



**POLITECNICO
DI TORINO**

Neurobionic City

— Urban Regeneration In Luoyang

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POLITECNICO DI TORINO

Corso di Laurea Magistrale
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Tesi di Laurea Magistrale

Neurobionic City
— **Urban Regeneration In Luoyang**



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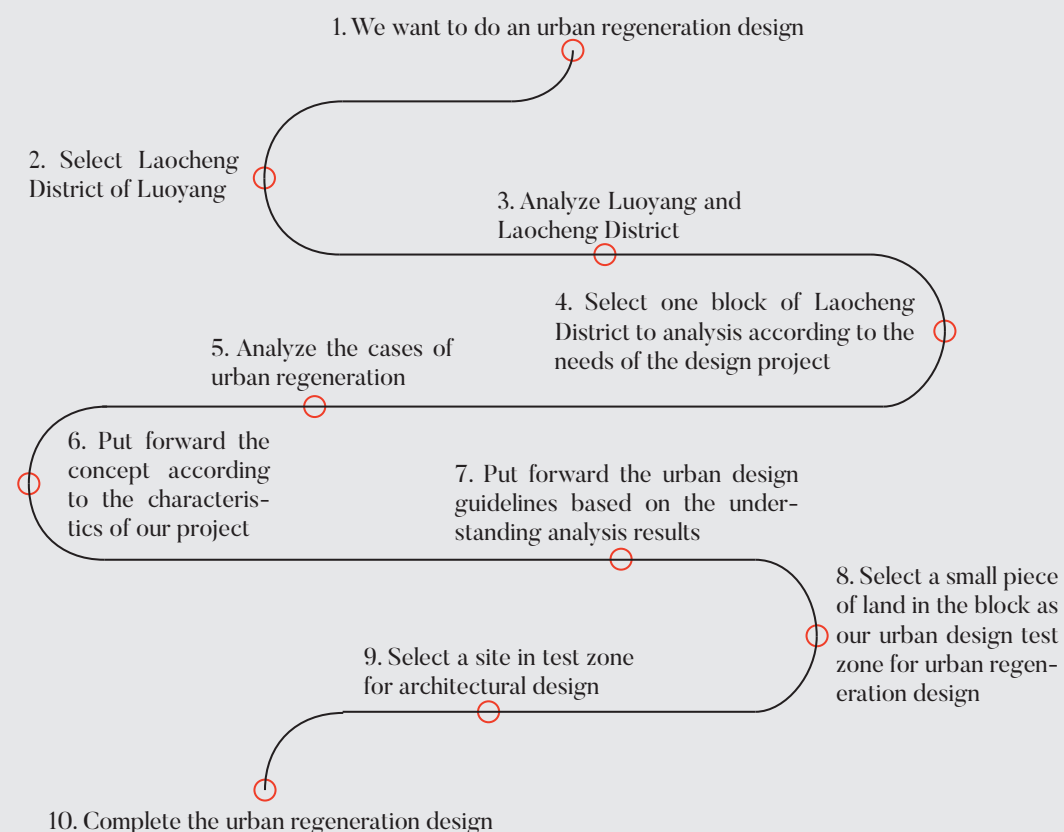
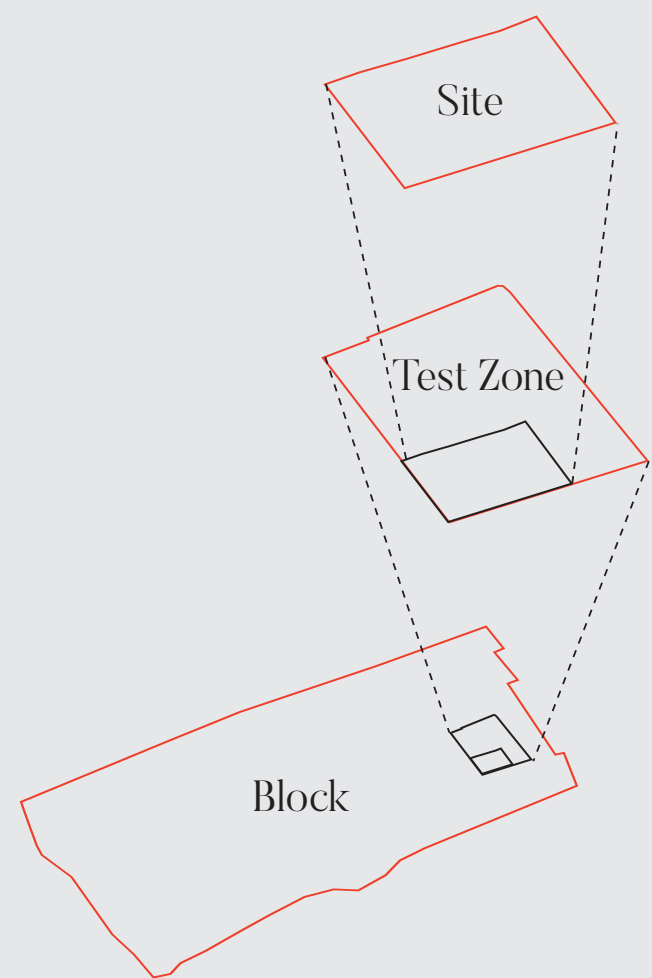
YU XIA

firma del candidato

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06.12.2020

ABSTRACT



Luoyang is the ancient capital of 13 dynasties, with a profound historical background. Laocheng District, a former urban center, preserves a large number of historic buildings and artifacts. Then with reform and opening up, Laocheng District loses its economic status. More and more residents are moving away from Laocheng District because of the existing facilities and buildings there. In this project, we combed the historical and cultural background of Laocheng District in Luoyang and analyzed the geographic location and architecture of Laocheng District. Laocheng District Regeneration Projects and Laocheng District were incorporated into the design guidelines of Laocheng District urban regeneration projects. We generated the central concept of our urban regeneration according to the features of neural networks in biology and Laocheng District and designed urban regeneration projects on the test zone chosen by us. Finally, we start from the perspective of protecting the intangible cultural heritage in Laocheng District and design an intangible cultural heritage center that conforms to the guidelines of urban design and represents Laocheng District's traditional characteristics in the site. So we want to inspire Laocheng District in this way.

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Section 1

PROJECT AND SITE UNDERSTANDING

Introduction Of Luoyang

Project Background And Location

History Of The Development In Laocheng District

Traffic Analysis Of The Historical Block

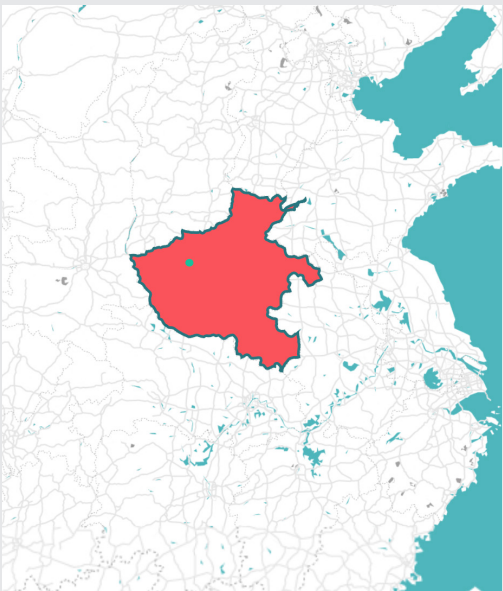
Green Space Distribution Analysis

1.1 Introduction Of Luoyang

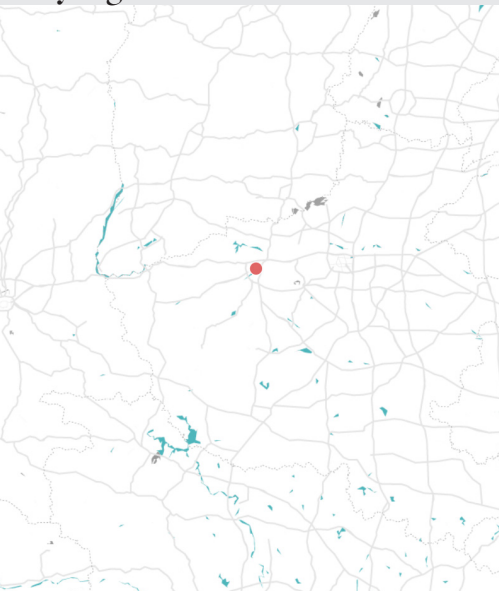
China



Henan Province



Luoyang



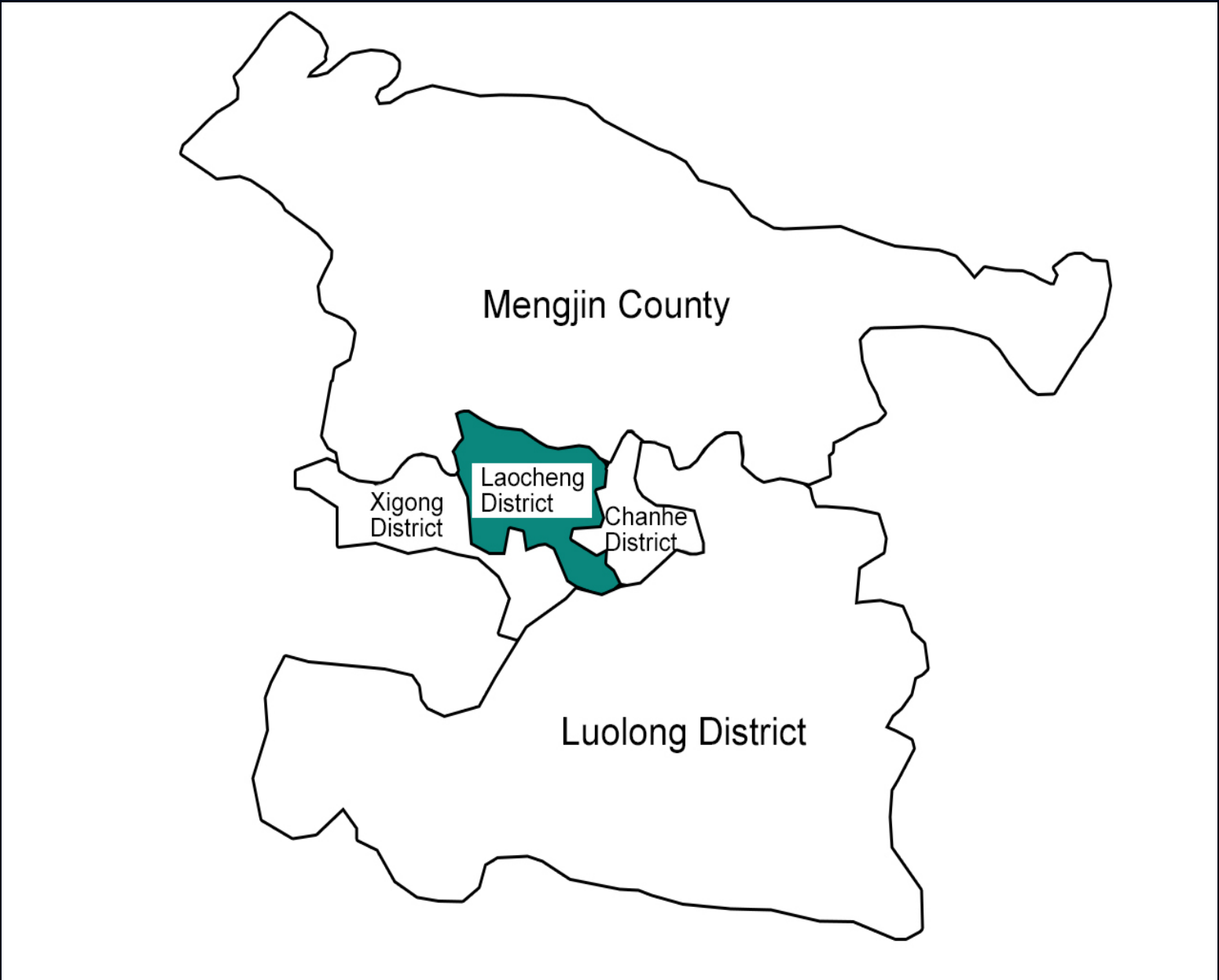
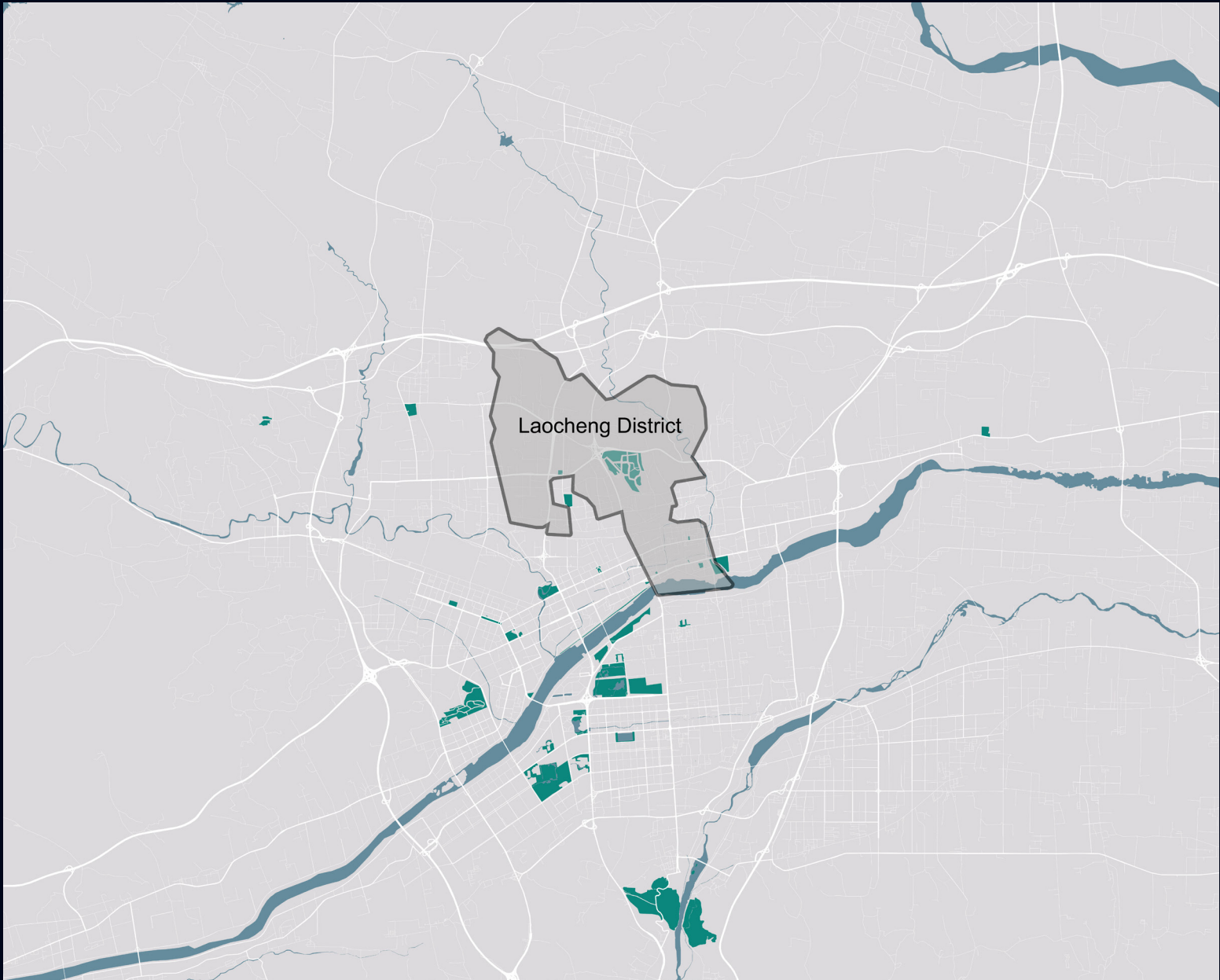
Luoyang is located in the western part of Henan Province. Luoyang has undergone dynastic changes, regime changes, social system renewal, and has witnessed the journey of the Chinese nation. It is the capital of thirteen dynasties, and for a long time, it was the political and cultural center of China. As a result, now Luoyang also has numerous cultural relics for study, reference, and learning. In the 80s of the last century, the government and experts proposed some measures for the protection of cultural relics to protect the Chinese civilization, to preserve its unique history, and to prevent the destruction of the ancient capitals and their relics. Drawing on the best experiences from abroad, the experts formally proposed the concept of “Famous Historical and Cultural City”. Luoyang is an ancient city, and its features and many historical relics make it stand out from other ancient cities and become one of the first national famous historical and cultural cities in China. Due to this background, the Luoyang municipal government has always attached great importance to

the preservation of ancient city buildings and historical relics. Most of the existing historical buildings are located in Laocheng District. Laocheng District was built according to the layout of the Sui and Tang dynasties, which formed the current city layout after hundreds of years. Since the beginning of the 21st century, the Luoyang municipal government has developed various policies for the protection of Laocheng District based on the layout of Laocheng District and the customs and characteristics of the inhabitants. In this process, the government has also encountered some problems, which are important issues in the context of the progress of the times. First of all, we expect to preserve the old style and the collective memory, however, in the current trend of urbanization, it is difficult to balance the needs of modern urbanization. Being too conservative or too radical will cause irreversible damage to the historical and cultural districts. Urban regeneration, as an activity to transform areas that have not kept pace with modern life, will play a key role in the preservation of Laocheng District.

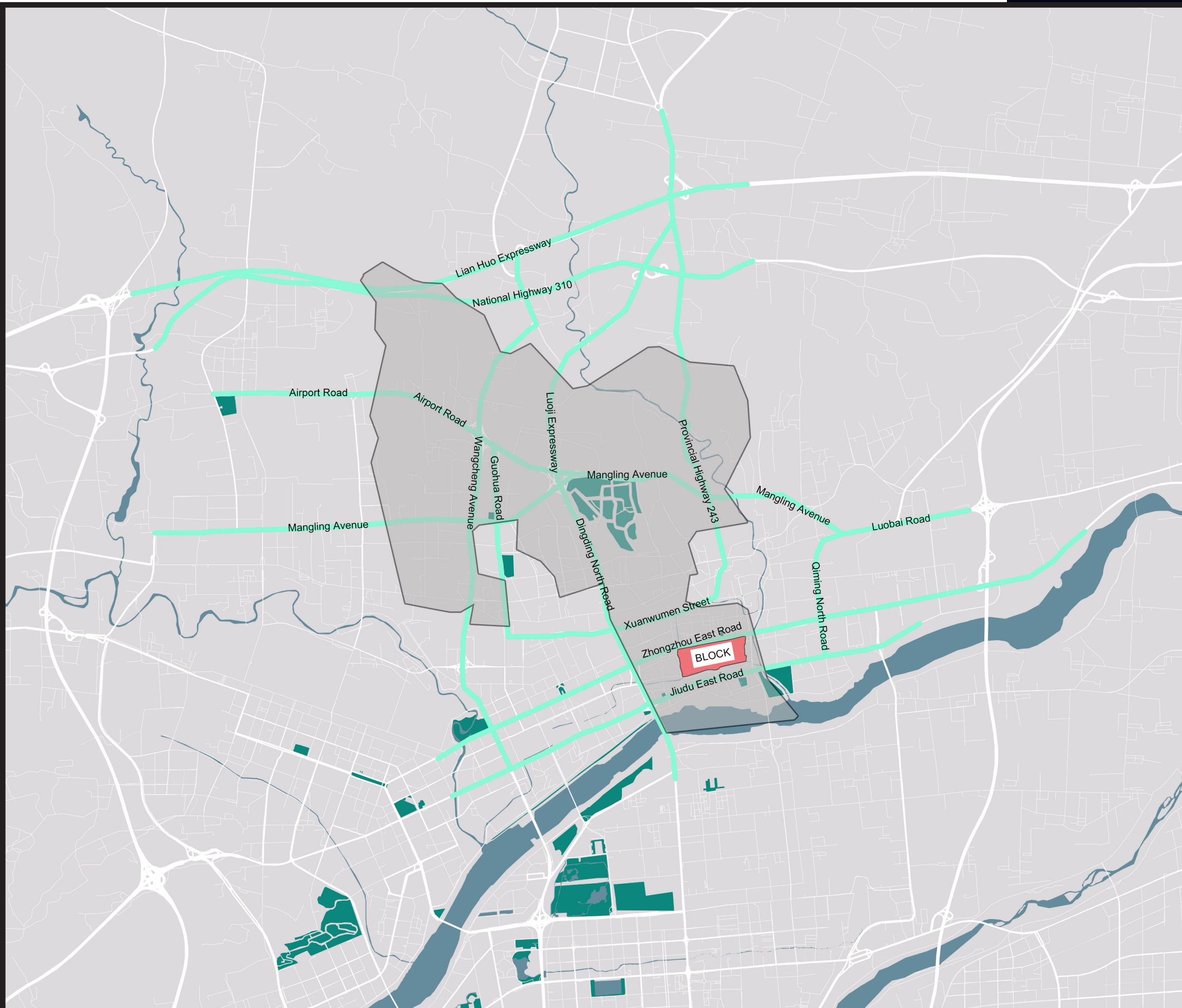
1.2 Project Background And Location

1.2.1 Site Location Map Based On The City

Located in the center of Luoyang, the Laocheng District is the earliest built-up area in Luoyang. It is adjacent to four districts/counties, namely Xigong District, Chanhe District, Luolong District, and Mengjin County. The area of Laocheng District has a total area of 56.7 square kilometers and a total population of 185000. And Laocheng District has a long history and was built in the Western Zhou Dynasty. Its changes are also the epitome of the development of Chinese traditional culture.



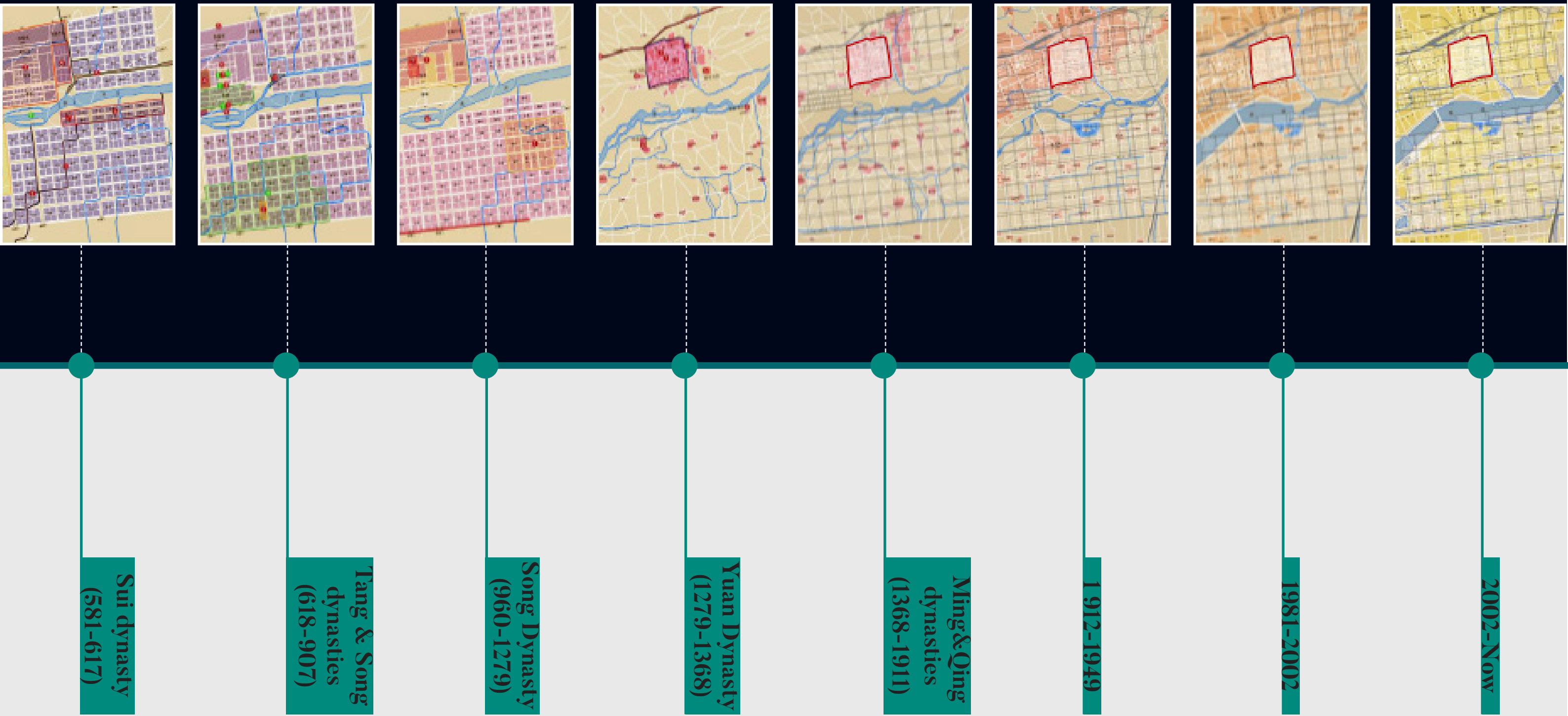
1.2.2 Block Map



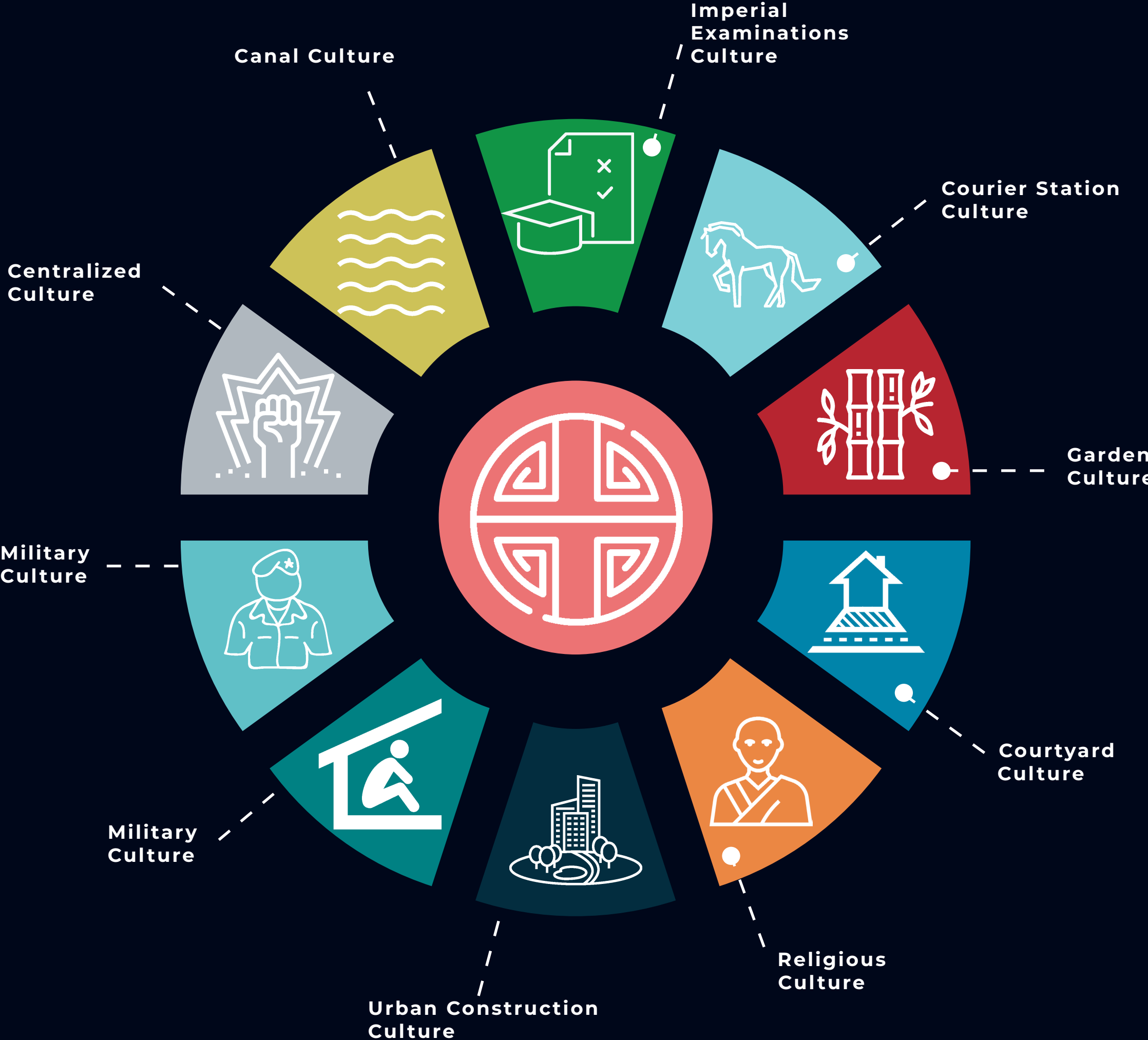
Our historical block is located in the south of Laocheng District, not far from the Luohe River. The total area of the site is about 94.15 hectares, ranging from Zhongzhou East Road in the north, Zhongzhou canal in the west, Zhongzhou canal in the South, and Shouchun North Street in the East. The block contains Lijingmen, Drum Tower, Wenfeng Tower, and other historical and cultural buildings. Recently, the government discovered the wall of the Jin and Yuan Dynasty and other important historical relics. These relics further reflect the long and continuous construction history of Laocheng District, which has very important historical and cultural value. At present, more than 80% of the residents have moved out of this area. The empty houses account for about 70% of the total amount of existing buildings. It has become an empty city.

