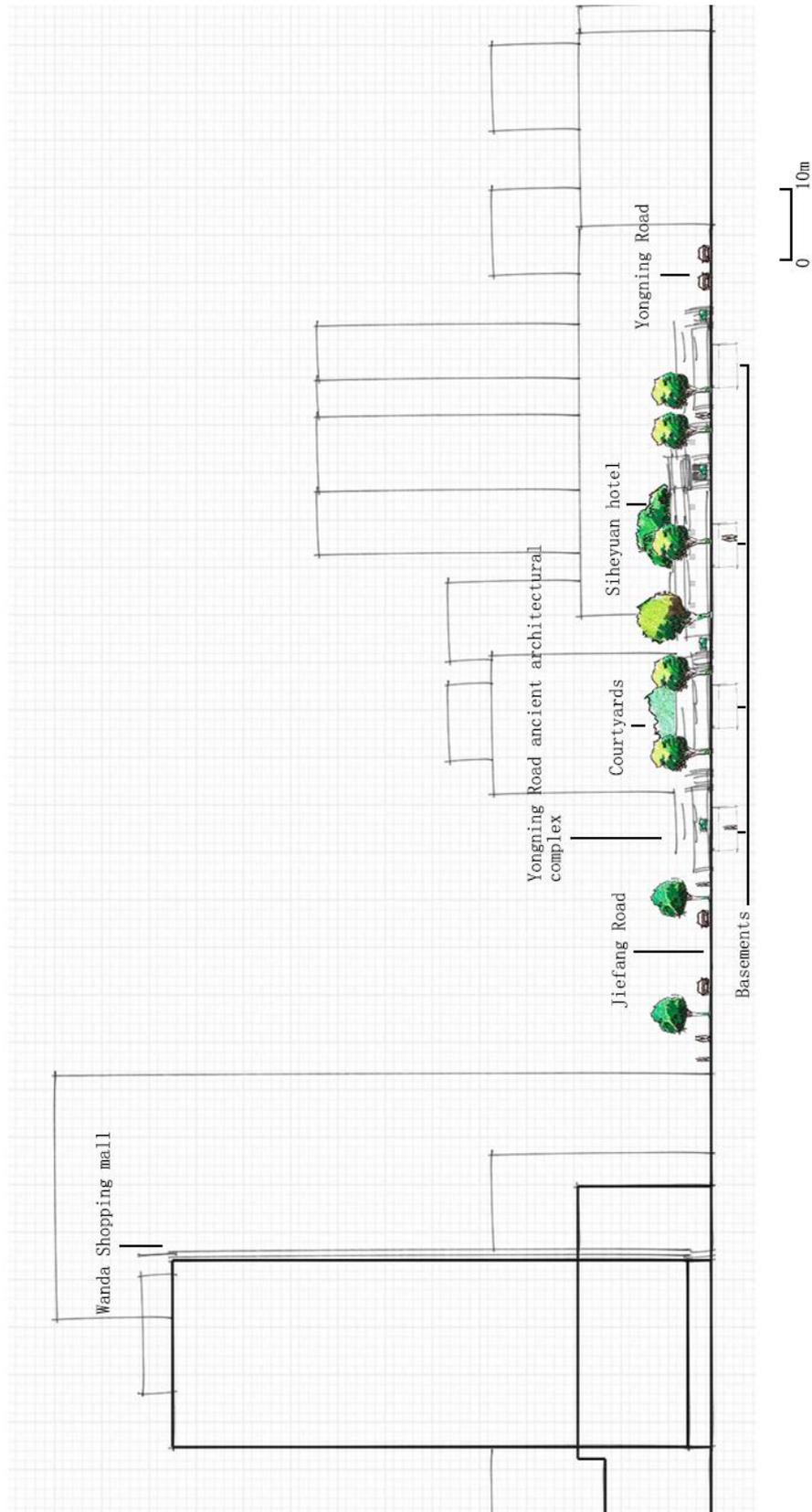


Figure 4.35 Section of the Yongning Road ancient architectural complex

Source: Author

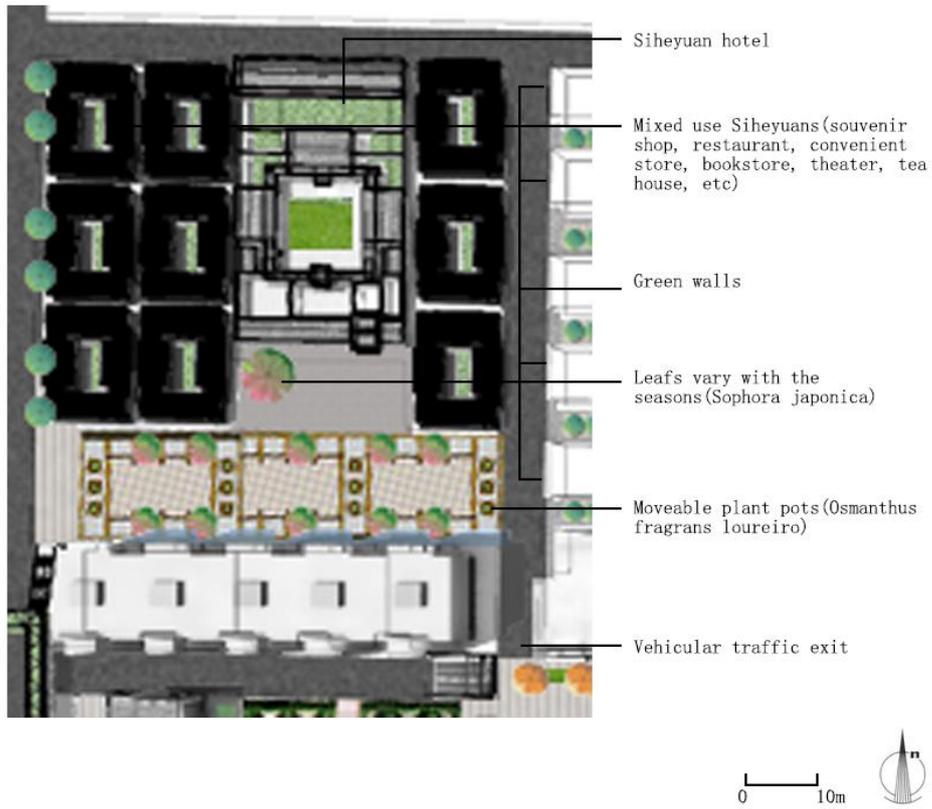


Figure 4.36 Illustrative plan showing the Yongning Road ancient architectural complex  
 Source: Author



Figure 4.37 The market was demolished and replaced with a square

Source: Author

### 4.3.3 The public facilities

As the mentioned earlier in this thesis, the public facilities of the Yongding Road historic district will be provided.(Figure 4.38 Public facilities) However, these public facilities will be developed with the local government and the residents. It is understood that the ancient architectural complex requires additional facilities, which would be attached to improve the living environment of the Yongding Road historic district.(Figure 4.39 The Siheyuan do not have their own toilet, there is only public toilet on the street) The public facilities may include the family bathroom, running water and heating installation and so on. (Figure 4.40 After the spatial reconstruction, the residents will have their own bathroom)



Figure 4.38 Public facilities

Source: Author



Figure 4.39 The Siheyuan do not have their own toilet, there is only public toilet on the street

Source: Author

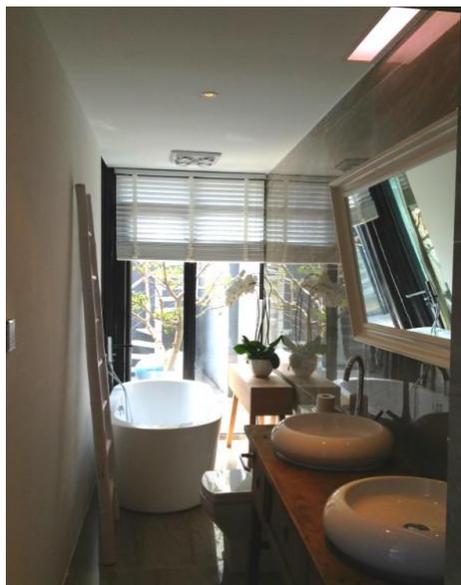


Figure 4.40 After the spatial reconstruction, the residents will have their own bathroom

Source: <http://www.54jzsjs.com/haowen/show-1354.html>

#### 4.3.4 The green wall and street planting

The Patrick's living wall will offer large-scale planting spaces that can be planted to create layered planes of color and pattern over the exterior walls of surrounding apartments and hospital. Such green walls will provide opportunities for plants to colonize and to benefit local environment.(Figure 4.41 The green walls at the surrounding

buildings)



Figure 4.41 The green walls at the surrounding buildings

Source: Author

Tree types can be defined in relation to the character of the various spaces: courtyards, squares, streets, church, and vary in terms of height, spread, form, texture and color, etc. Street trees will be planted in trenches with irrigation systems

with a 2 m<sup>2</sup> permeable surface per tree. (Figure 4.42 *Salix babylonica* and *Sophora japonica*)



Figure 4.42 *Salix babylonica* and *Styphnolobium japonicum*

Source: <https://de.pinterest.com/pin/181762534935775084/>

## 5. CONCLUSION

The historic district, as an important carrier of city life, it is also the core of the urban public space. The reconstruction and development of historic district bring the new blood to the city. However, due to the limitations in the Yongding Road historic district, the living environment was inconvenient for residents. Therefore, the spatial reconstruction is the most rational way of historic district development and is the easiest to implement.