1.3 History Of The Development In Laocheng District

1.3.1 Changes In Luoyang's Historical Urban Construction Land



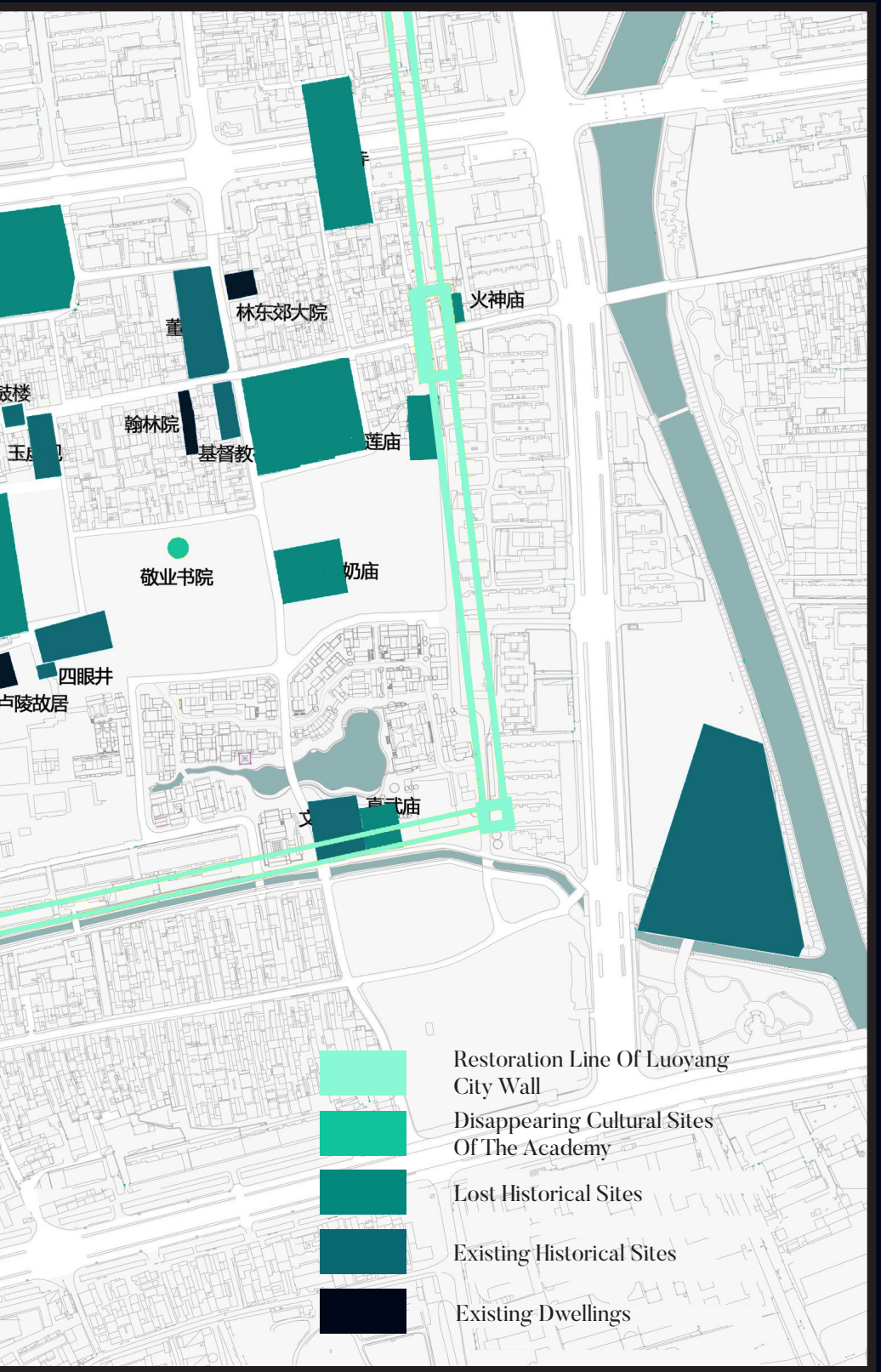
1.3.2.1 Cultural Summary



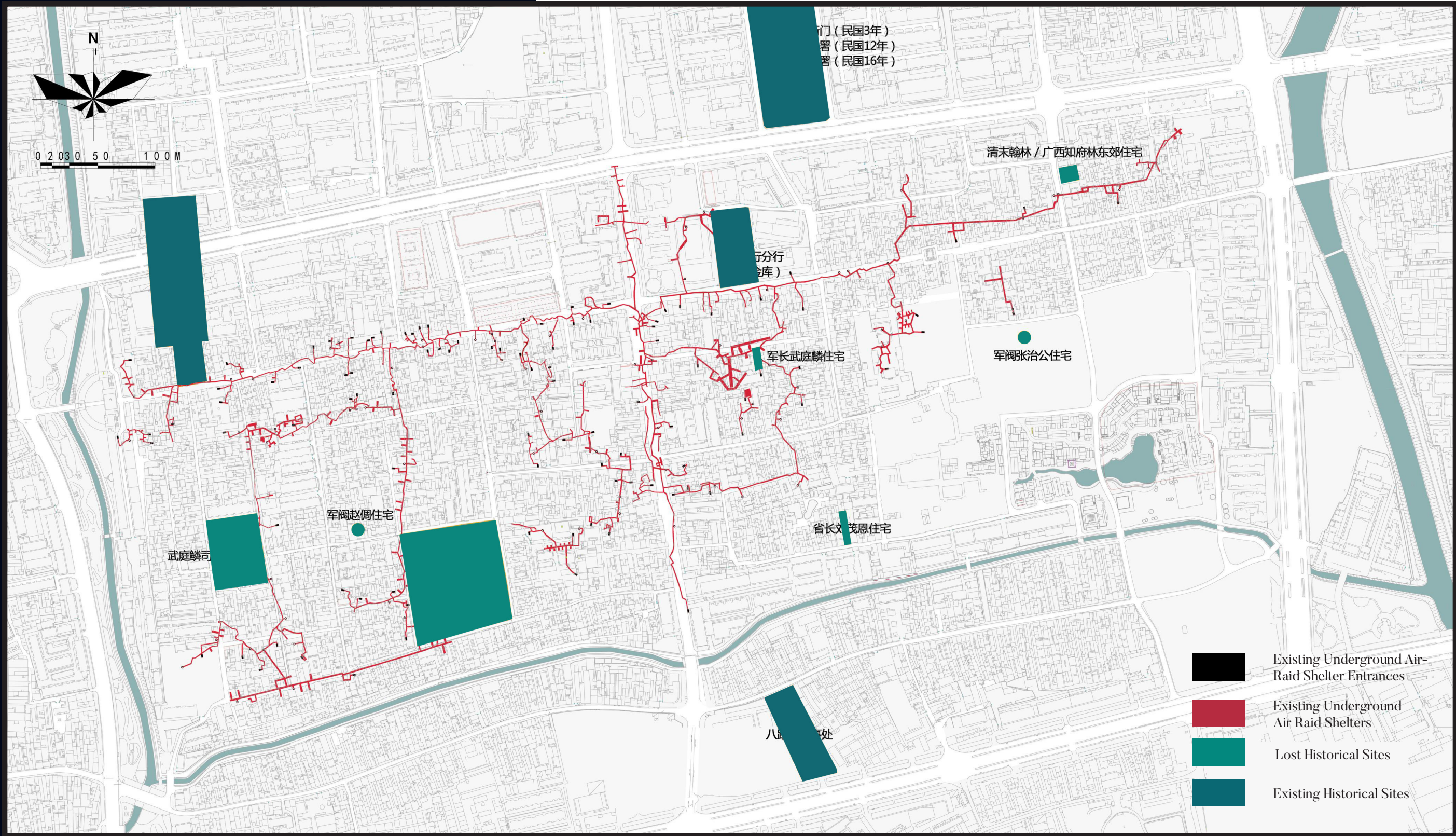
1.3.2.2 The Yuan Dynasty Culture



1.3.2.3 The Ming&Qing Dynasty Culture



1.3.2.3 Culture Of
The Republic Of China



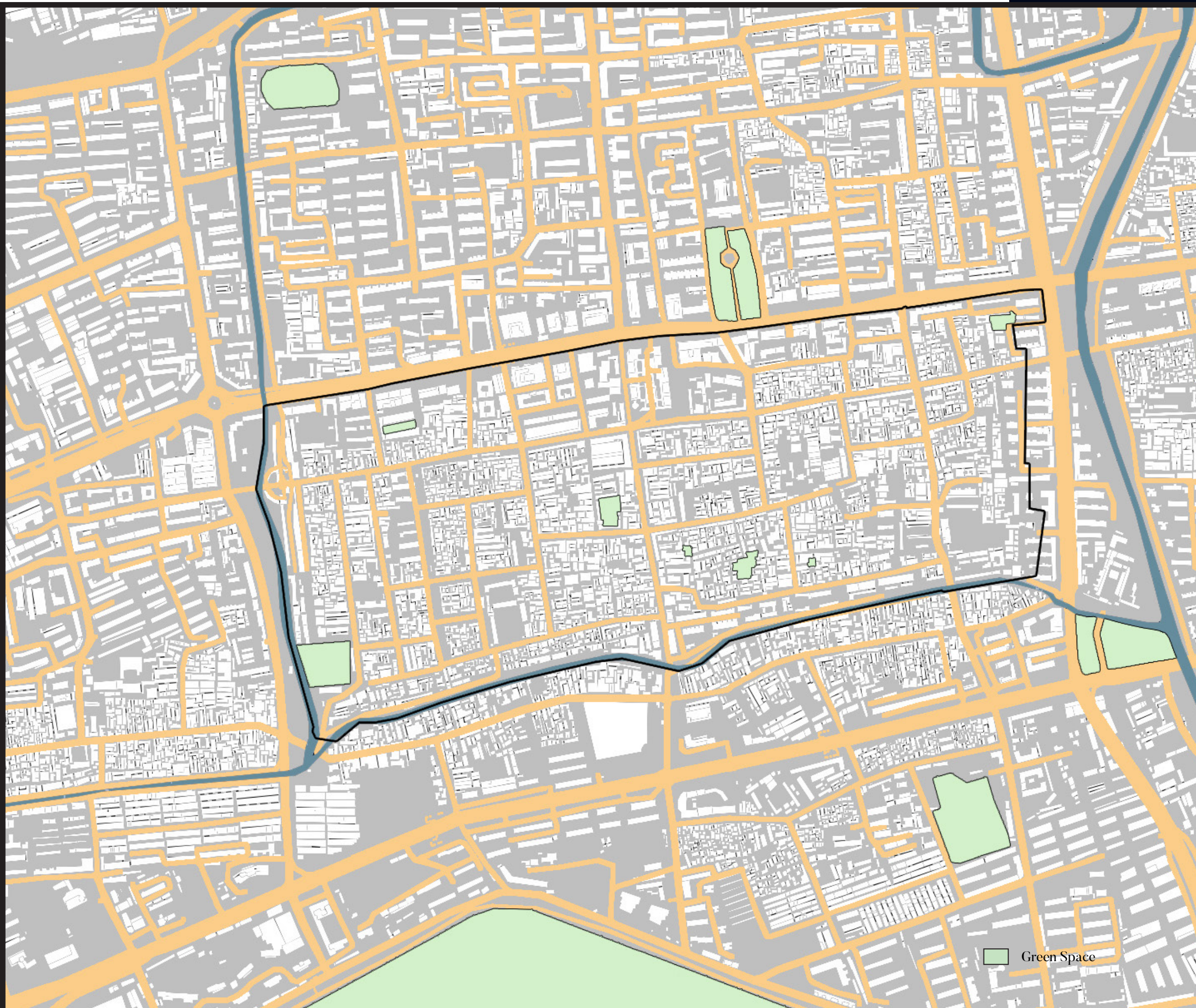


1.4 Traffic Analysis Of The Historical Block

The block is surrounded by Jiudu East Road, Zhongzhou East Road, Jinye Road, and Xinjie Street. The streets with large passenger flows in the block are East Street, West Street, North Street, and South Street. Besides, there are many sidewalks inside the block, such as Anle South Street, Jing Hutong, Mingxin Street, etc.



1.5 Green Space Distribution Analysis



The green rate of Laocheng District is not high, especially in the block range of our analysis, the green space is very little. The main form of green space is that some trees are distributed along streets.

Section 2

CURRENT SITUATION ANALYSIS OF THE Historical Block

Open Space Hierarchy Analysis

The Road Analysis

Pedestrian Traffic Analysis

Street Scale Analysis

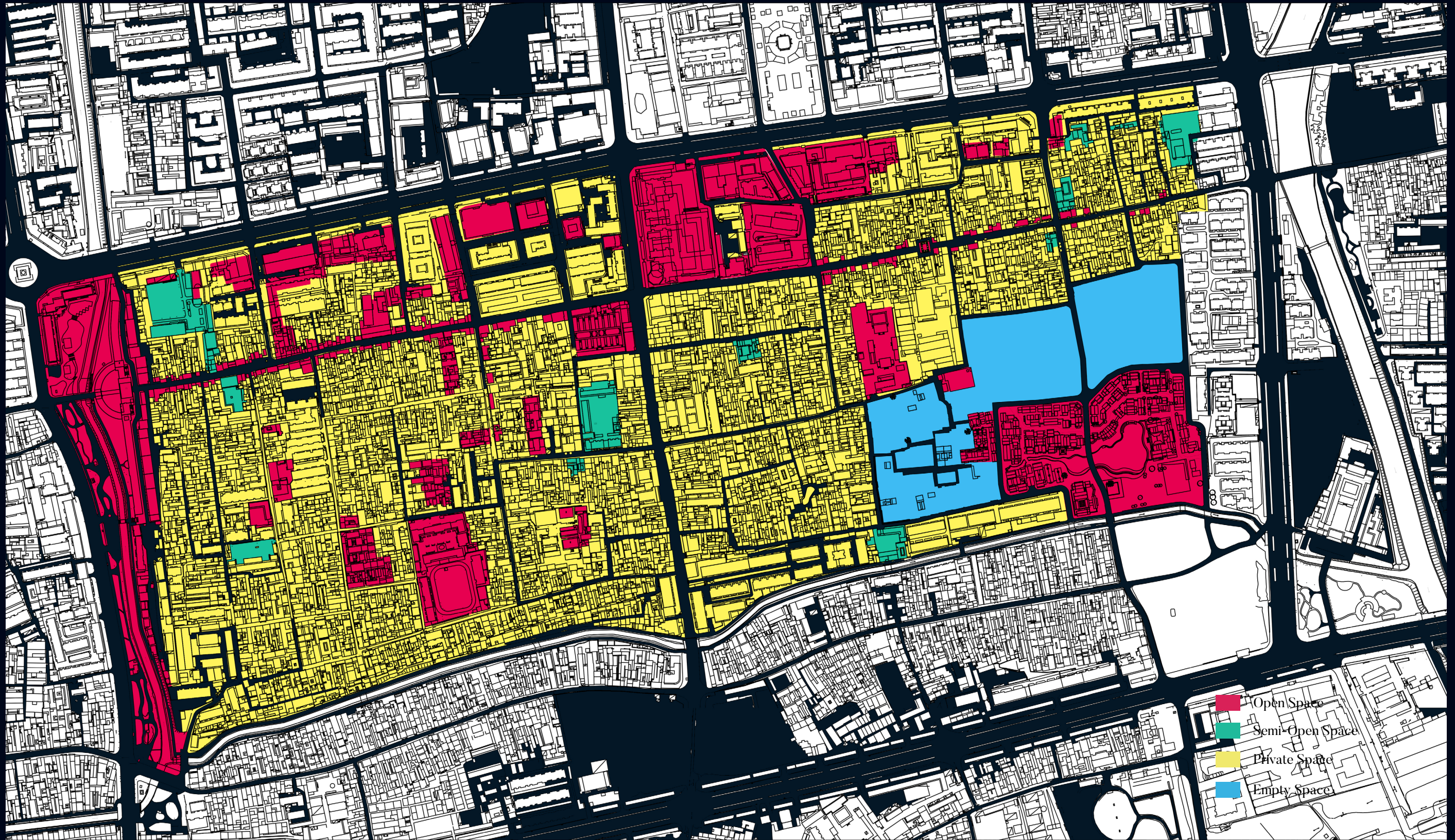
Building Layout Analysis

Function Analysis

Architectural Analysis



2.1 Open Space Hierarchy Analysis



Open space

Most of them are concentrated in commercial spaces around public buildings or roads, which are only for human habitation. So the block can not form a large public space to provide people for activities.

Semi-open space

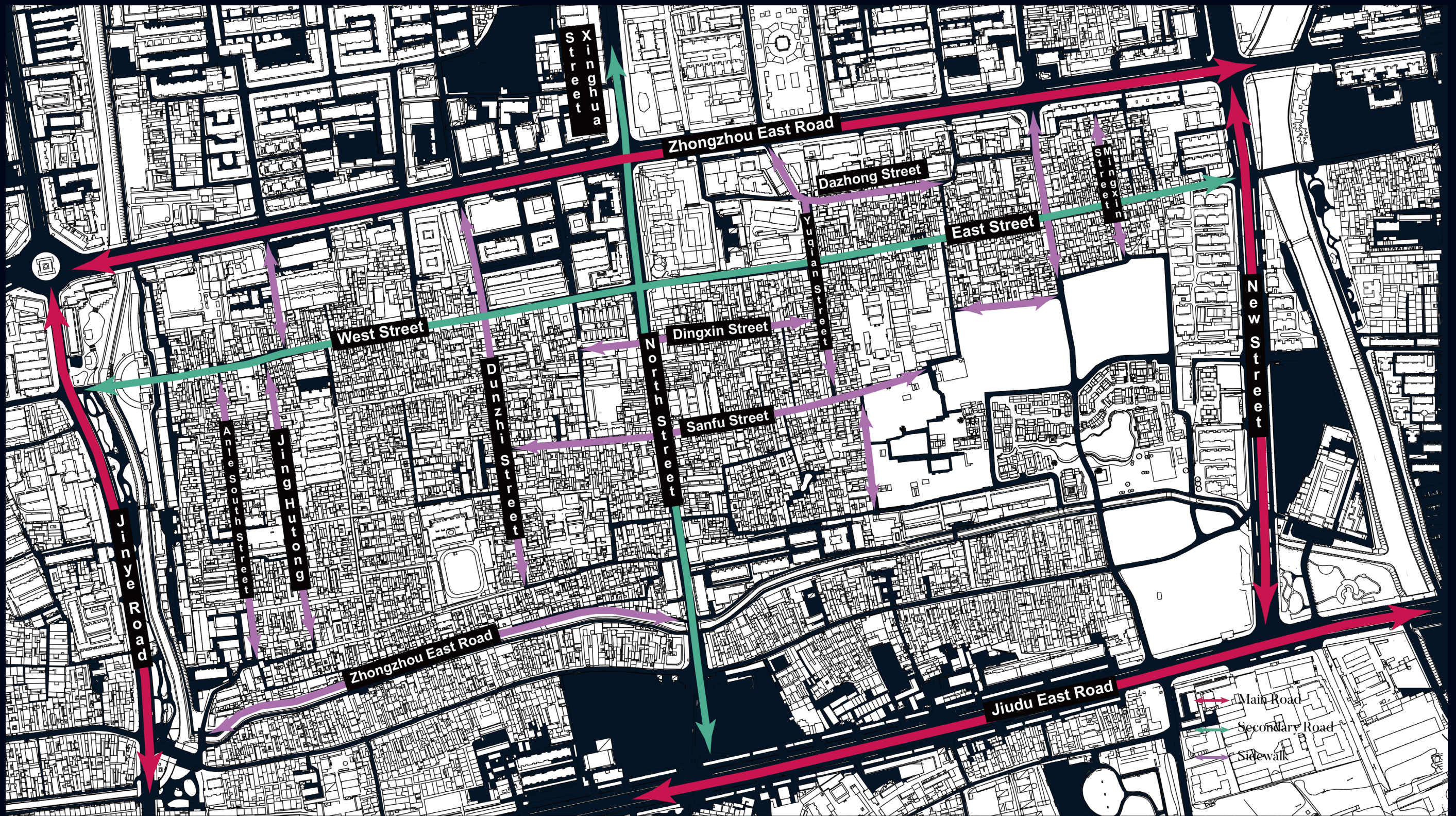
Most of the semi-open spaces in the block are for religious, administrative, and medical functions. These places are open to all people, but in fact, such space can only serve specific groups of people (believers, government staff, doctors, patients, etc.) and cannot be shared by the public.

Private space

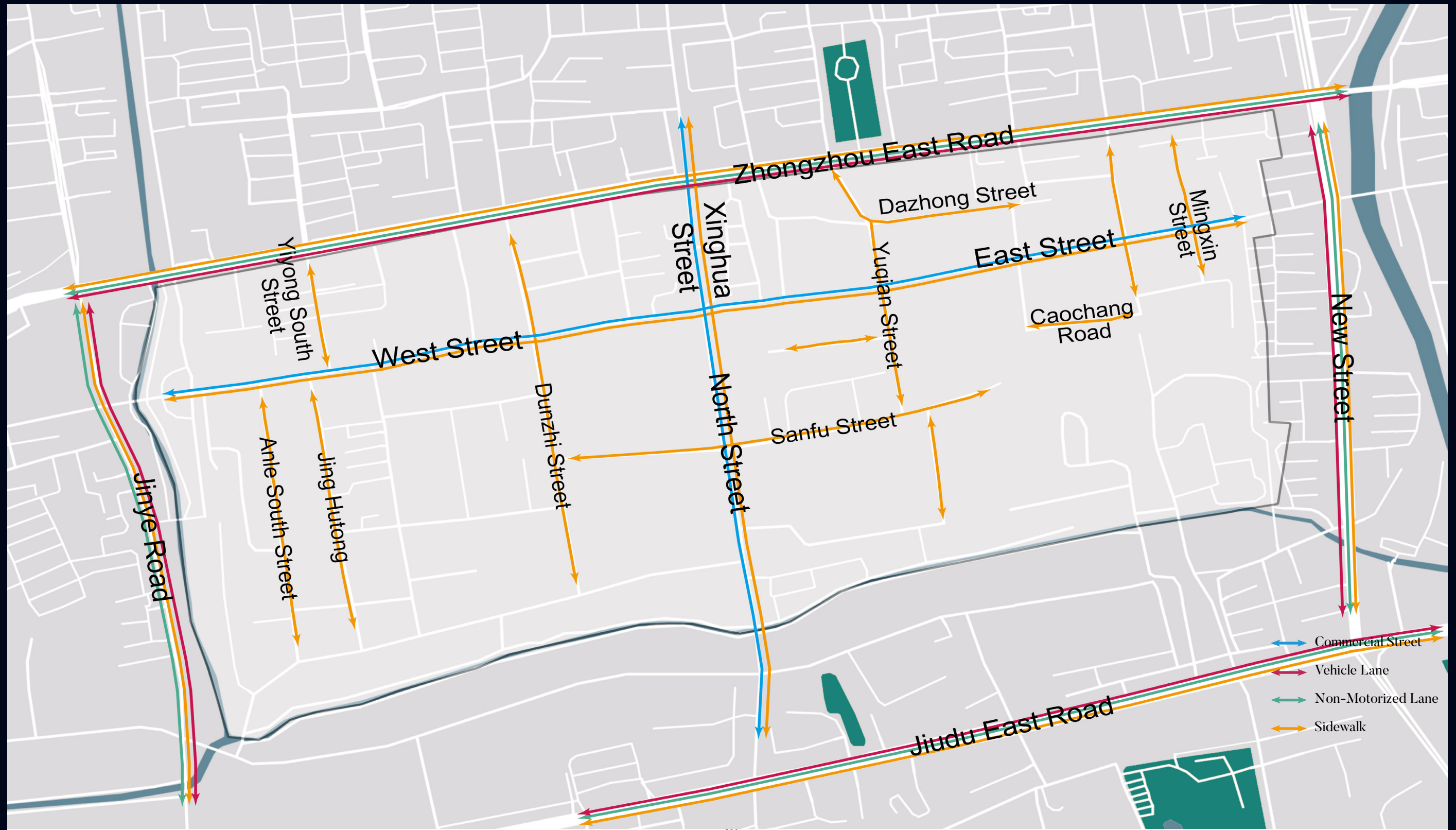
Most of the private space in the block is a residential area. They are some low-rise traditional buildings, and the distribution is relatively concentrated, forming more private space. This phenomenon also creates a space barrier for people to communicate with each other.

- Open Space
- Semi-Open Space
- Private Space
- Empty Space

2.2 The Road Analysis

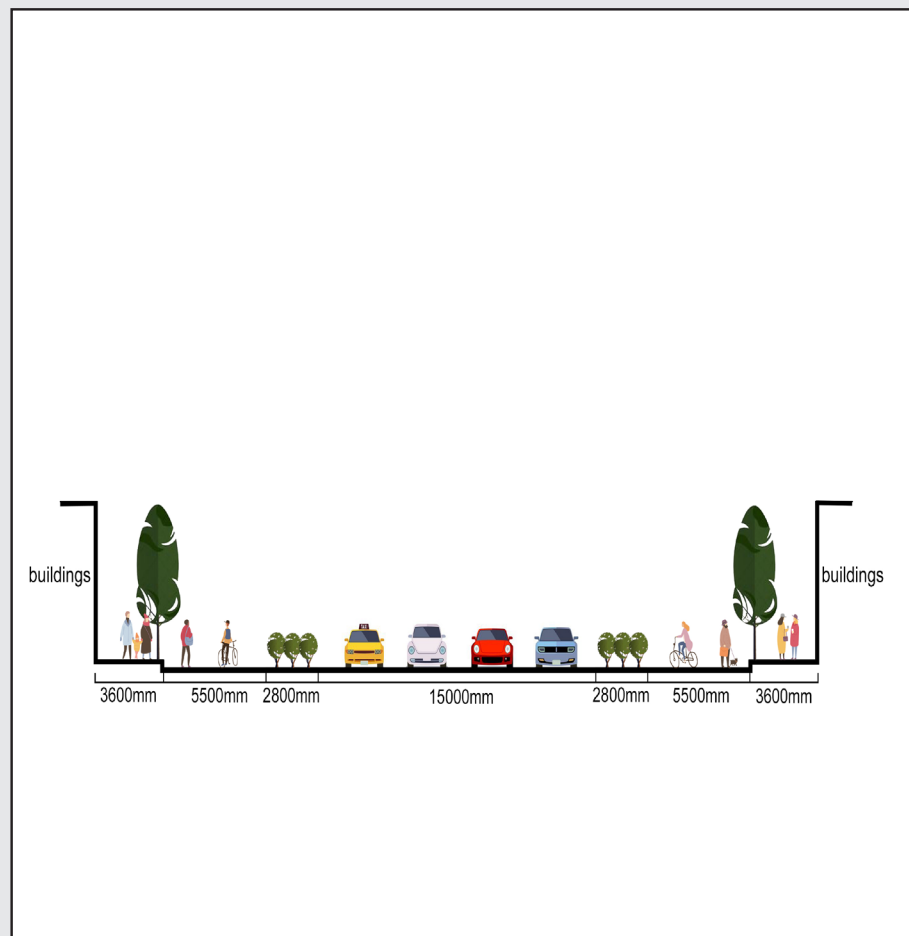


2.3 Pedestrian Traffic Analysis

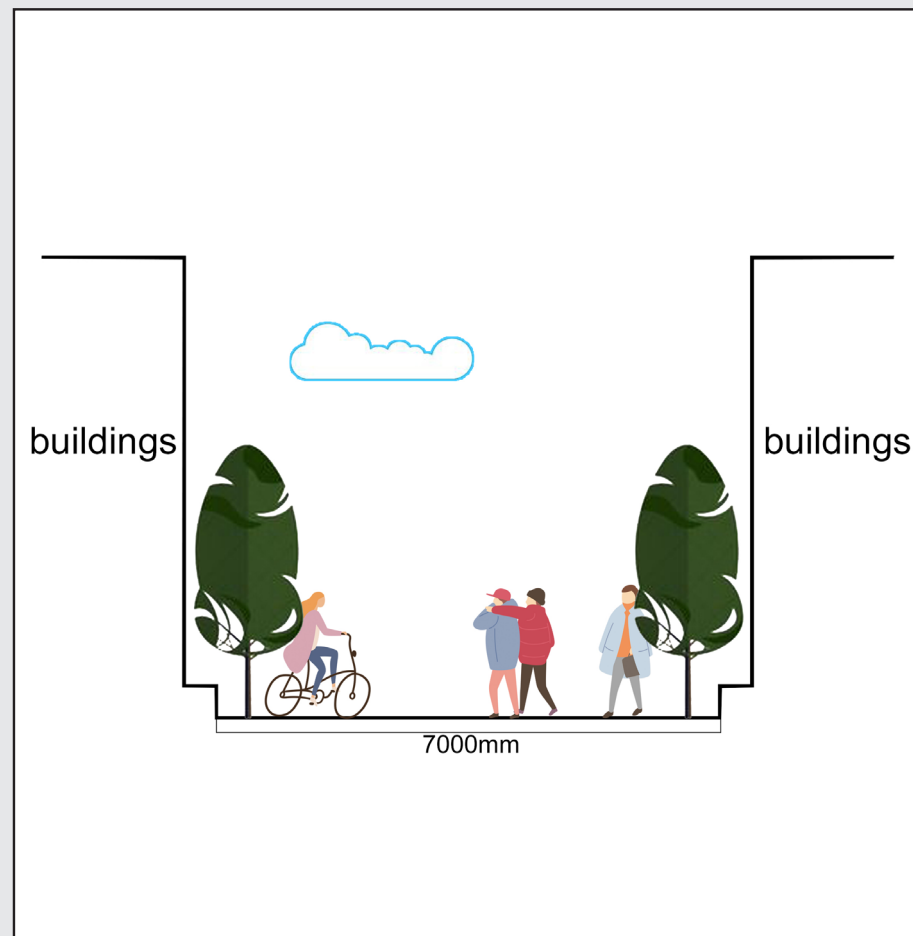


The site is surrounded by Jiudu East Road, Zhongzhou East Road, Jinye Road, and Xinjie Street, with vehicle lanes, non-motorized lanes, and sidewalks. The streets with the large pedestrian flow in the block including East Street, West Street, North Street, and South Street. These streets are not divided into different areas for people and vehicles. The circulations of people and non-motorized lanes are mixed, which brings hidden danger to people's safety. Other sidewalks in the block also have the same problem, but due to the small pedestrian flow, this problem is not as serious as in the commercial street.

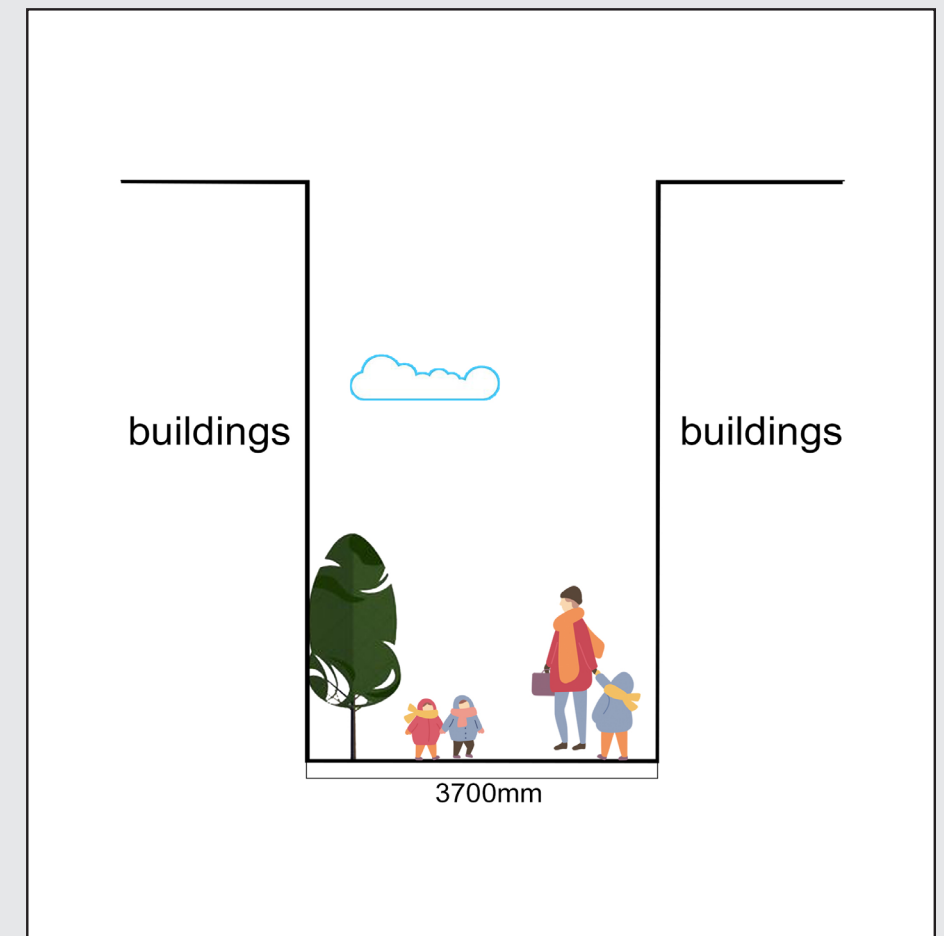
2.4 Street Scale Analysis



Main Road



Secondary Road



Sidewalk

Main road

The main road section is mainly in the periphery of the block, and the road is spacious. It is divided into sidewalks, non-motorized lanes, vehicle lanes, and median strips with vegetation. So people could have a good sense of use.

Secondary road

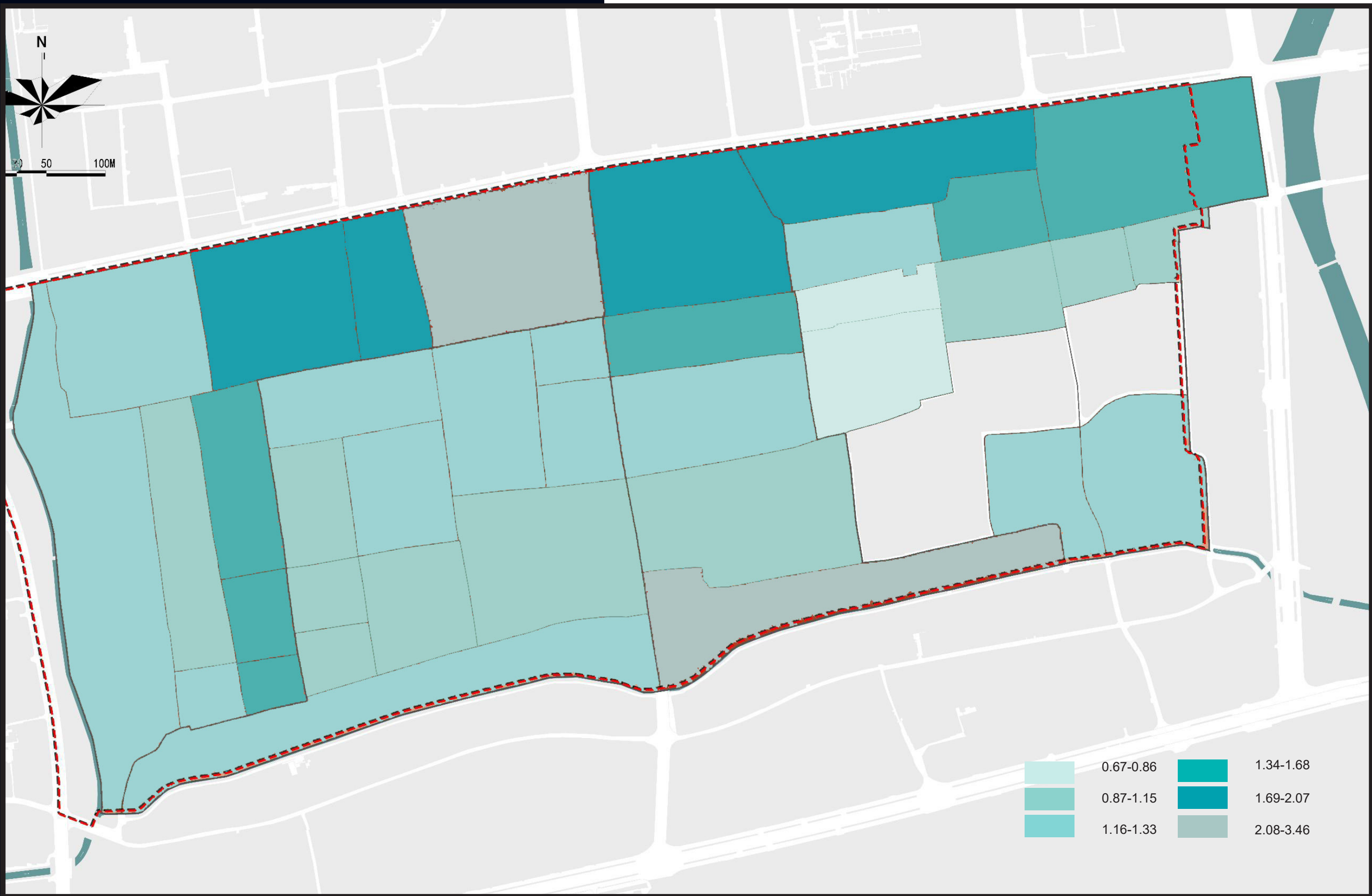
For example, West Street and East Street, cross the block from east to west, these streets have large pedestrian flows in the block. The width of the road is about 6.5-8m. Shops are distributed on both sides of West Street, and a large number of tourists spend a lot of time shopping on West Street every day.

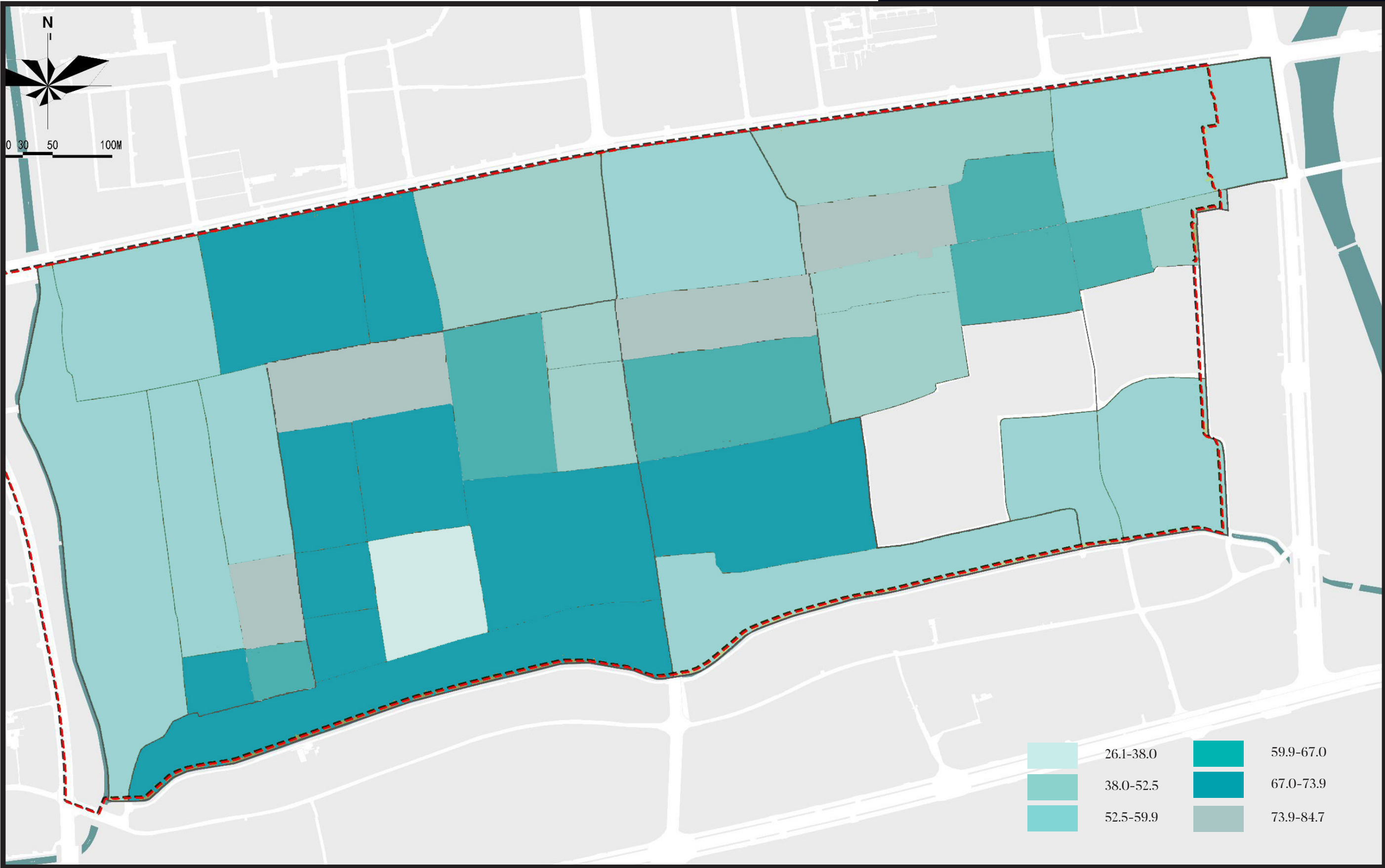
Sidewalk

We choose Mingxin Street as a small example of the sidewalk. The road is narrow, about 3.7m. There are almost residential buildings on both sides of the road.