Based on this principle, this thesis analyzes the actuality of the Yongding Road historic district. Then by study of related literature and cases on this subject, we made a deep analysis of the current situation of this area, such as:

A. Based on the concepts and ideas from the previous studies. According to the actual situation in China. I have summed up the guidelines of spatial reconstruction that help me to determine the most economic and effective landscape architecture program.

B. The historic district has an important role in the urban development. The main objective of spatial reconstruction is to protect the integrity of the historic district, but also improve people's living standard. Historic districts are the historical products of social economic development in cities. The historic district carries different kinds of local culture information and reflects the change of urban history. So, if the historic district want to be protected, the historic district has to rely on the development of city. Only the urban economics advance provides material base for protecting the historic district, and the historic district promotes local tourism development faster and better. Therefore, the spatial reconstruction of historic district becomes more important than before. By reviewing the related successful cases, I have summed up the main design methods of spatial reconstruction in Yongding Road historic district.

C. After investigation and interviews in the Yongding Road historic district, the

environment, and public facilities in this area has already exposed a lot of problems. But I found that the local residents want to improve their living environment, and the Yongding Road historic district has huge potential in the spatial reconstruction.

D. According to the present situation and the existing problems of the Yongding Road historic district. I have given the two strategies to improve the resident living standard while protecting the historic district.

The Yongding Road historic district is the center of Taiyuan, it has the properties of complexity and uncertainty, so we cannot cover all cases in this article. My goal is just to provide a possible solution for the current problem of the Yongding Road historic district.

I hope this thesis can attract more experts and scholars to concern about the Yongding Road historic district. Then they can propose the better ways and means and solve existing problem of the Yongding Road historic district.

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## APPENDIX

### The questionnaire of the spatial reconstruction in Yongding road historic district

Date:

Interviewee:

Hello, Mr./Mrs. I am a postgraduate student from the Anhalt University of Applied Sciences. In order to find out how the strangers viewed the situation of the Yongding Road historic district. Meanwhile, that's will be better if you can give me some advises on how to improve the environment here.

#### Background information

Age:

Gender:

Career:

1.What are your identity?

Local Resident  Patients and their families  Shopper  Stranger

Others

2.How long did you spend in coming to here?

Less than 3 minutes  5 minutes  10 minutes  More than 10 minutes

3.How did you get here?

Walk  Bicycle  Public Transport  Private car

4.How far you are willing to go ?

Less than 300 meters  300 meters to 500 meters  500 meters to 1000 meters  More than 1000 meters

5. What were you doing here? (Multiple Choices)

Exercise and communication  Take a walk  Pleasure  Visit  Other reasons

6. What attracted you to come to here? (Multiple Choices)

Public Facilities  Scenery  Function  Culture  Others

7. What do you think of this place?

Very Interesting  Interesting  Normal  Boring  Very Boring

8. How often do you come in here?

Once a week  Two or three times a week  Everyday  Irregularly

9. How often do you go to the City Park? (Such as the Yingze Park, the Fenne Riverside Park, Longtan Park)

Once a week  Three times a week  Everyday  Irregularly

10. How long are you staying?

Summer:  15 min  30 min  60 min  More than 60 min

Winter:  15 min  30 min  60 min  More than 60 min

11. Where do you think the place must be reconstructed? (Multiple Choices)

Residential Area  Commercial Center  Office Space  Historic District

Others

12.If you must bring a people here, who is first? (Multiple Choices)

Family  Friend  Social Group  Colleague  Stranger

13.How would you describe the environment here?

Small  Comfortable  General  Empty  Other sizes

14.How much space will be enough for communicate with other people?

Small  Comfortable  General  Empty  Other sizes

15.What kinds of space do you like ?

Enclosed Space  Semi-Enclosed Space  Open Space

16.Where do you like to go? (Multiple Choices)

Large Square  City park  Neighborhood Unit  Spatial reconstructed  
Historic district

17.Did you like the environment here?

I really enjoying the time here  I like it here  This place looks distorted to  
me

18.Did you feel comfortable to stay in this place ?

Very Comfortable  Comfortable  Normal  Uncomfortable  Very  
Uncomfortable

19.What is the biggest impact on this place?

Climate  Space  Function  Public Facilities  Safety  Culture

Landscape  Others

20.Do you think the public space is important to the residents?

Very Important  Important  Normal  Unimportant

21.Do you think the spatial reconstruction is necessary to the Yongding Road historic district?

Very Important  Important  Normal  Unimportant

Thank you again for your cooperation!