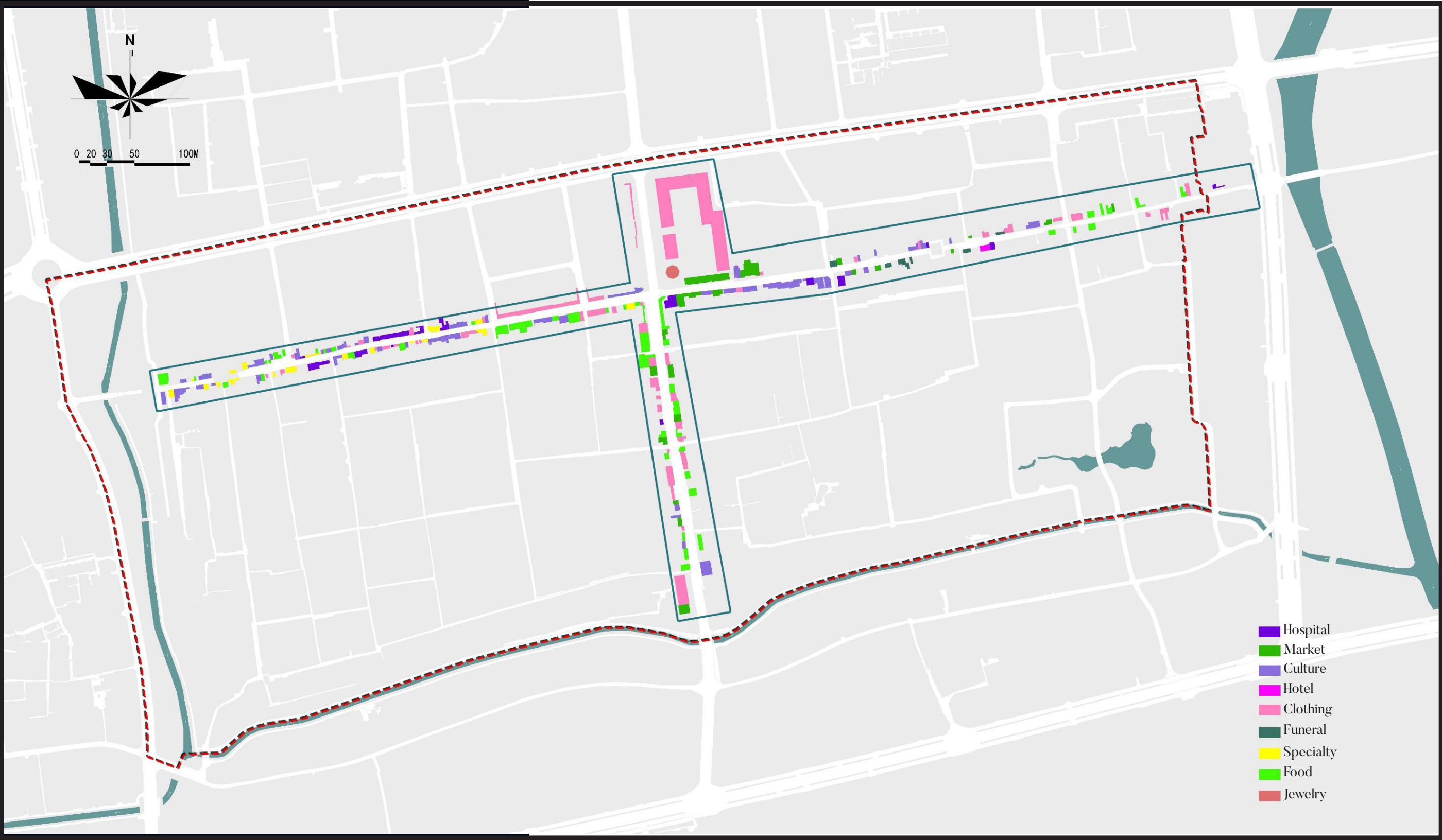
2.5 Building Layout Analysis

2.5.1 Floor Area Ratio Analysis



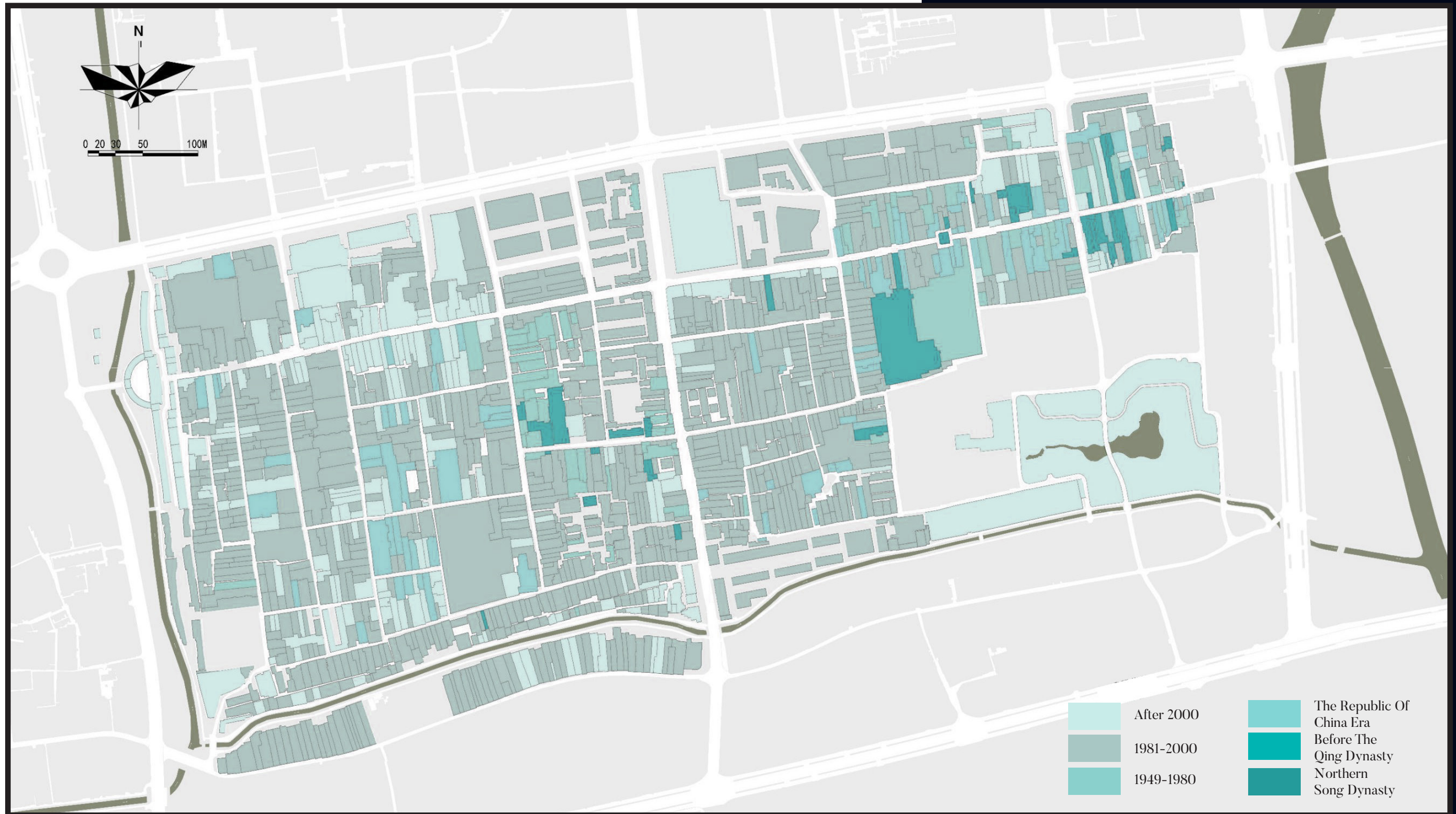


2.6 Function Analysis

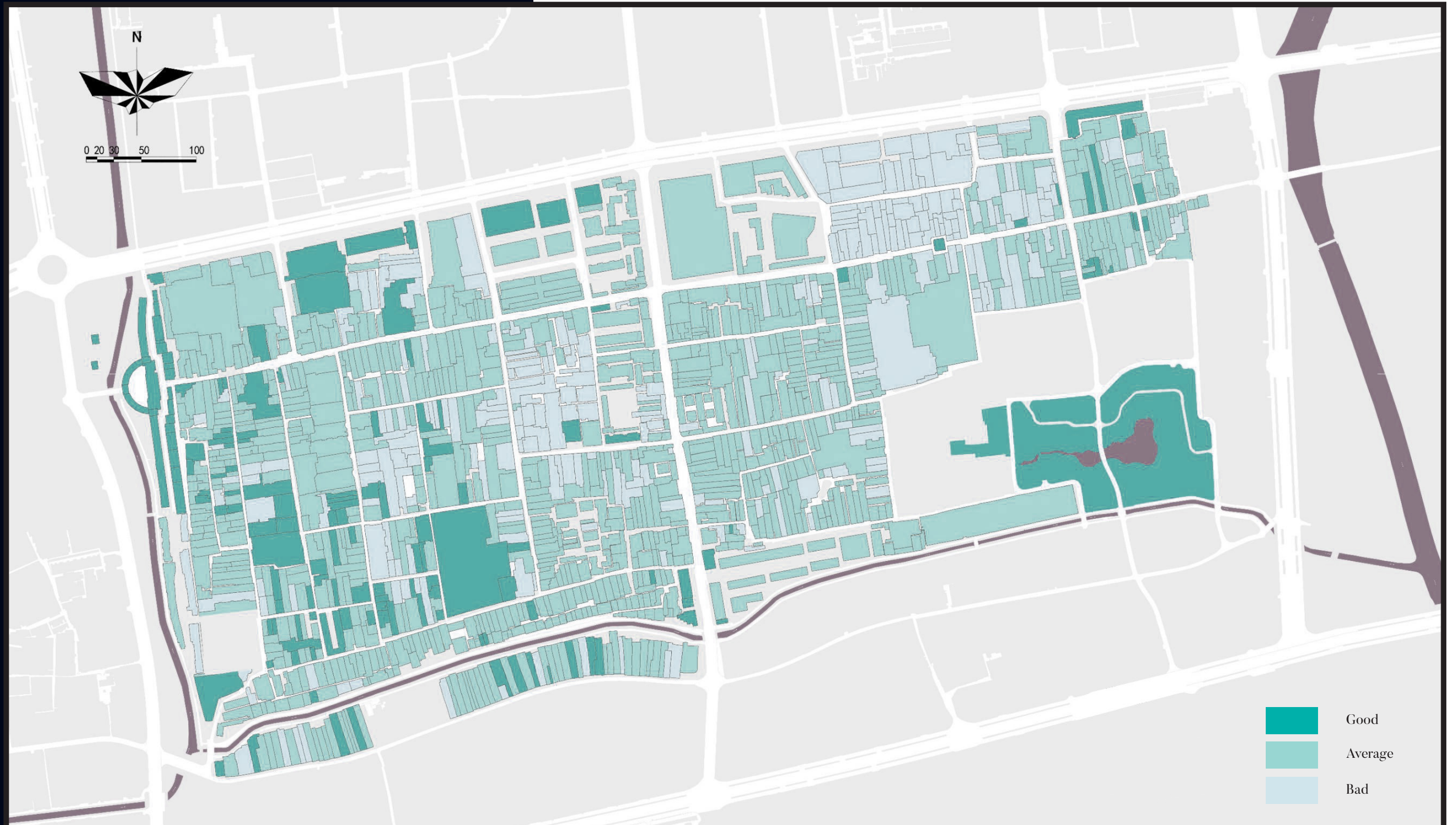


2.7 Architectural Analysis

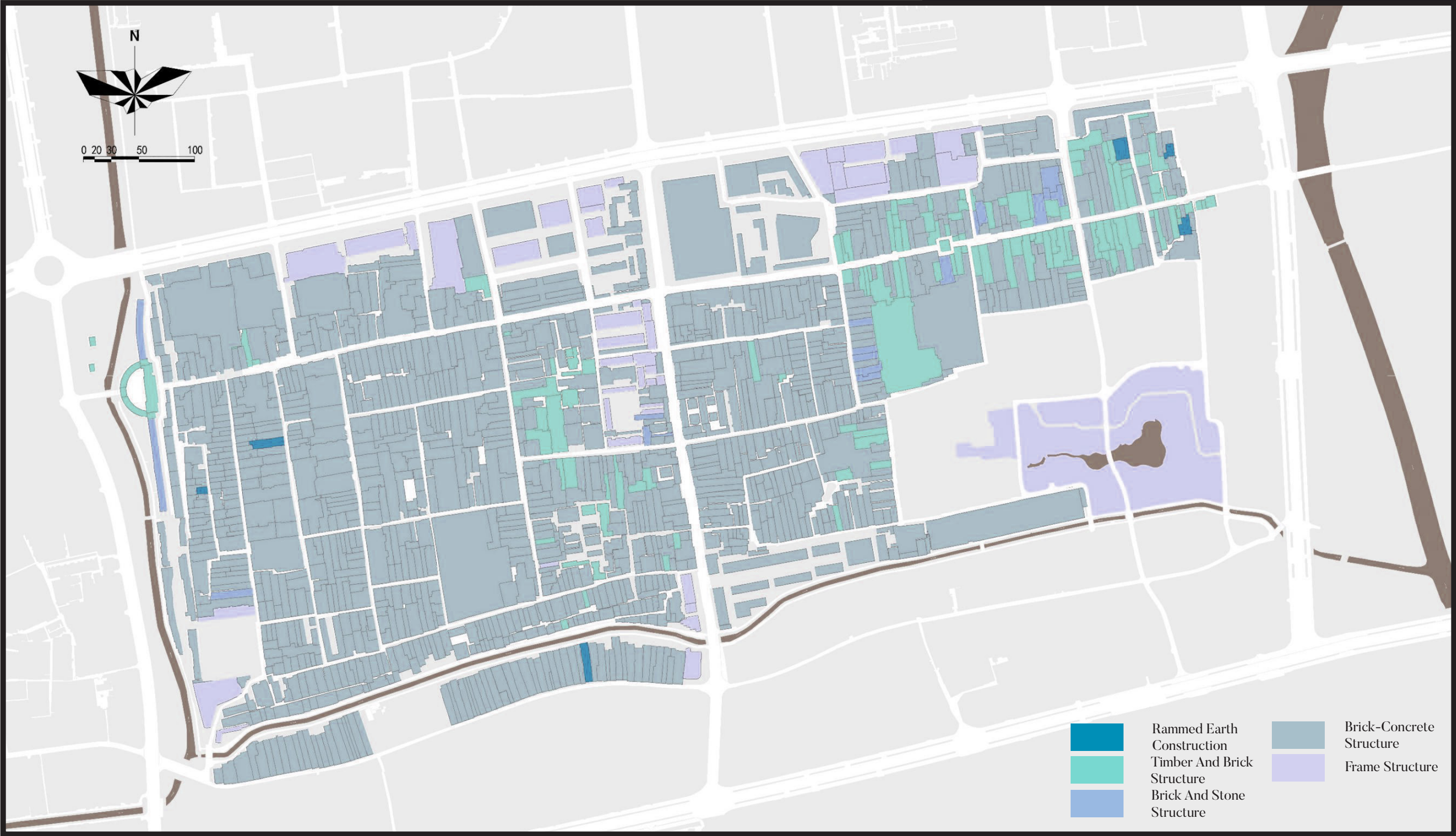
2.7.1 Building Age Analysis

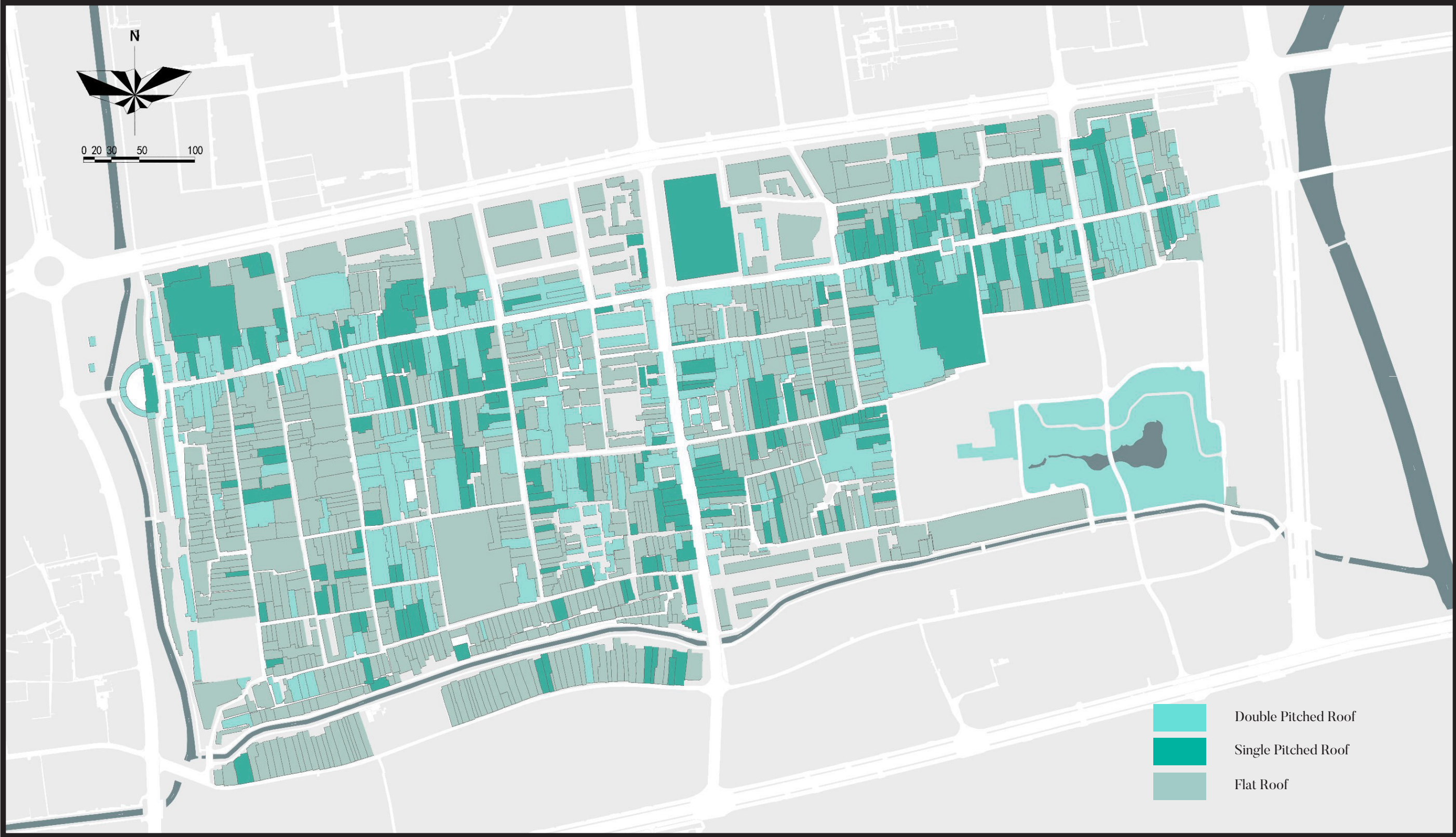


2.7.2 Building Quality Analysis

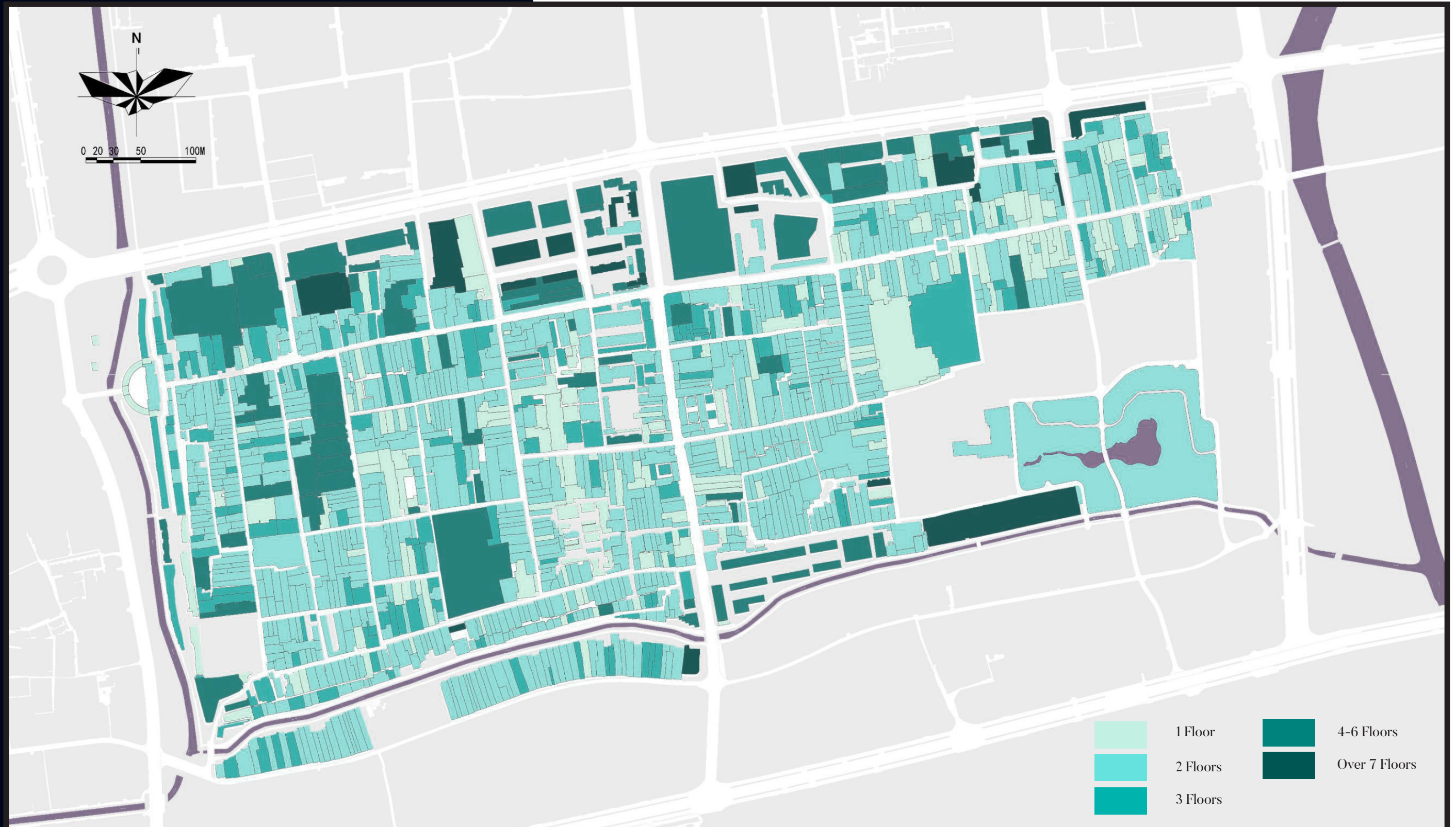


2.7.3 Structural Analysis
Of Buildings





2.7.5 Number Of Floors Analysis



Section 3

CASE STUDIES

Case 1:
Southern Song Imperial Street,
Hangzhou

Case 2:
Dongsi Culture Center,
Beijing

Case 3:
Renovation Design Of Fayuan
Temple Historical And Cultural
Reserve,
Beijing

Case 1: Southern Song Imperial Street, Hangzhou

PROJECT: SOUTHERN SONG IMPERIAL STREET
LOCATION: SHANGCHENG DISTRICT, HANGZHOU,
CHINA
PLANNING: WANG SHU
DESIGN TEAM: HE XINGANG, ZHAO CHANGXIN, FU
QIANG, QIU LIYING
CLIENT: HANGZHOU MUNICIPAL GOVERNMENT
PROJECT TYPE: CITY RENOVATION
STREET LENGTH: 4.2 KM
COMPLETION DATE: 2009.10



3.1 Similarity Analysis
3.1.1 Location And Environment



Location

The Southern Song Imperial Street International Tourism Complex has gathered a large number of buildings in different periods, from the earliest heyday of the Southern Song Dynasty to the Ming and Qing dynasties, from Western-style buildings in the early years of the Republic of China to modern buildings on Zhongshan North Road, from various religious buildings to the home of celebrities and century-old shops that are rich in Hangzhou's local characteristics, which can be called the "Museum of Architectural History".

The area around Luoyang Laocheng District is



Historic Building Node

rich in attractions, history and culture, and is an important tourist destination in Luoyang. The building has a history of more than 800 years since its construction in 1217 AD, and is antique and of great conservation significance and value.

3.1.2 Historical Development
The Southern Song Imperial Street is about 4.3 km long, with Zhongshan Road as the main axis. It was originally the route that the Southern Song emperors had to pass through every three years to perform their heavenly rituals. The first section of the street was the political center of the capital at the time, so it was mainly used for selling high-end luxury goods. The second part of the street was the commercial center of the time. The end formed a scene where commerce and entertainment thrived together, and had the largest entertainment center of the time, Beiwa.

Laocheng District is the only surviving ancient city site in Luoyang, with a history of more than 800 years since the Sui and Tang dynasties. The surviving ancient buildings of the Ming and Qing dynasties are typical examples of the ancient architectural groups of the Central Plains, and the crisscrossing lanes are the urban context of the hutong culture. It is the embodiment of Luoyang's tangible and intangible cultural heritage, so it also has important conservation value and significance.

3.1.3 Neighborhood Characteristics
The Imperial Street, the commercial center of the time, had a boisterous streetscape. The street is

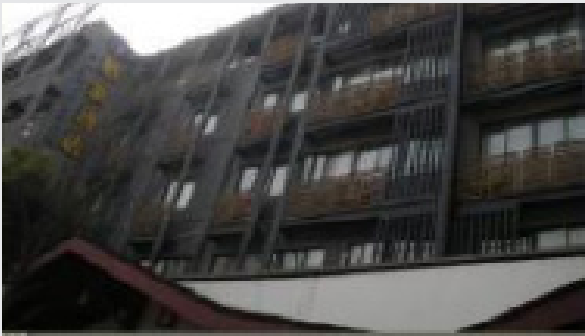


lined with shops and people coming and going to enjoy their leisure time. As a renovation of an old neighborhood, the preservation of the original scene of life is one of the characteristics of the Imperial Street. Today, the Imperial Street can still be seen crowded with people relaxing and shopping here. At the same time, the Imperial Street has the ruins of the Imperial Street from the Southern Song Dynasty, which is of high conservation value and significance. Although Laocheng District of Luoyang has undergone many dynasties, it still retains traces of the Song Dynasty, due to its prominent historical position. The rich historical heritage has been well preserved, which is also one of the important features of the East West Street. During the Sui and Tang dynasties, Laocheng District belonged to the east of Luoyang, which was the more complete center of handicraft production and commodity trade. Production and trade were structured together, and workshops and shops were combined. Therefore, various commercial forms are also one of the characteristics of this area.

3.2 Modification Methods
3.2.1 Function Structure
The overall functions of the Southern Song Imperial Street before the renovation was also mainly commercial function. The proportion of types of business structure is unbalanced, leisure types of business are relatively few, it is difficult to make tourists and citizens stop to leisure. In terms of

brands, there are few foreign brands, and some brands are not well known enough to attract the target consumer groups in the high-end market, and the number of high-end consumption level businesses is insufficient. Reflecting the royal "imperial culture" of the limited number of business types, lack of variety. There are also not enough types of businesses that reflect the leisure culture in the "quality life" of the citizens. In addition, there is a lack of places for education and publicity on the history of Imperial Street and a lack of protection for the ruins. In order to solve the above problems, the Imperial Street has made a great strategy to adjust the overall business type in terms of function - to add leisure and entertainment business types and to recreate the culture of Southern Song "Wasi". At the same time, the introduction of "Chinese and foreign time-honoured" brand, to improve visibility, not in line with the business format north to increase the level of high-end consumption of the business format, to guide the medium-grade, low-grade business format to upgrade, and low-grade business format adjusted to the northern section of Zhongshan Middle Road in the mass consumption area. It also added the "Southern Song Imperial Street Ruins Exhibition Hall" to enhance the publicity and education on the Southern Song ruins.

3.2.2 Architectural Form
The renovation of buildings is divided into four



Architectural Renewal Approach

levels: the demolition of buildings that are severely deteriorated and cannot be repaired or re-used to perform their functions; the preservation of well-preserved buildings of historical value for use as museums of history or to regain their functions; and the removal of parts of buildings that are basically perfect and the renovation of buildings that have been affected as a whole to give them a second life and enable them to resume their functions.

Adding new buildings, improving the whole and injecting new energy. In the renovation of the building façade, under the premise of a unified style, the various types of businesses have their own characteristics. European, Indian, modern and other elements are unified under the Chinese style. It gives it a sense of “repairing the old as the old”. In the facade components, the use of louvers, copper coin ornaments, canopies, etc., the use of wood, brick and concrete materials, the use of natural colors or similar colors to unify the facade, which made it in the modern atmosphere, but also unified in the Chinese style.

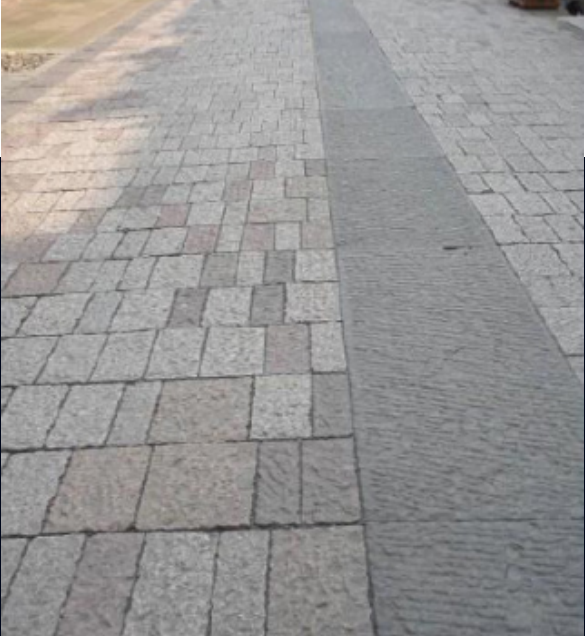
3.2.3 Landscape Environment

The road is model-led on the Imperial Street of the Southern Song Dynasty, with a scale suitable for pedestrians. The material is made of Xiang Gao bricks, shrimp red roadway slabs and Chinese black roadway slabs. In the water feature system, the water from the Zhonghe River is drawn to the inlet of the Gulou Building, flowing through 13

water features ponds, and finally discharged into the Zhonghe River through a concealed pipe from the outlet of West Lake Avenue, forming a cycle. The water surface along the street is filled with various aquatic flowers and plants, such as lotus flowers, which add greenery to the neighborhood.

3.2.4 Spatial Composition

Imperial Street makes full use of vertical and horizontal public and semi-public spaces to develop medium and high-end leisure and entertainment businesses. Horizontally, it focuses on making good use of public spaces such as waterways, side roads in front of shops, and alleyways and lanes that will be transformed into semi-public leisure and consumption spaces in the future. In the open-air and semi-open-air form, it introduces leisure businesses such as water bar, coffee and cafe, extending leisure space and time for tourists and expanding leisure consumption; vertically, the private space on the second and third floors will be transformed into semi-public space for leisure and business operations. In addition, in a way to reflect Chinese and foreign cultural characteristics and the characteristics of the “imperial street culture”, Chinese and foreign drama, juggling, storytelling and other forms of entertainment performances will be introduced to carry out dynamic, sound, experiential consumption activities, so that the imperial street up and live.



Landscape Element



PROJECT: DONGSI CULTURE CENTER – 77 COURTYARD RENOVATION PROJECT
LOCATION: 77COURTYARD, DONGSI SITIAO, BEIJING
DESIGN COMPANY: MARCH URBAN ART CENTRE
PRODUCER: JEFFREY ZHANG
PLANNING AND PUBLIC ART: DR. JACK TIAN
DESIGN PRINCIPLE: RIK . ZOUOLIU JING
DESIGN TEAM: HE XINGANG, ZHAO CHANGXIN, FU QIANG, QIU LIYING
CLIENT: CAPITAL URBANIZATION GROUP
PROJECT TYPE: CITY RENOVATION
SITE AREA: 1023 SQM
DESIGN PERIOD: 2017.9-2017.12
COMPLETION DATE:2018.10
PHOTOGRAPHER: JIN WEIQI

Case 2:
Dongsi Culture Center,
Beijing



3.2.1 Introduction

Dongsi Culture Center (No.77 Dongsi Hutong) is located at No.77, Dongsi Road, Dongcheng District, Beijing. The block where No.77 Dongsi Hutong is located is also one of the historical and cultural reserves in Beijing. The government hopes that these historical and cultural reserves can inherit the history and guide the surrounding areas to start the protection of historical buildings. At the same time, the government hopes that the renovation project can improve the previous living environment and create better living conditions for the residents.

3.2.2 Functions Of Dongsi Culture Center

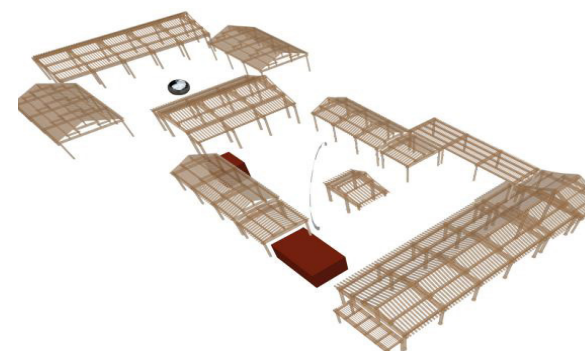
The designers hope to integrate the idea of protecting traditional architecture and inheriting culture into people's lives through their renovation design and make the building become a bridge to transmit spiritual culture to residents. They reconsidered and designed the function and architectural form of the building, and renovated the original Chinese traditional courtyard into a center of culture. The renovated Dongsi Culture Center will serve as a space for the cultural experience. People can come here to study and visit at any time. At the same time, people can also enjoy various cultural activities provided by the culture center, which will greatly enrich people's lives and learn more cultural knowledge.

There are mirrors and water inside the courtyard, which greatly increases the courtyard space from the visual effect so that people can feel the open space after entering the court-



1. Entrance; 2. Multimedia Display; 3. Tiling array; 4. Chuihua Gate; 5. Step; 6. Dongsi Street Model; 7. Cultural visit road; 8. Hutong Antique Showroom; 9. Cultural Exchanging Centre; 10. Dongsi Future Planning Blueprint; 11. Dongsi New Lifestyle; 12. Dongsi New lifestyle Showroom; 13. Traditional&New Culture Film; 14. Souvenir Shop; 15. Reception Hall(7P); 16. Lecture Hall(48P); 17. Meeting Room(17P); 18. Private Room(14P); 19. Storage; 20. Kitchen; 21. Washroom; 22. Office

yard. The first courtyard has an "Impression of Tile Houses" exhibition area. People can enter the second courtyard from the first courtyard through a pendant flower door in the Qing style. In the second courtyard, there is a cultural exhibition area of west wing-rooms,



which tells people about the history of the surrounding area. There are also many exquisite designs about modern art in the culture center. The designers placed these public art exhibits in courtyards to attract people to visit. The design of these public art exhibits is also integrated into traditional Chinese culture. The design is very clever and enlivens the whole courtyard space.

3.2.3 Similarities Between Dongsi Culture Center And Our Design

3.2.3.1 geographical position

Like the site selected in our design, the No.77 courtyard of Dongsi Hutong is located in the historical block of the city, surrounded by many historical buildings. These buildings contain the historical culture and memory of this area.

3.2.3.2 History And Culture

Dongsi Hutong has a long history, just like our chosen site. Dongsi Hutong was a commercial street in the Yuan Dynasty. However, Laocheng District had a preliminary scale in the Western Zhou Dynasty, and most of the existing buildings are from the Ming and Qing Dynasties. To some extent, They witness history. Through these buildings, people can understand the long history of China for thousands of years, and the living habits and customs characteristics of people in the historical period, which is very helpful for us to protect other historical buildings in the future.

3.2.3.3 Architectural Features

Such courtyards have a history of at least 3000 years, and there are many types in China. The layout of the Chinese traditional courtyard is a

courtyard in the middle, and the house is built around the courtyard. Its typical characteristics are very regular appearance, generally square, courtyard symmetry. The combination forms of courtyards can be flexibly changed according to different needs. The connection between the rooms depends on the corridor outside the house. This kind of design makes it very convenient for people to go back and forth in these courtyards even when it's raining and snowing. However, with the improvement of living standards, traditional courtyards are no longer suitable for people's daily lifestyle, so many people choose to move out of these traditional courtyards.

3.2.4 The Influence Of Dongsi Culture Center

Our life is now in the transition stage, the public is aware of the importance of protecting historical buildings, and the government proposes to build a city with culture as the carrier. The establishment of the Dongsi culture center attracts a lot of tourists, which enriches the economic activities of the region. At the same time, the establishment of the Dongsi culture center promotes the vitality of surrounding courtyards and areas, enriches people's daily life, and makes the surrounding economy have a relative improvement. From this case, we can find some experiences that we can learn from in the future:

1. The renovation project will become the center and guide the surrounding areas to attract other industries to join.
2. The renovation project will change people's previous impressions of the historical block. People have the opportunity to re-understand the region and its regional culture and get some memory points about traditional culture.
3. Such renovation projects can not only guide the renovation process of the surrounding areas but also further bring vitality to the whole culture. People can make some cultural peripheral products through these cultures and their derived cultures so that the regional culture can accompany people's daily life, which would strengthen the construction of the city image.

Case 3:

Renovation Design Of

Fayuan Temple Historical

And Cultural Reserve,

Beijing

PROJECT: RENOVATION DESIGN OF FAYUAN TEM-
PLE HISTORICAL AND CULTURAL RESERVE
LOCATION: NO.7 FAYUAN TEMPLE FRONT STREET,
XICHENG DISTRICT, BEIJING
DESIGN COMPANY: BEIJING XUANFANG DADE
REAL ESTATE INVESTMENT CO., LTD., ISA YIXIA IN-
TERNATIONAL DESIGN GROUP, GERMANY
PROJECT TYPE: URBAN REGENERATION
DESIGN DATE: 2019



3.3.1 Introduction

Located in Xicheng District, Beijing, the Fayuan Temple's historical and cultural reserve covers an area of 21.50 hectares. In addition to religious areas, the reserve is mainly residential areas. The historical reserve has a profound cultural heritage. After the Beijing municipal government work report put forward the idea of "symbiotic courtyard" in 2019, designers began to explore urban regeneration in the historical reserve and committed to injecting new blood into the historical block.

Temple historical and cultural reserve, surrounded by traditional historical buildings. It includes some buildings for public use, such as Fayuan temple, China Islamic college, the former site of Tangminzhong Temple, etc. There are many similar public historical buildings around our site, such as Drum Tower, the former home of Li Zhanbiao, etc.

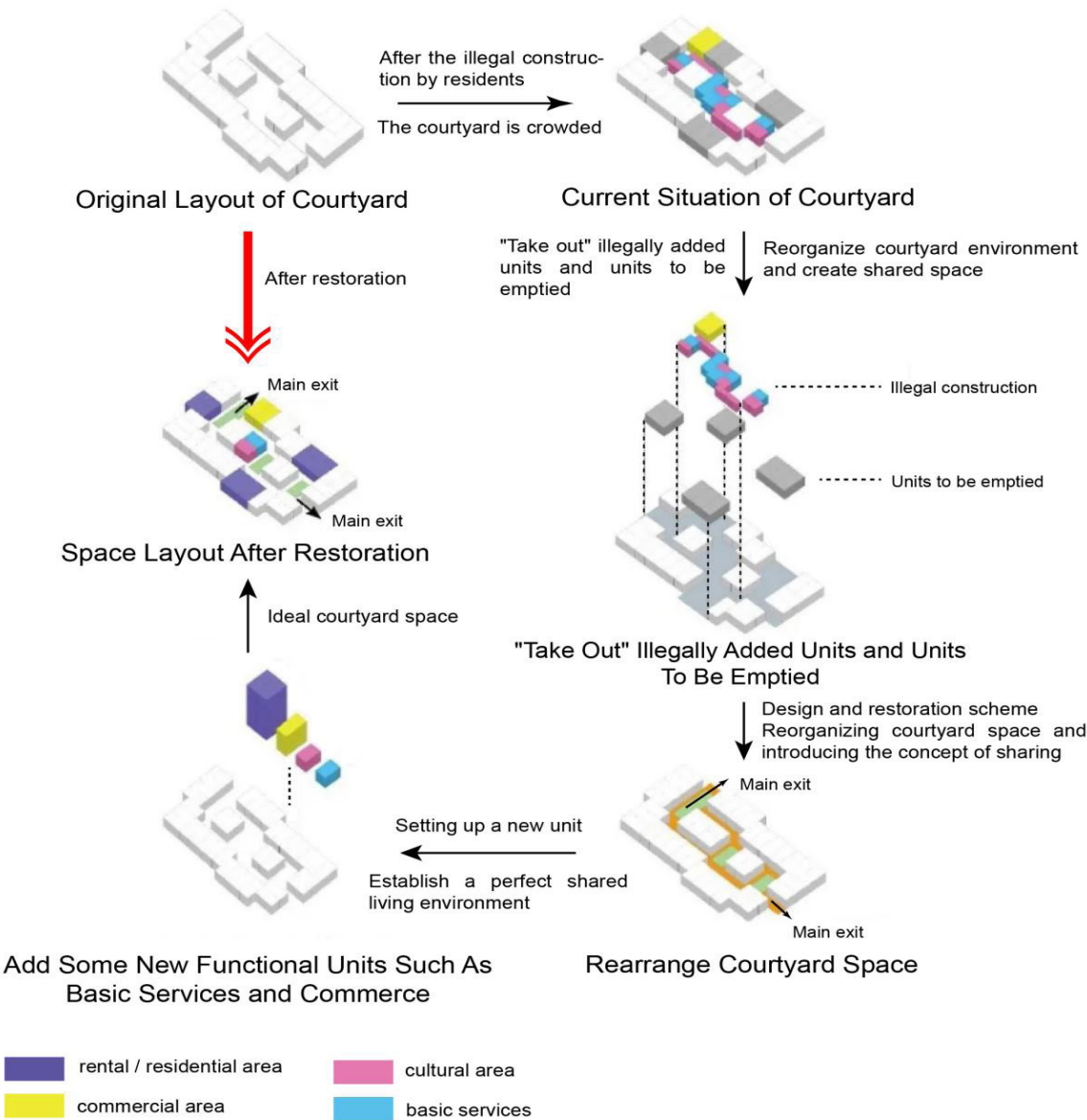
3.3.2 History And Culture

The project is located in the historical and cultural block of the Fayuan temple, which was built in the Tang Dynasty. The block reflects the common people's culture in Xuannan culture. There are various historical buildings with Xuannan cultural characteristics in the reserve. These buildings witness the history of Beijing city and are a minia-

3.3.2 Site Analysis

3.3.2.1 Geographical Position

The renovation project is located in the Fayuan



ture of social changes. The site of our renovation design has been established since the Western Zhou Dynasty, retaining the urban layout of the Sui and Tang Dynasties, and also has the historical heritage of Heluo culture. It also witnesses the change of the city.

3.3.2.3 Existing Problems

There are some problems in the Fayuan Temple historical block as well as in our selected block. For example, most of the buildings are in an empty state and there is little communication between people. What's more, there are many illegal buildings, fewer vegetation areas, and a poor living environment in the reserve.

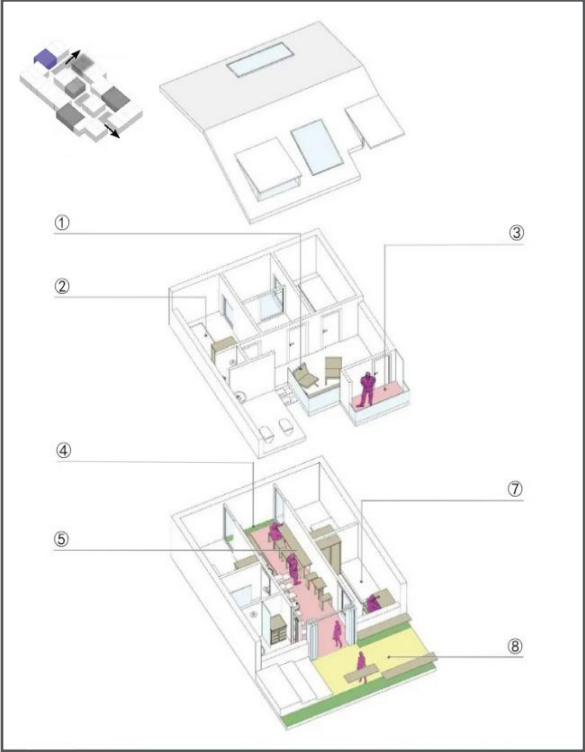
3.3.3 Courtyard Design

Based on this situation, the designer designed a scheme for the reserve.

The project is divided into several functional modules, taking the following three functional modules as an example

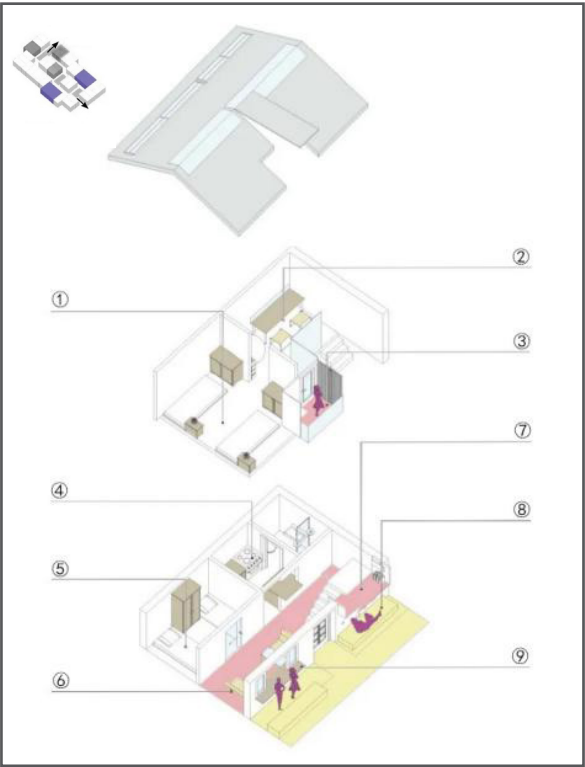
Shared architecture

Transformation module 1: Youth Hostel -- Young people constantly inject new vitality into the block.

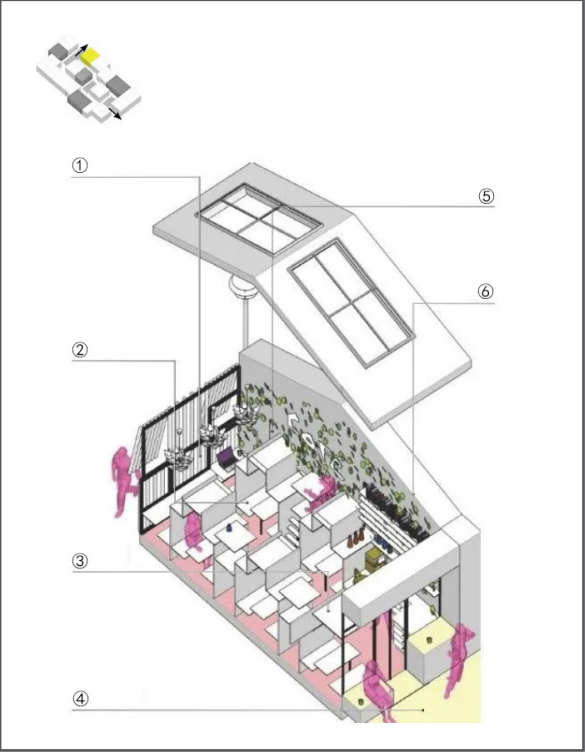


①reading area ②bedroom ③balcony ④vertical indoor garden
⑤bedroom ⑥bedroom ⑦leisure area

Transformation module 2: long term rental apartments - Rental apartments for young people



①bedroom②bedroom③balcony④kitchen⑤bedroom⑥living room⑦reading area⑧leisure area⑨bar



①landscape area②booth③booth④entrance of leisure area⑤leisure area⑥bar

Transformation module 3: the commercial space - Combination of daily life scenes and experiential tourism products.

3.3.4 Influence Of Renovation Project Of Fayuan Temple Historical And Cultural District

In today's society in China, due to the improvement of people's living standards, we are very willing to go out and travel in the rest time. This phenomenon has given birth to the development of some youth hostels and hotel industries. With the explosive information received in the new century, people began to favor some Hotels with a sense of design in neighboring countries, such as Japan and South Korea. This kind of hotel contains a lot of local elements, and its design form and idea are different from the high-rise residential buildings that people usually live in. Therefore, a large number of tourists choose to experience and take photos in such similar hotels.

The module forms of youth hostels, long-term rental apartments, and commercial spaces attract tourists into the historical and cultural block and makes people stay in the historical block for a long time. It would provide a lot of opportunities for the region to generate some economic activities, thus driving the economic development of the reserve.

Therefore, we can learn from the experience of the project in the later renovation design. Combination of daily life scenes and experiential tourism products.

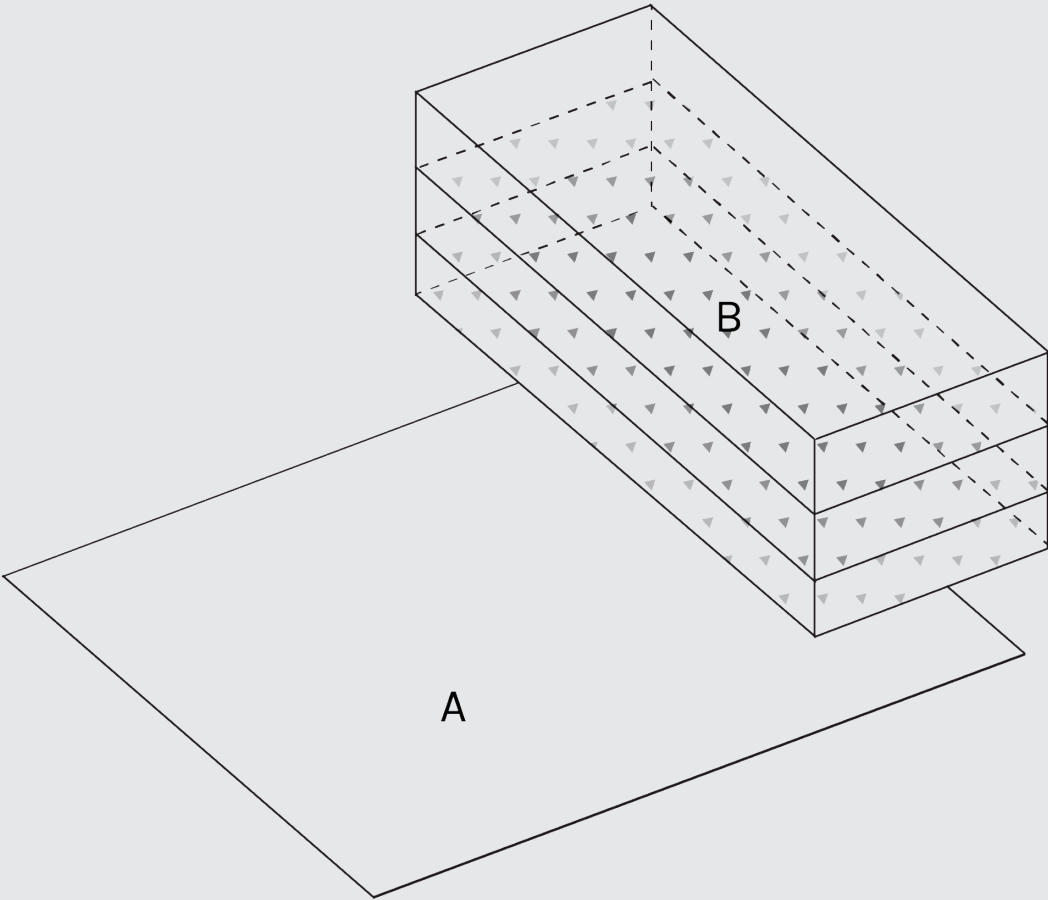
Section 4

GUIDELINES FOR URBAN DESIGN

- Guidelines for Urban Planning
- The Classes of Roads
- The Classes of Open Space
- Guidelines for Architecture Design
- Guidelines for Functions

4.1 Guidelines for Urban Planning

4.1.1 Floor Area Ratio



$$\boxed{A} \times 2 \geq \boxed{B}$$

The floor area ratio of most areas of our block is less than 2. In the urban regeneration design, we could continue to use the floor area ratio.

The total construction area shall not exceed the land area multiplied by 2.

$$A \times 2 \geq B$$

4.1.2 Green Area Ratio

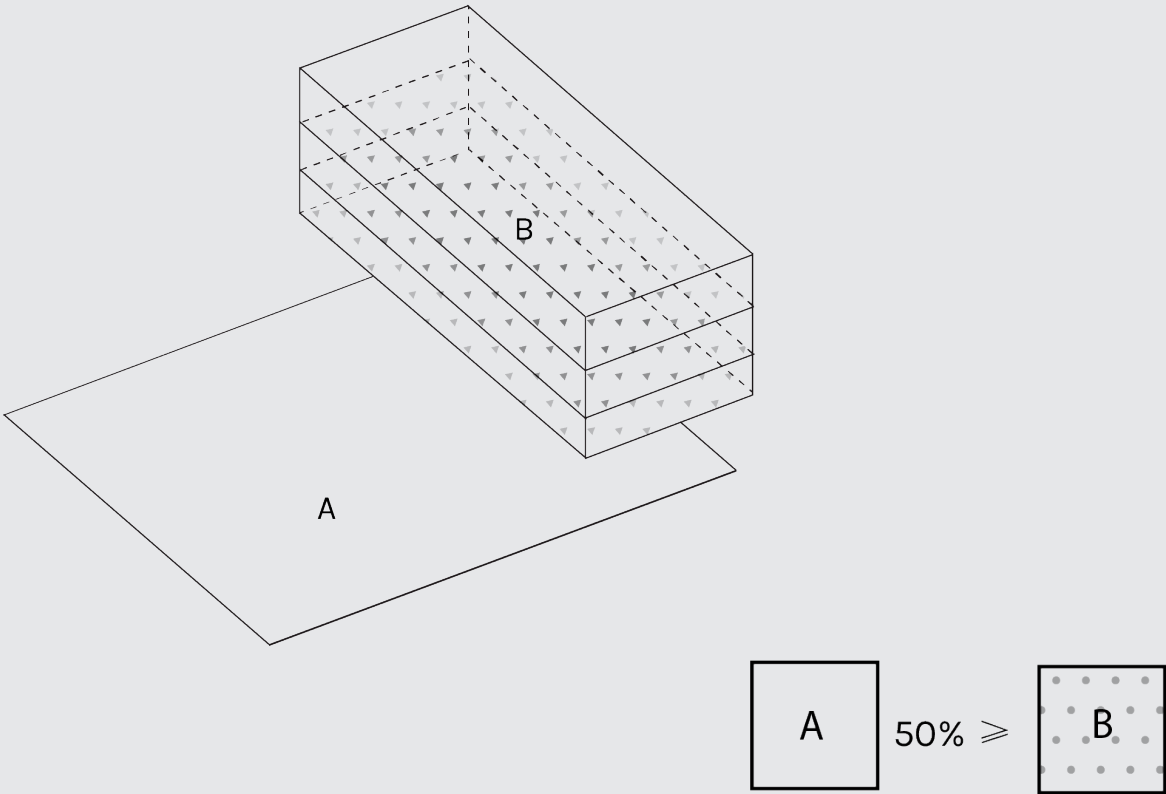
In the previous green space distribution analysis, we can find that the green space of the block is very small and the green area ratio is very low. Therefore, in future design, we will greatly increase the area of green space and improve the green area ratio. For this rule, the total area of all kinds of green space is more than 20% of the total area of the land.

$$A \times 20\% < B$$

4.1.3 Cover Area Ratio

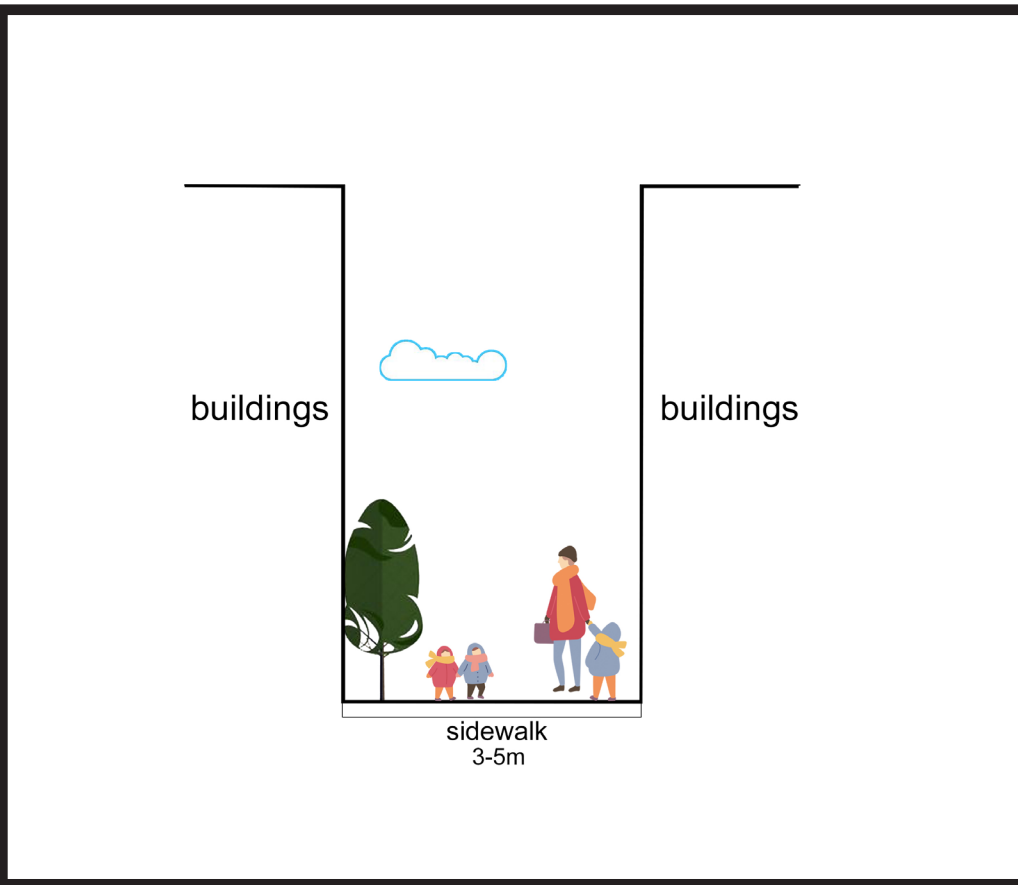
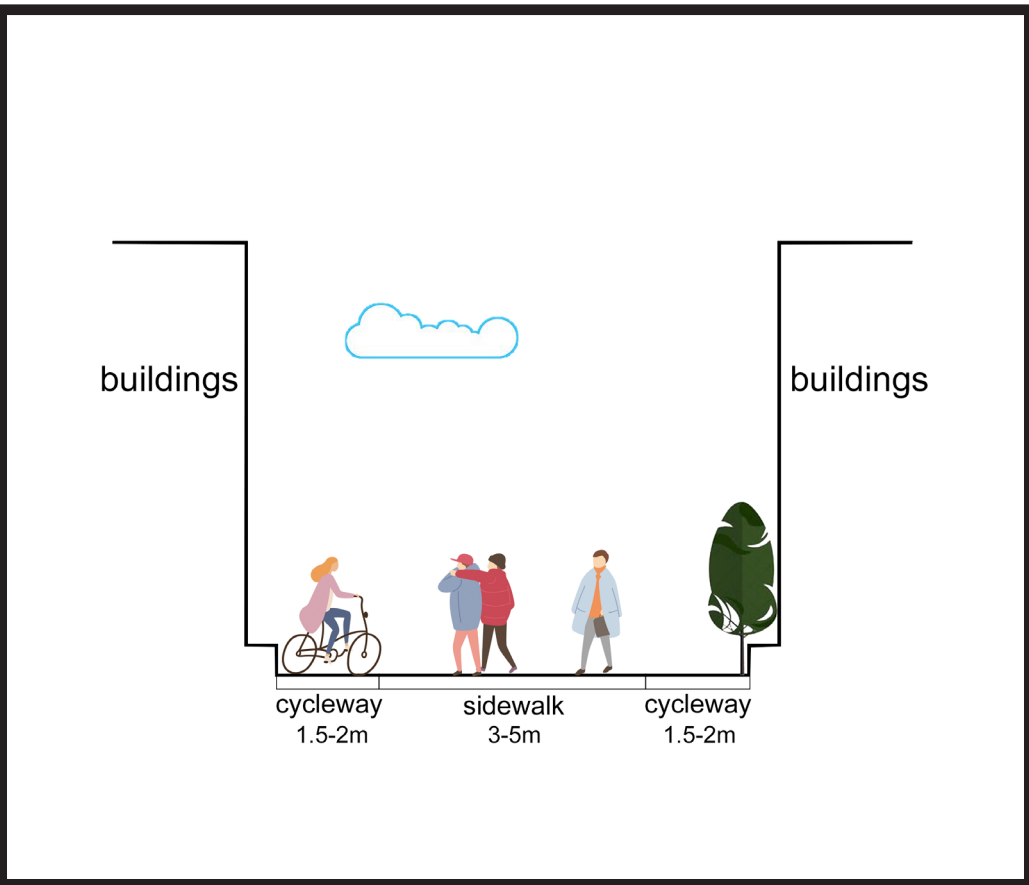
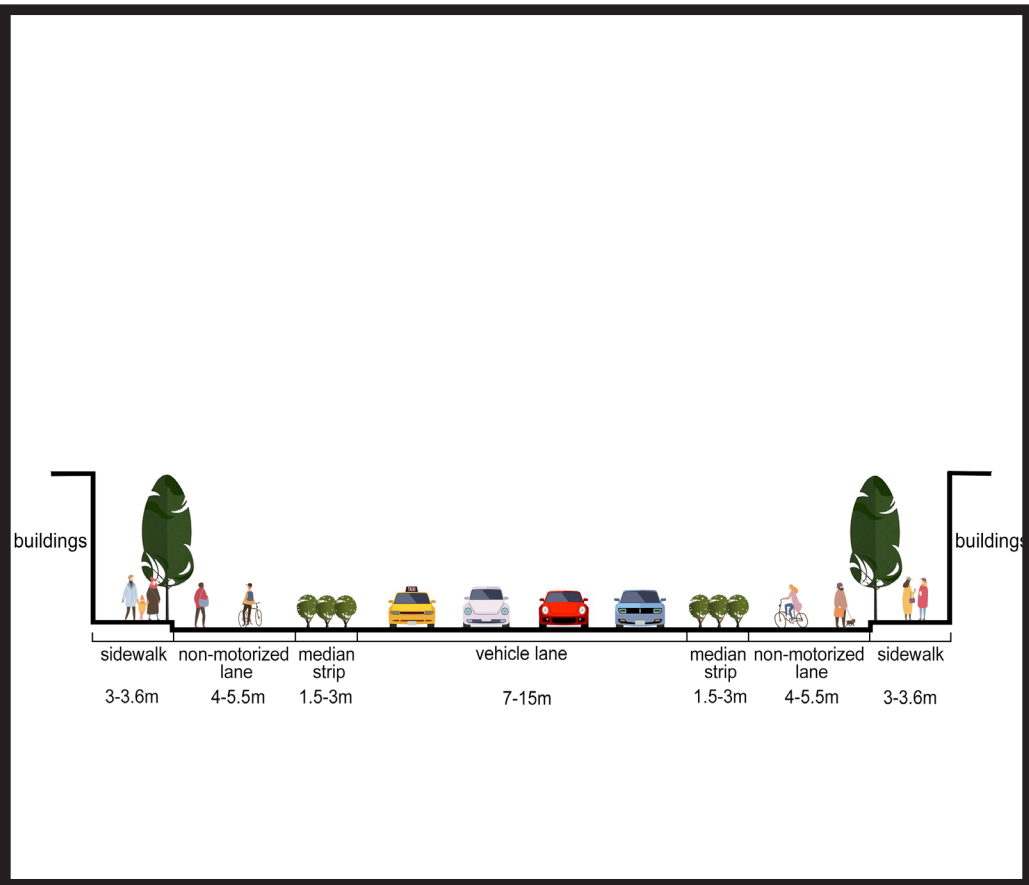
The cover area ratios of the block are mostly concentrated in 52.5-84.7%. In such a cover area ratio, people will feel depressed and have a poor sense of use. We make a rule about the cover area ratio. The building area is less than or equal to 50% of the total land area.

$$A \times 50\% \geq B$$



4.2 The Classes of Roads

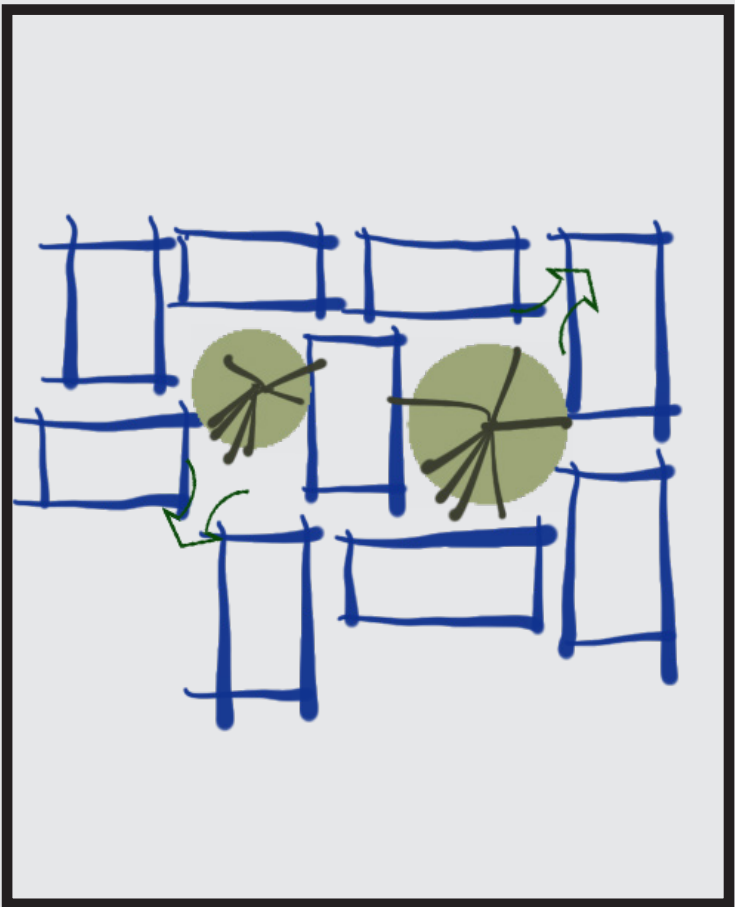
We divide roads into three classes: the main road, the secondary road, and the sidewalk. In the future design, we will continue to use this classification method.



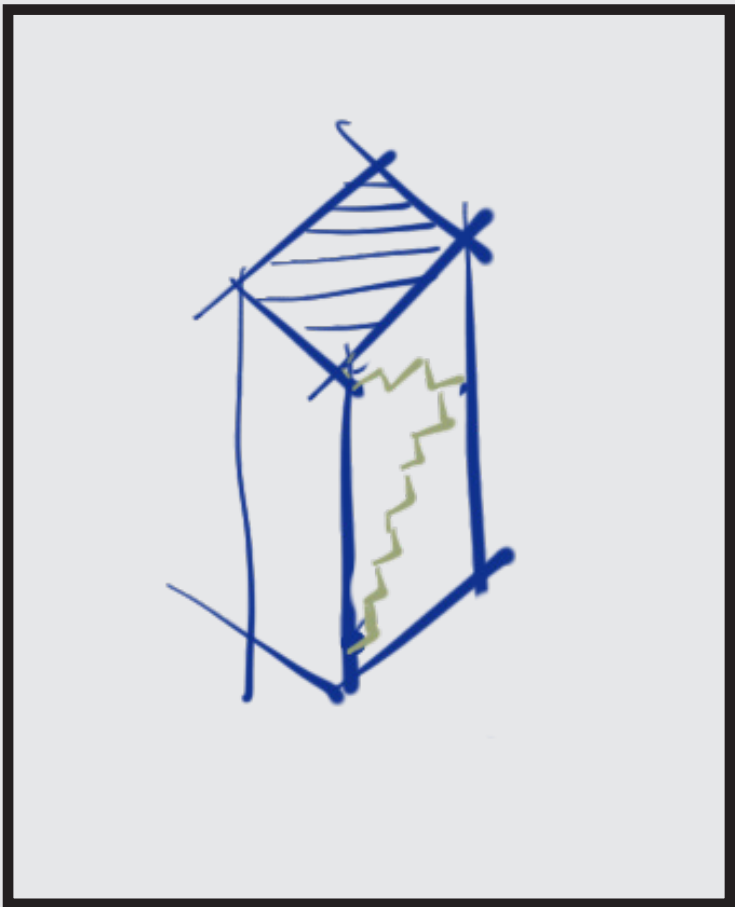
4.3 The Classes of Open Space



1st Level: The open space leading to the road



2nd Level: The open space inside the block



3rd Level: The open space on the roof

Privacy Level



Public

Privacy

Accessibility

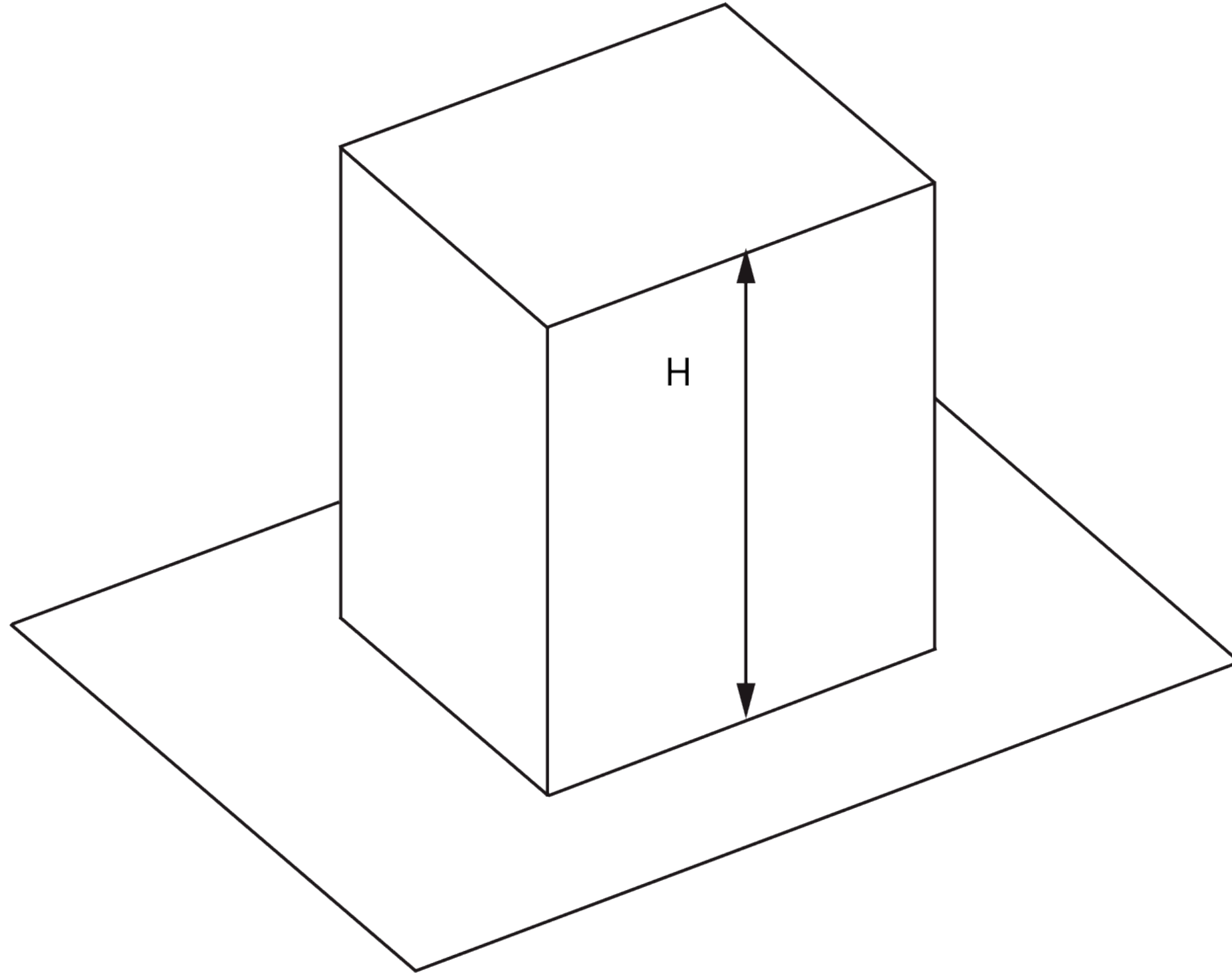


High

Low

4.4 Guidelines for Architecture Design

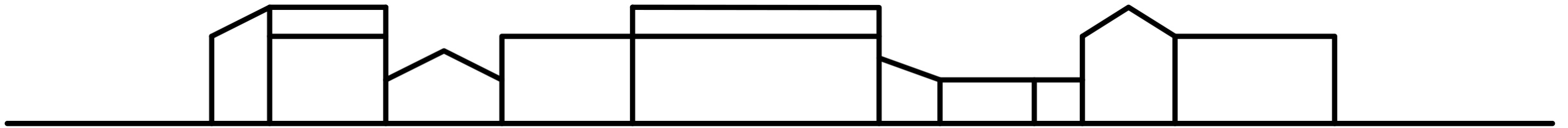
4.4.1 The Number Of Floors



We find that most buildings have no more than four floors. In the subsequent design, the number of floors will not exceed 4.

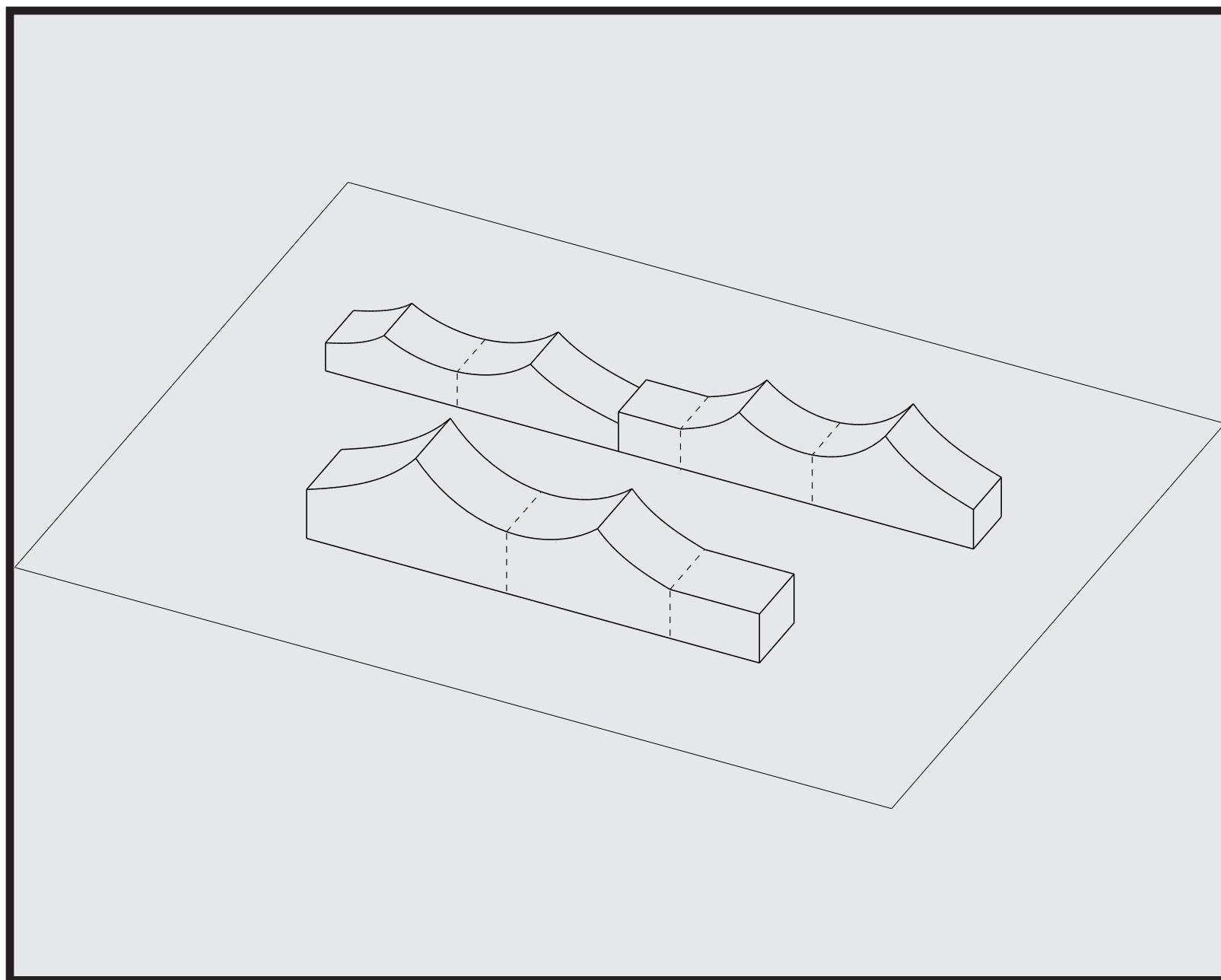
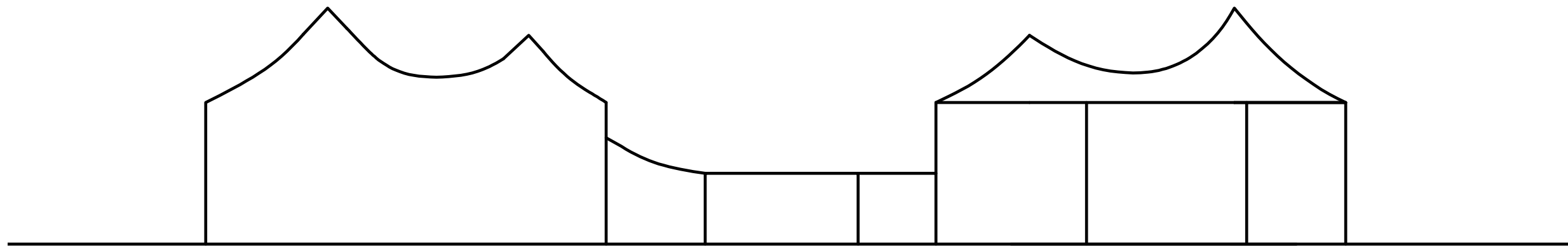
$H \leq 4$ floors

4.4.2.1 The Forms Of Roofs In The Original Buildings



The roof forms in the block include flat roofs, single pitched roofs, and double pitched roofs. We will retain the combination form of such roofs in the design, to protect the characteristics of the architectural form in the block.

4.4.2.2 The Forms Of Roofs In The New Buildings



In our block, the roof forms of the buildings are mainly pitched roofs and flat roofs. Therefore, in the following urban regeneration design, the roof design will retain these forms. We will make some small changes to the pitched roofs. Some roofs of the new buildings will take the form of a curved pitched roof. The curved pitched roof symbolizes the Mang Mountain¹, which gives the block historical and cultural significance. At the same time, the curved pitched roof makes the urban regeneration design have its architectural language, which is the symbol of the original urban texture gradually updated to the form of modern architecture.

¹Mang Mountain: it is located in the north of Luoyang City, Henan Province. It is a strategic place in military affairs. Many emperors and celebrities were buried here.

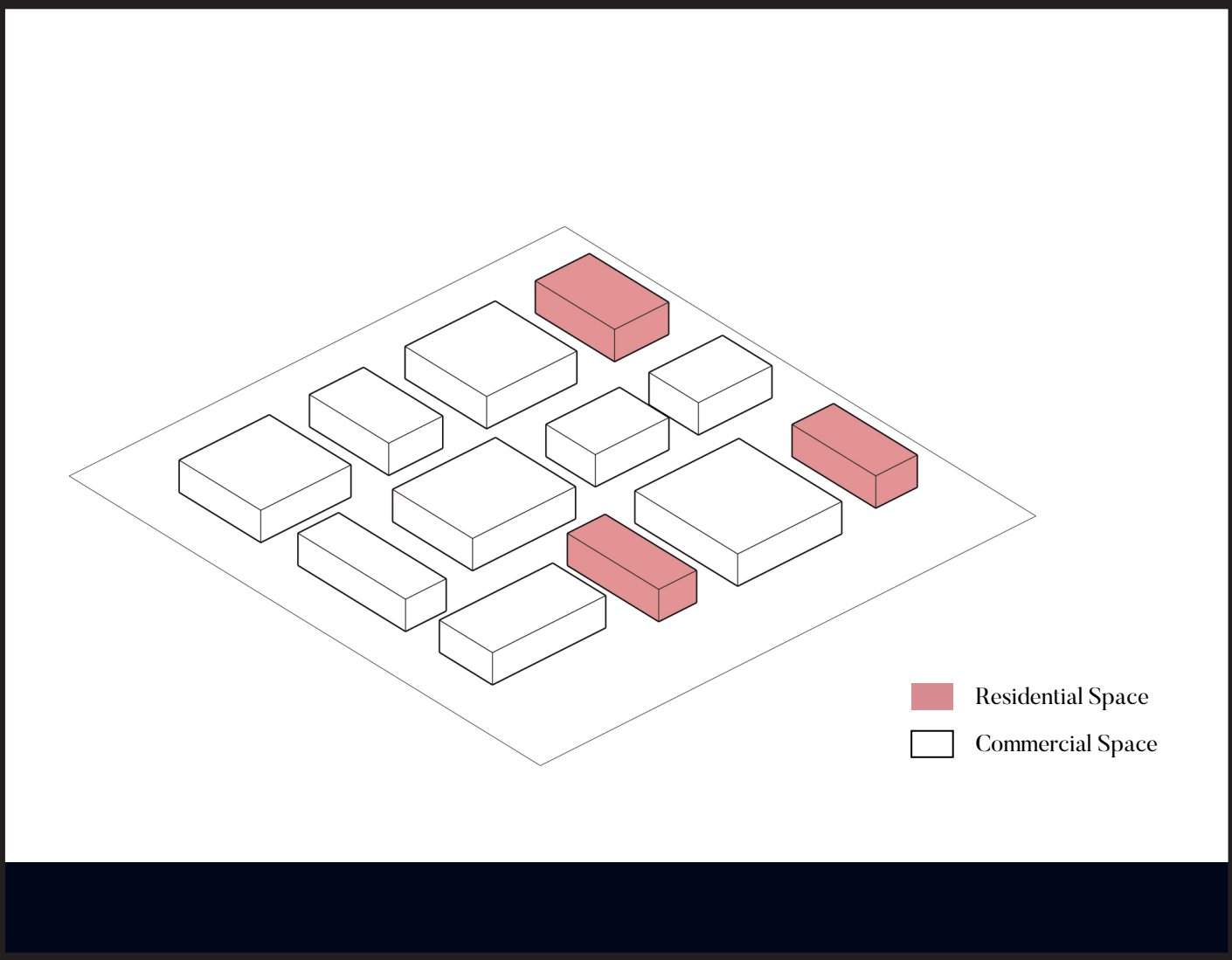
4.4.3 Materials And Colors

The buildings in the block are mainly made of red bricks and grey bricks. In the later design, we can retain such architectural colors and combine them with other appropriate colors. In terms of materials, we will also adopt a combination of traditional materials and new materials. This approach is to retain the characteristics of the historical block while injecting new vitality into the historical block.



4.5 Guidelines for Functions

The building functions in our block is mainly residential function, only commercial space is distributed along the main street. We hope that after the renovation, in addition to the residential space and commercial space, some green space and public space can be set up for people to use in the block, which could activate the area and let people have a good life/tour experience in this area.



Section 5

URBAN REGENERATION DESIGN

Neurobionic City

Design Specifications

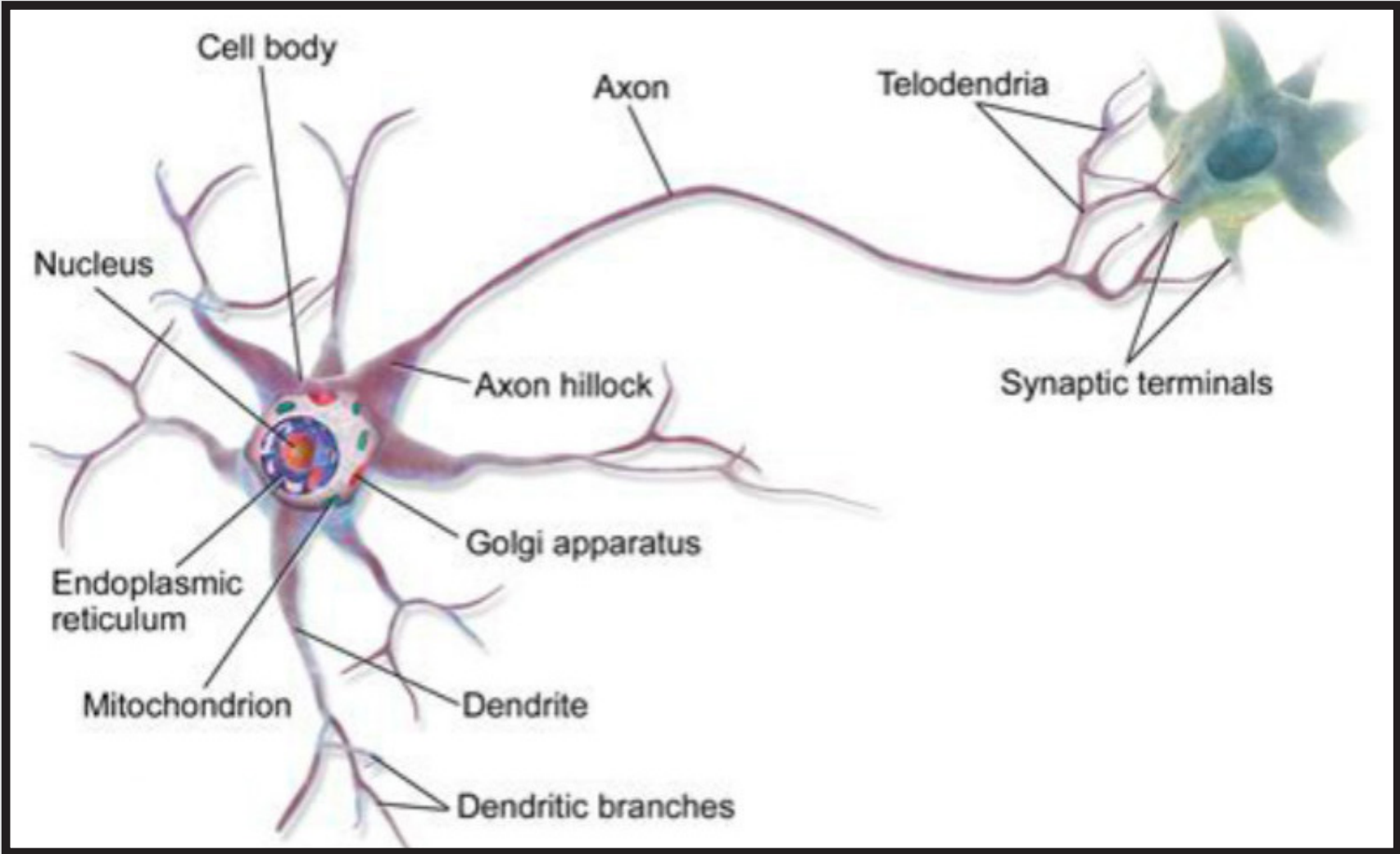
Master Plan

Axonometric Drawing



5.1 Neurobionic City

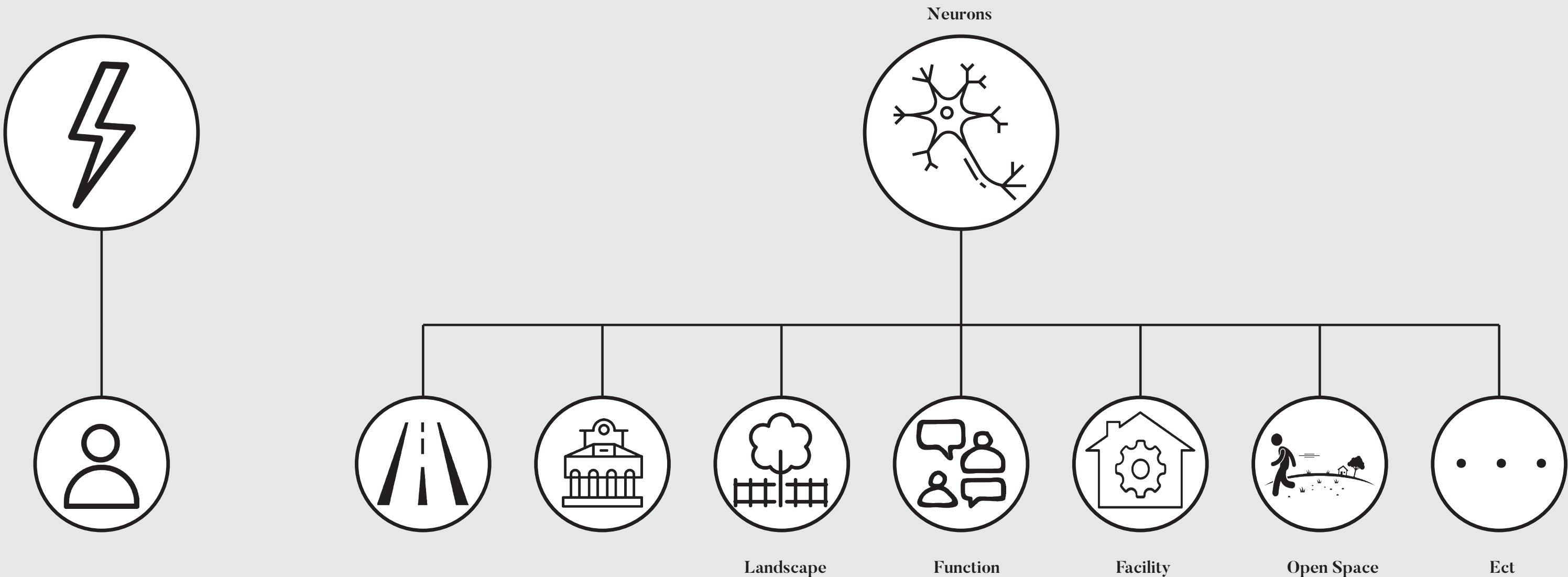
5.1.1 Neurons



Neurons are the most basic structural and functional units of the nervous system. It is divided into two parts: the cell body and protuberance. The cell body is composed of a nucleus, cell membrane, and cytoplasm, which can connect and integrate input information and transmit information. There are two kinds of protuberances: dendrites and axons. The function of dendrites is to receive the impulses from the axons of other neurons and transmit them to the cell body. The function of the axon is to receive external stimulation and then transmit from the cell body.

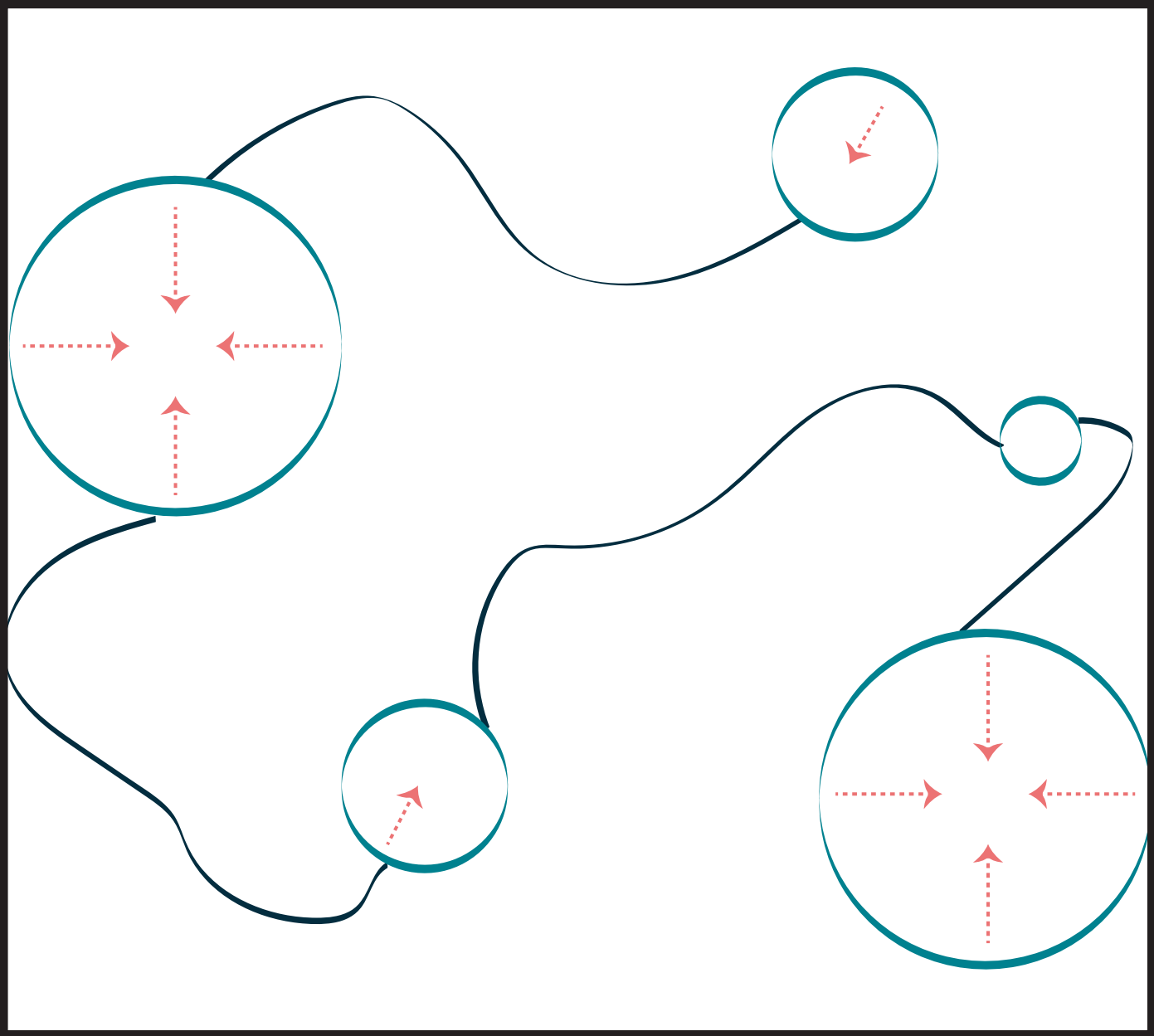
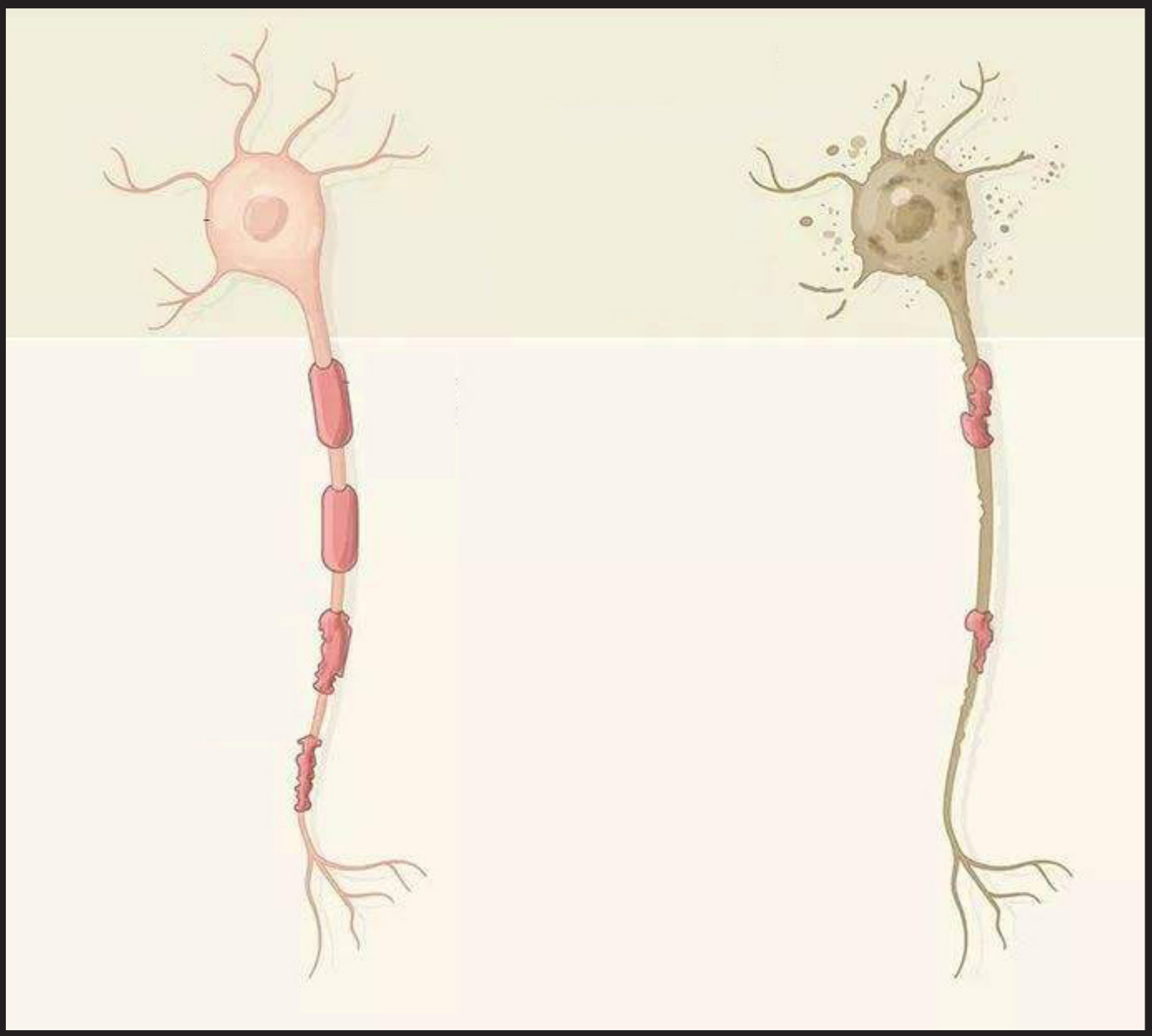
5.1.2 Nerves In The City

In our city, public space and other important space are like neurons carrying the communication between people, and inputting and outputting various kinds of information. The activities of people are like nerve impulses. They transmit information and stimulate other spaces to cause "excitement". In this way, it will affect the development of the whole city and promote the common progress of people and the city.



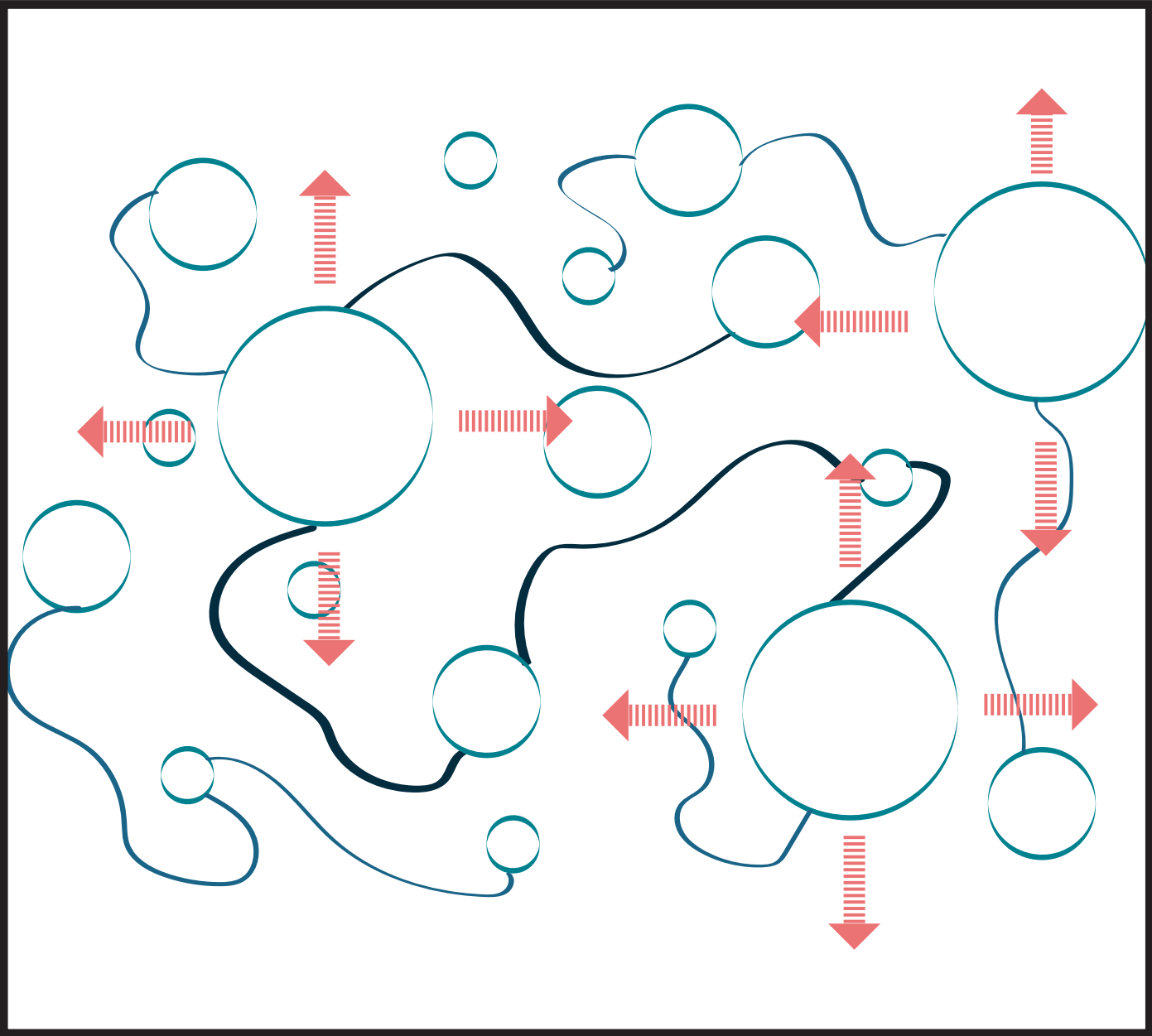
5.1.2 Nerves In The Past

In our selected block, public space, landscape space, and green space are little, and there is no place and opportunities for people to communicate with each other. It's like the body has fewer neurons and the body no longer generates and transmits nerve impulses. Therefore, the stimulation cannot be transmitted to the central nervous system, and there is no sensation or movement at this time. However, when there is not enough public space in our city and there is no information exchange and transmission, the city will not only lose its vitality but also "shrink" the neural network of the whole city.



5.1.2 Nerves In The Future

We look forward to providing more public space, landscape space, and green space for people’s activities and communication in future design. This way can accelerate the stimulation and expansion of the city’s “neural network” and cause the city “excited”, which could make the whole city active and energetic.



5.2 Design Specifications

Our urban design is mainly based on urban guidelines and the concept of the neurobionic city.

In our urban design, we retain some unique characteristics of the block. The facade continues to use red and grey bricks and the form of the facade is a combination of flat roofs and pitched roofs. Then we also use some new materials such as glass and concrete to meet the needs of people's modern life. To be able to echo with the Mang Mountain and form the unique architectural form and style of the test zone, we have made some small changes to the pitched roofs of some buildings-the original pitched roofs become curved pitched roofs.

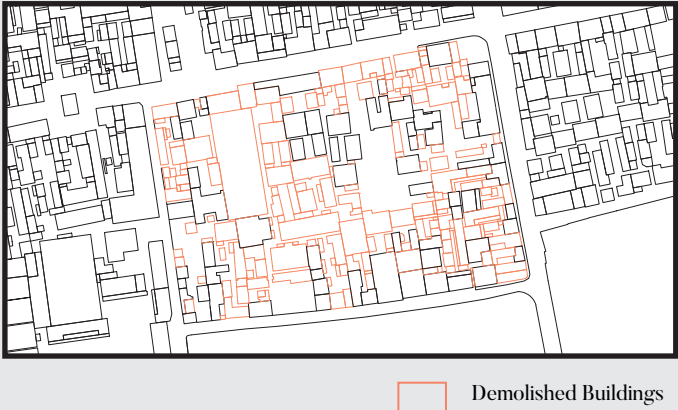
According to the original architectural texture of the building in the test zone, we demolished some buildings built without permission and some buildings with a bad impact on the living environment of residents. What's more, because of the requirements of the cover area ratio and the floor area ratio in urban design guidelines, the number of floors and the floor area are controlled. The original green rate in the test zone is very low. In terms of the urban design guidelines, in addition to planting trees along the street, we also provide some space in the test zone area as green space and plant a lot of vegetation between the courtyards and inside the courtyard, which provides a good and comfortable natural environment. People can get in touch with nature in their spare time. In the design concept, the open space in our urban regeneration design acts as a neuron in the neurobionic city, providing a place where people can communicate. People, on the other hand, act as nerve impulses. They transmit different

messages and connect various spaces every day. People also stimulate the whole block, make the block more dynamic, and further stimulate the neurobionic city. After our earlier analysis, we found that except for some shops distributed along the main streets in the test zone, there is not enough open space inside the test zone to provide people for activities. As a result, children had no place to play with their peers, young and middle-aged people could not relax after work, and the old could not enjoy life.

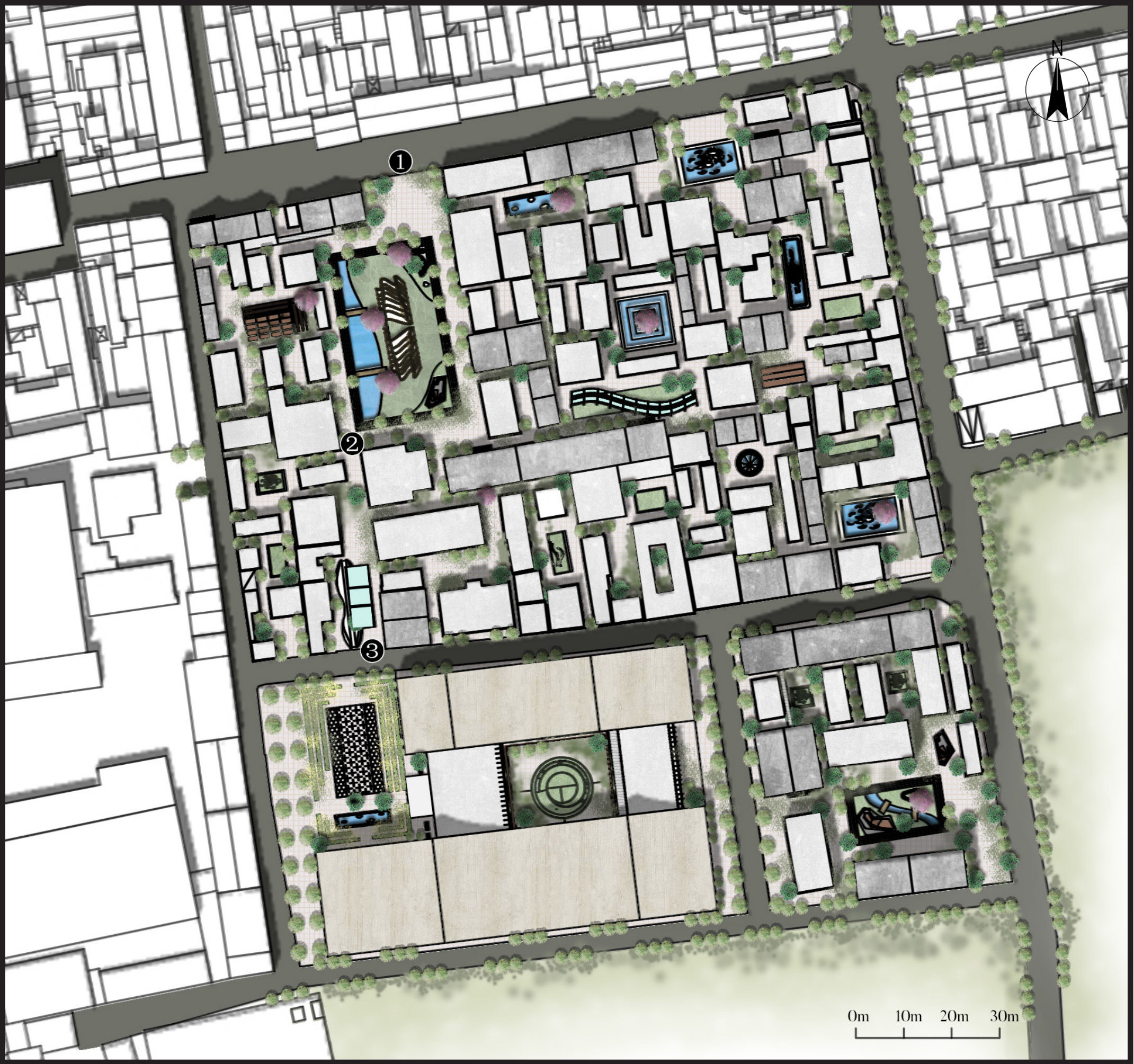
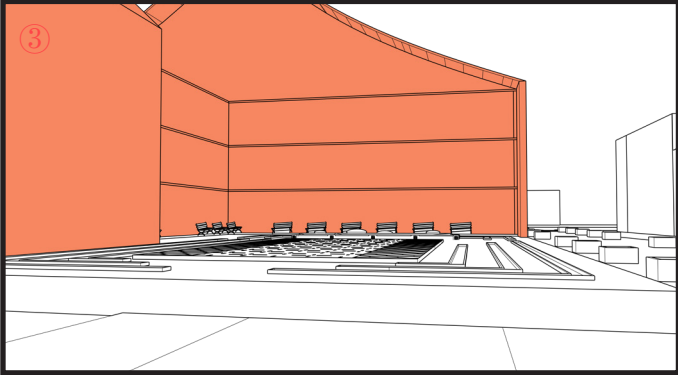
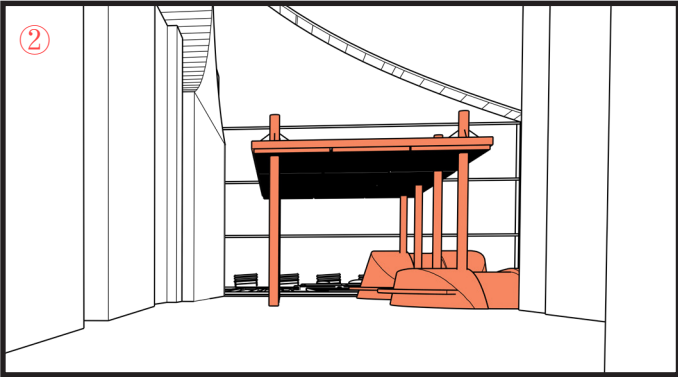
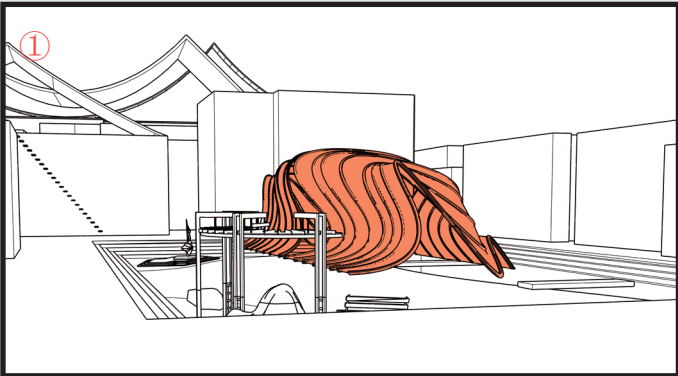
For the above reasons, we provide more open space. The open space in the test zone has three different levels. The first level of open space is mainly set up near the roads. They connect with other open spaces and roads to attract people to enter the open space in the test zone. Besides, these first level open space also guides people to the intangible cultural heritage center. The second level of open space is set inside the test zone, and they connect to other open spaces. The third level of open space is on the roofs of buildings. They connect the upper open space and some open space below. Their existence also provides the diversity of the activity space selection, which is the biggest highlight of the test zone compared with other places. We hope that our urban design ideas and concepts could change from an experimental and theoretical stage to a practical design concept and means, which would provide more choices for the urban regeneration design. We also hope that Laocheng District can be rejuvenated and become the focus of the city again.

5.3 Urban Design Master Plan

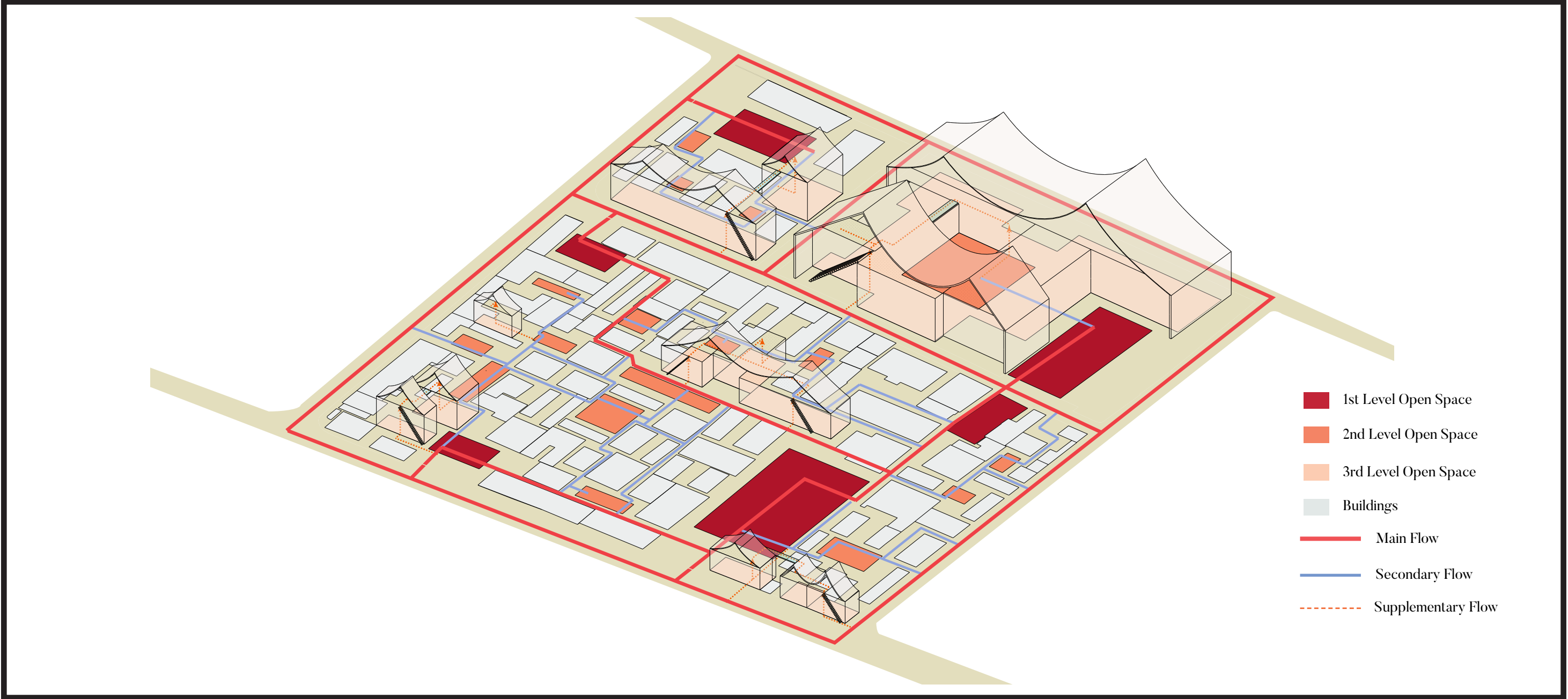
Demolished Building Analysis



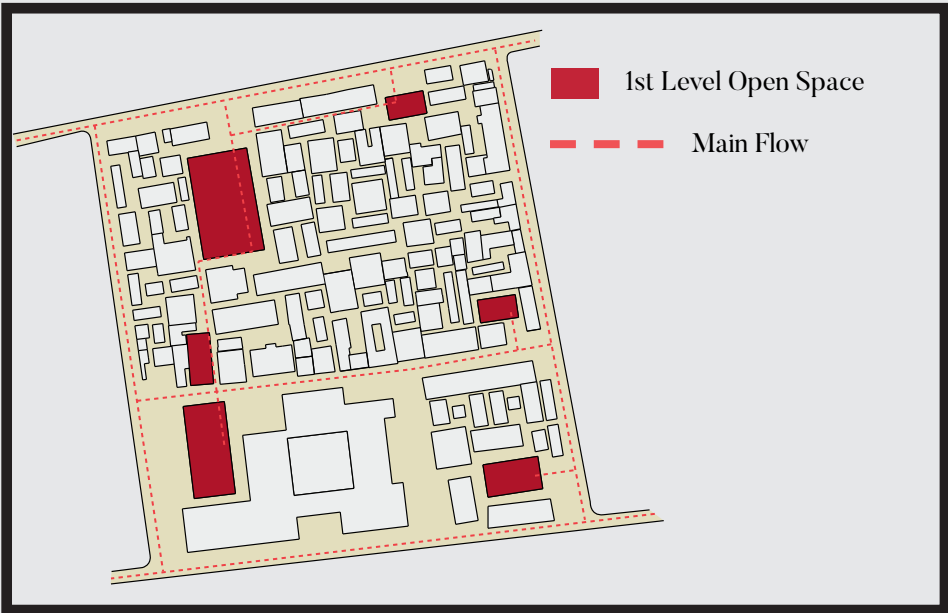
Sight Analysis



The connections of different public space



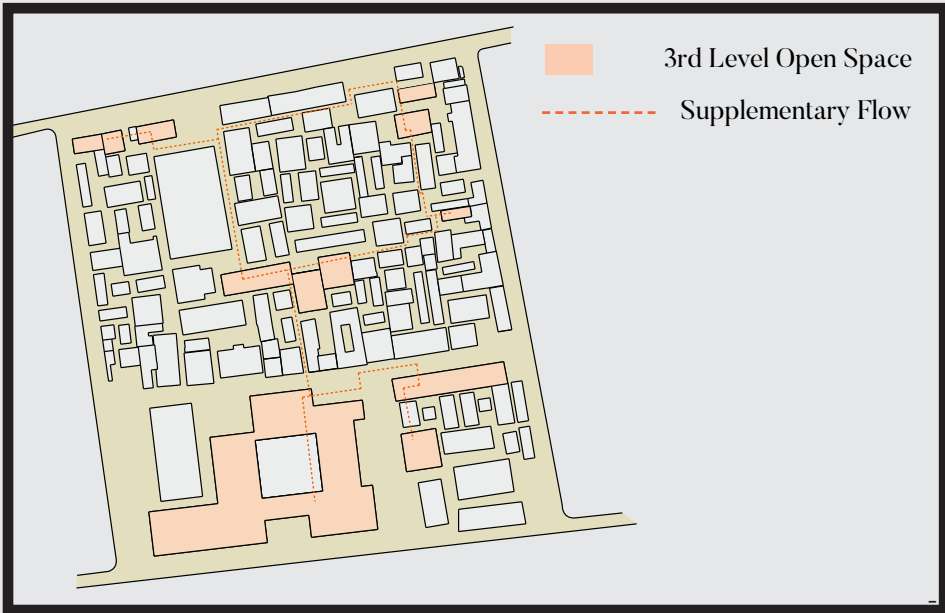
1st Level Open Space



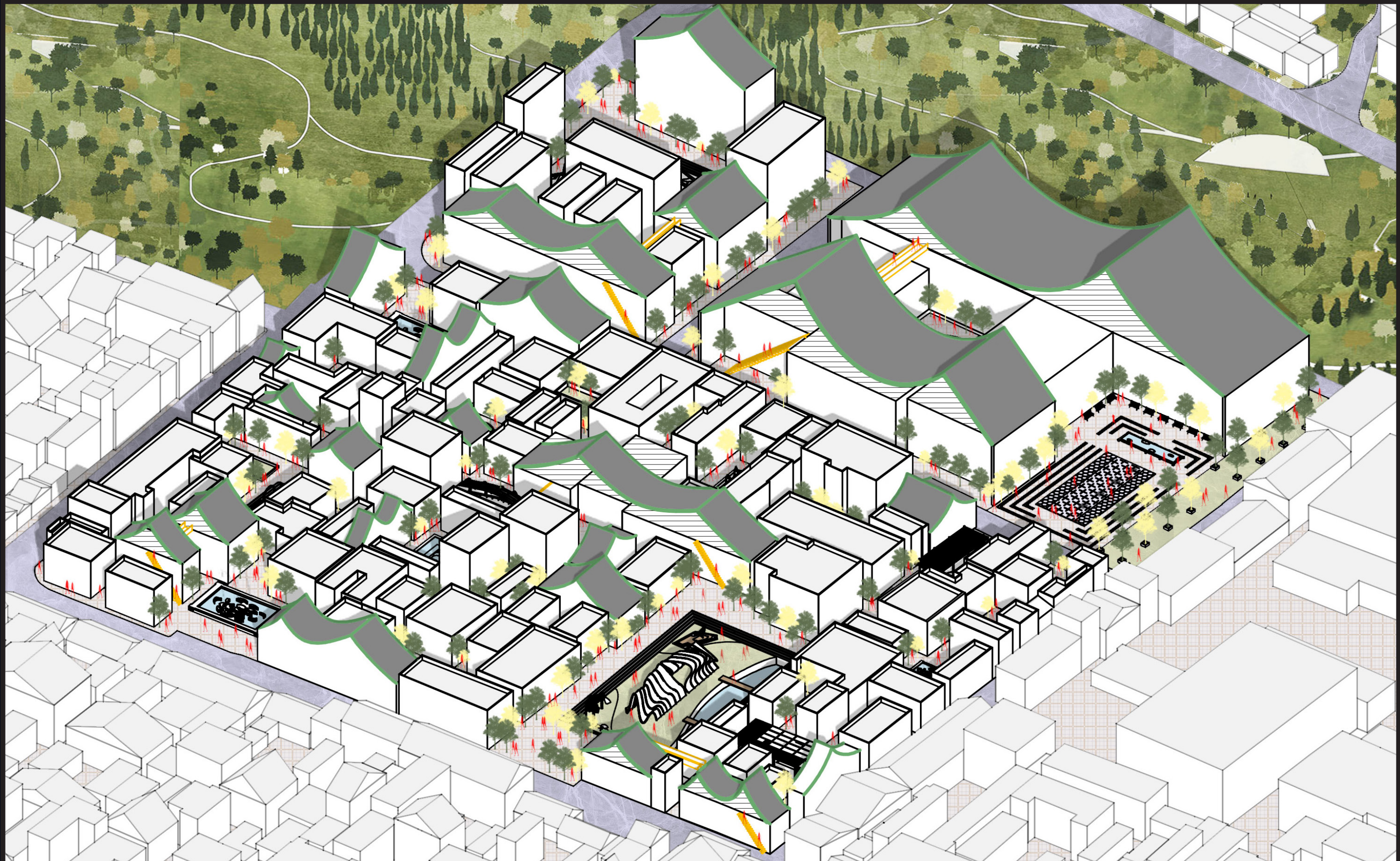
2nd Level Open Space



3rd Level Open Space



5.4 Axonometric Drawing



Section 6

INTANGIBLE CULTURAL HERITAGE CENTER

- Introduction Of Intangible Cultural Heritage
- Intangible Cultural Heritage In Laocheng District
- Design Specifications
- Diagram
- Perspective
- Axonometric Drawings
- Technical Drawings
- Exploded View

6.1 Introduction Of Intangible Cultural Heritage

6.1.1 What Is The Intangible Cultural Heritage?

Intangible cultural heritage refers to all kinds of practices, performances, forms of expression, knowledge systems and skills as well as related tools, objects, handicrafts, and cultural places regarded as their cultural heritage by various groups, and sometimes individuals. According to Chinese law, intangible cultural heritage refers to various forms of traditional cultural expression passed down from generation to generation and regarded as part of their cultural heritage, as well as objects and places related to traditional cultural manifestations, such as literature, languages, traditional art, music, dance, traditional skills, medicine, etiquette, and so on.

6.1.2 What Are The Characteristics Of Intangible Cultural Heritage?



Intangible cultural heritage is a kind of people-oriented cultural heritage, which emphasizes people. The intangible cultural heritage is not inherited by books and other carriers, but by oral transmission as a cultural chain, which leads to the intangible cultural heritage is very "fragile". In short, for the process of intangible cultural heritage inheritance, human heritage is particularly important. However, much intangible cultural heritage is lost with the rapid development of society, which is a huge loss to our society.

The protection of intangible cultural heritage not only needs the input of the government but also needs the joint efforts of people. We need to introduce these fragile intangible cultural heritage to the public as much as possible. In this way, people will understand them and be interested in them, so that the intangible cultural heritage can continue to be inherited in human society. For architects, the design of an intangible cultural heritage center can be regarded as a means to let the public understand the intangible cultural heritage.

6.1.3 What Can We Do For Intangible Cultural Heritage?

6.2 Intangible Cultural Heritage In Laocheng District

6.2.1 Introduction



Luoyang has many intangible cultural heritage assets. Among the existing intangible cultural heritage projects, there are 8 national intangible cultural heritage projects and 58 provincial intangible cultural heritage projects. Laocheng District has 39 intangible cultural heritage projects. It includes Luoyang water banquets, Luoyang palace lanterns, Luoyang paper cuttings, Liuxin peony paper carvings, production skills of Chinese flute, production skills of Go, Luoyang Tri Color firing skills, Tang dynasty white porcelain production skills and so on. Among them, traditional skills and traditional medicine account for a high proportion.

6.2.2 The Current Situation And Problems Of Intangible Cultural Heritage In Old Urban Areas



1. Intangible culture is facing extinction, and inheritors of intangible cultural heritage projects are scarce. At present, there are 44 inheritors of intangible cultural heritage in Laocheng. Most of them are old. They refuse to teach skills to people outside the family. However, young people in the family are not willing to learn these traditional skills, which leads to the loss of many intangible cultural heritage projects. At the same time, due to the progress of science and technology, modern people are more used to using products made by modern technology, which makes it difficult for these products made by traditional techniques to get economic returns. More and more people who are engaged in intangible cultural heritage projects give up this work and turn to industries that can achieve quick economic returns.
2. The intangible cultural heritage in Laocheng District is the lack of management. There is also a shortage of personnel and funds. What's more, people's propaganda for intangible cultural heritage is not enough.
3. The awareness of intellectual property rights of intangible cultural heritage projects is weak, and there are 8 projects without any trademark application.
4. Government officials and ordinary people are lack of understanding of intangible cultural heritage. As far as the government is concerned, they do not have an institution specifically responsible for intangible cultural heritage. For ordinary people, they have few chances to contact intangible cultural heritage in their daily life. Therefore, even though there are many intangible cultural heritages in the area where they live, they have little understanding of these intangible cultural heritages. Intangible cultural heritage is "the most familiar stranger" to people.

6.2.3 What Can We Do For Intangible Cultural Heritage?



In this design, we will design an intangible cultural heritage center on the site. This intangible cultural heritage center will display a variety of intangible cultural heritage and introduce the history of intangible cultural heritage, traditional skills, the technical process to people. Even in the cultural center, visitors can experience the production process of cultural projects. This way can greatly shorten the distance between intangible cultural heritage and people, make intangible cultural heritage "approachable", and let people feel its charm. After people understand the intangible cultural heritage projects, they can also drive the consumption of these cultural projects, which can not only encourage more people to engage in these intangible cultural heritage projects but also promote the economic development of the region. The intangible cultural heritage center will become a part of our neurobionic city. It is connected with other urban spaces to promote the development of the city.

6.3 Design Specifications

The design meticulously researches the local traditions and culture and explores the carriers of the intangible cultural heritage as a key factor in preserving the memory of the city. We believe that intangible cultural heritage experience center is like neurons in the nervous system that can bring people like nerve impulses to the area and stimulate new energy in the area.

In the design of the master plan, we have made reference to urban design. The main public space is used to direct the flow of people from the main streets to the project. At the same time, we have used the front plaza and the grand staircase to direct the flow of visitors into the center. In the entrance design, we have also divided the entrance into a visitor entrance and a staff entrance, which allows for a clear flow of the building.

In the design of the building's form, the main focus was on contemporary architecture and the use of traditional Chinese symbols for pitched roofs. In accordance with the design guidelines, the new building has a curved pitched roof. Concrete, red brick, glass curtain walls and timber are the main building materials used. The volume of the building rises and falls from the heights, resembling the shape of an endless mountain, which echoes the cultural symbols of Mount Mang in the distance. The different façade styles on the north and south sides of the styling design, due to their different functions, form a kind of dialogue between the ancient and the contemporary, which is also one of the highlights of the design.

In terms of plan design, the north side of the building is dominated by office functions, while the south side of the building is dominated by exhibition functions. Depending on the peo-

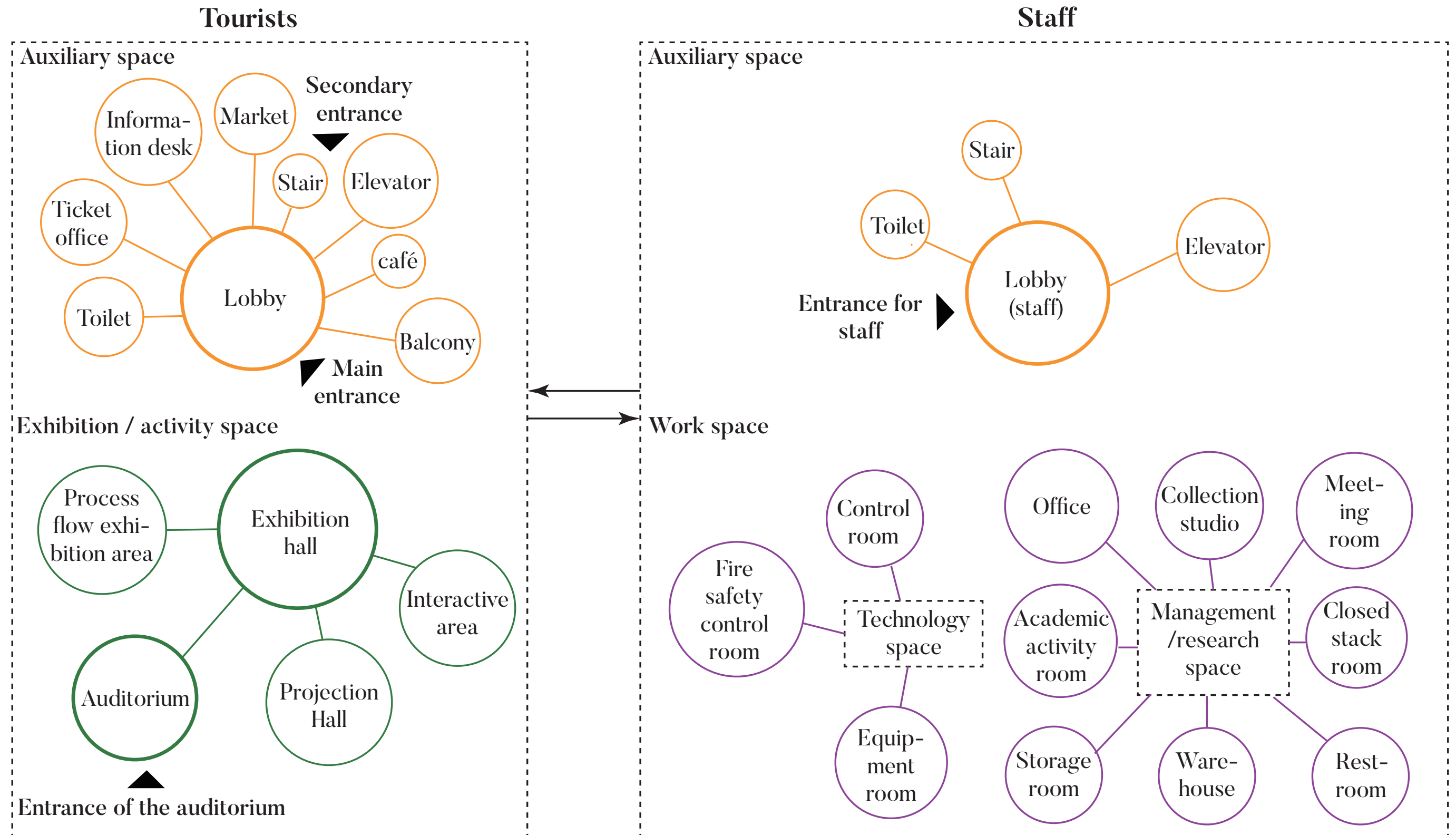
ple who use the building, there is a visitor route and a staff route. The visitor route leads from the lobby to the various exhibition halls and then up the walkways and stairs to all the exhibition halls. On the third floor, there is an intangible cultural heritage experience area where traditional handicrafts can be made. After the tour, visitors can use the sky bridge to reach the opposite roof, where we have designed a traditional market. In the traditional market, visitors can taste traditional snacks and buy souvenirs and experience the local intangible cultural heritage first hand.

The façade design takes into account the different functions carried out by the building and is slightly different in style. On the south side, where the exhibition space is dominant, the façade design is more flexible. A large glass curtain wall was chosen. For the protection of the exhibits, the curtain wall is covered with a wooden grille and aluminum mesh for shading, which also enriches the architectural language of the façade. On the north side of the building, the façade features the iconic grand staircase to attract people to the roof area. In addition to this, the windows in the office areas have been given the same architectural language as the south façade, i.e. wood grills and aluminum mesh, to ensure architectural unity.

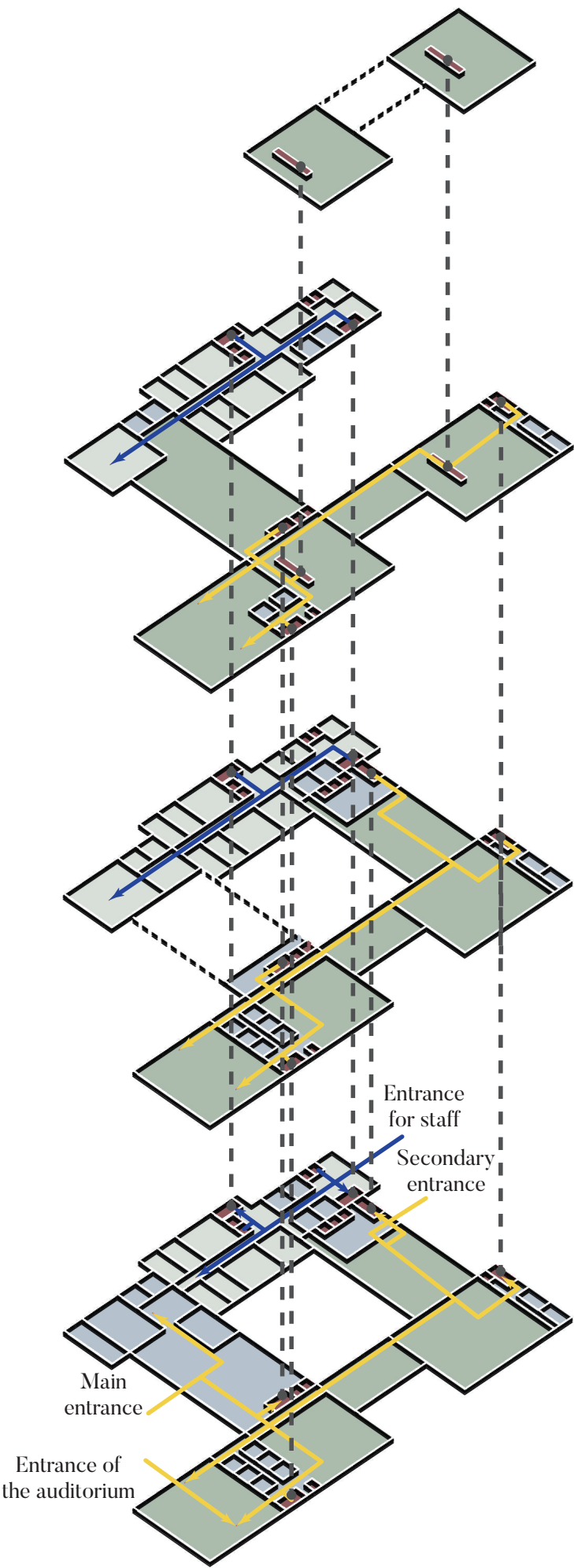
Overall, the design takes into account the local traditions and culture as well as the harmony and unity of the building. The functional flow of the design is well organized and the shapes are unique and iconic. On the other hand, it confirms the urban design guidelines and the rationality of the urban design. We believe that urban regeneration can bring new vitality to the area.








6.4 Diagram

6.4.1 Function Analysis Diagram



6.4.2 Circulation
Analysis Diagram



- | | | | |
|---------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------------------------------------------|---------------------------------------|
|  | Exhibition / Activity Space |  | Circulation Of Tourists |
|  | Work Space |  | Circulation Of Staff |
|  | Auxiliary Space |  | Vertical Circulation (Stair/Elevator) |
|  | Stair / Elevator | | |

6.5 Perspective



Perspective



6.6 Axonometric Drawings



Axonometric Drawings



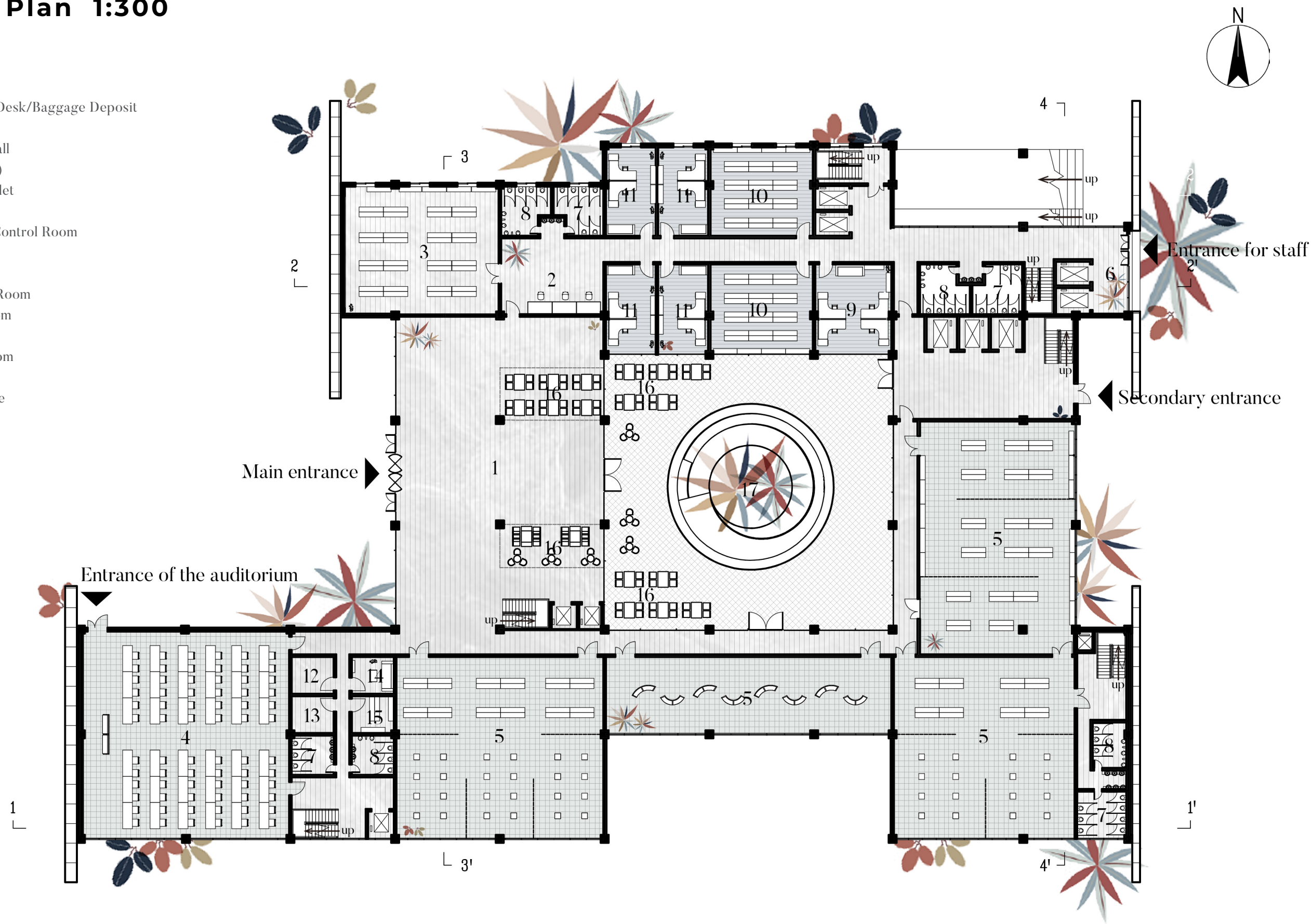
6.7 Technical Drawings

6.7.1 Master Plan



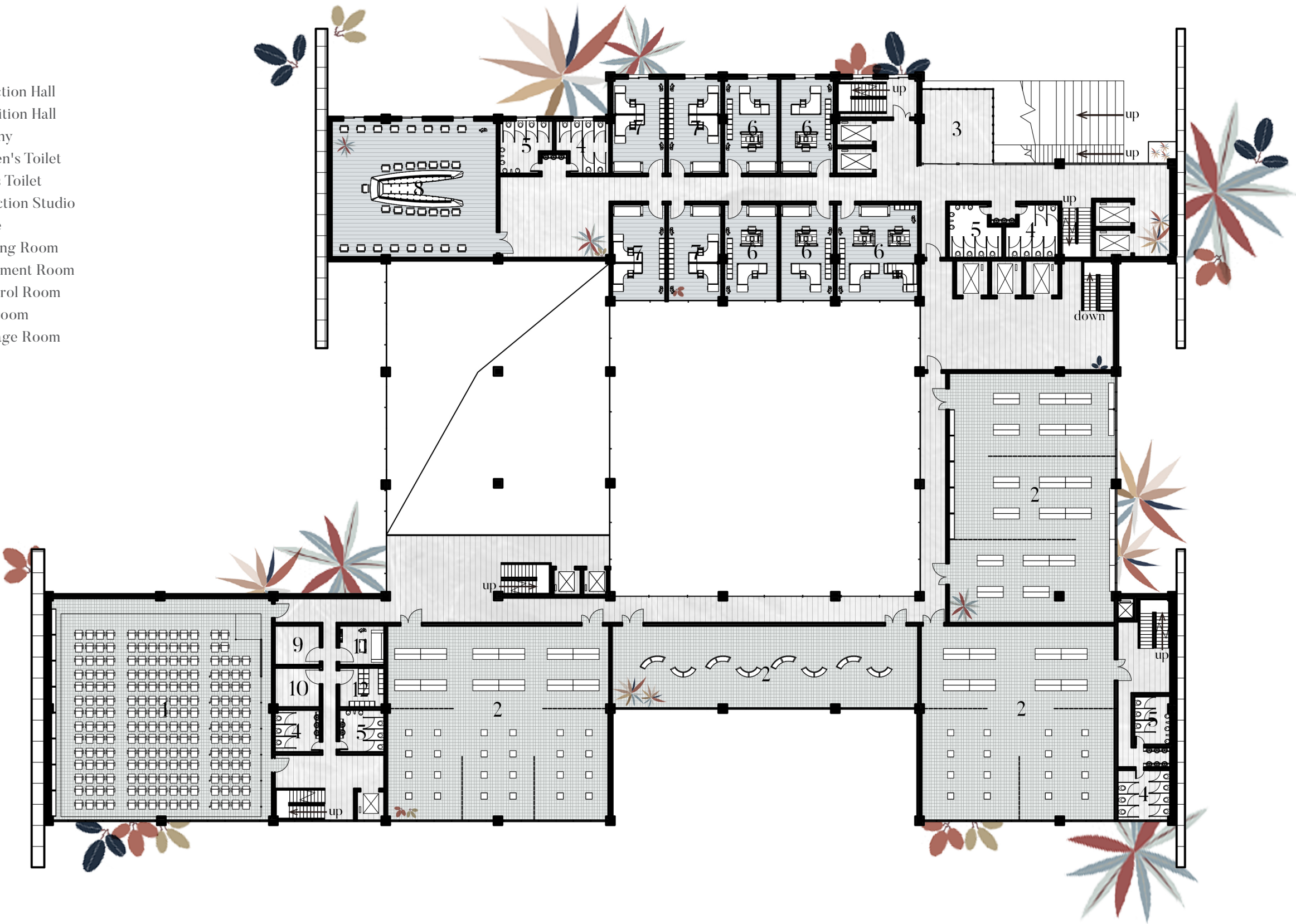
6.7.2 OF Plan 1:300

- 1 Lobby
- 2 Ticket Office
- 3 Information Desk/Baggage Deposit
- 4 Auditorium
- 5 Exhibition Hall
- 6 Lobby (Staff)
- 7 Women's Toilet
- 8 Men's Toilet
- 9 Fire Safety Control Room
- 10 Warehouse
- 11 Office
- 12 Equipment Room
- 13 Control Room
- 14 Restroom
- 15 Storage Room
- 16 Café
- 17 Green Space



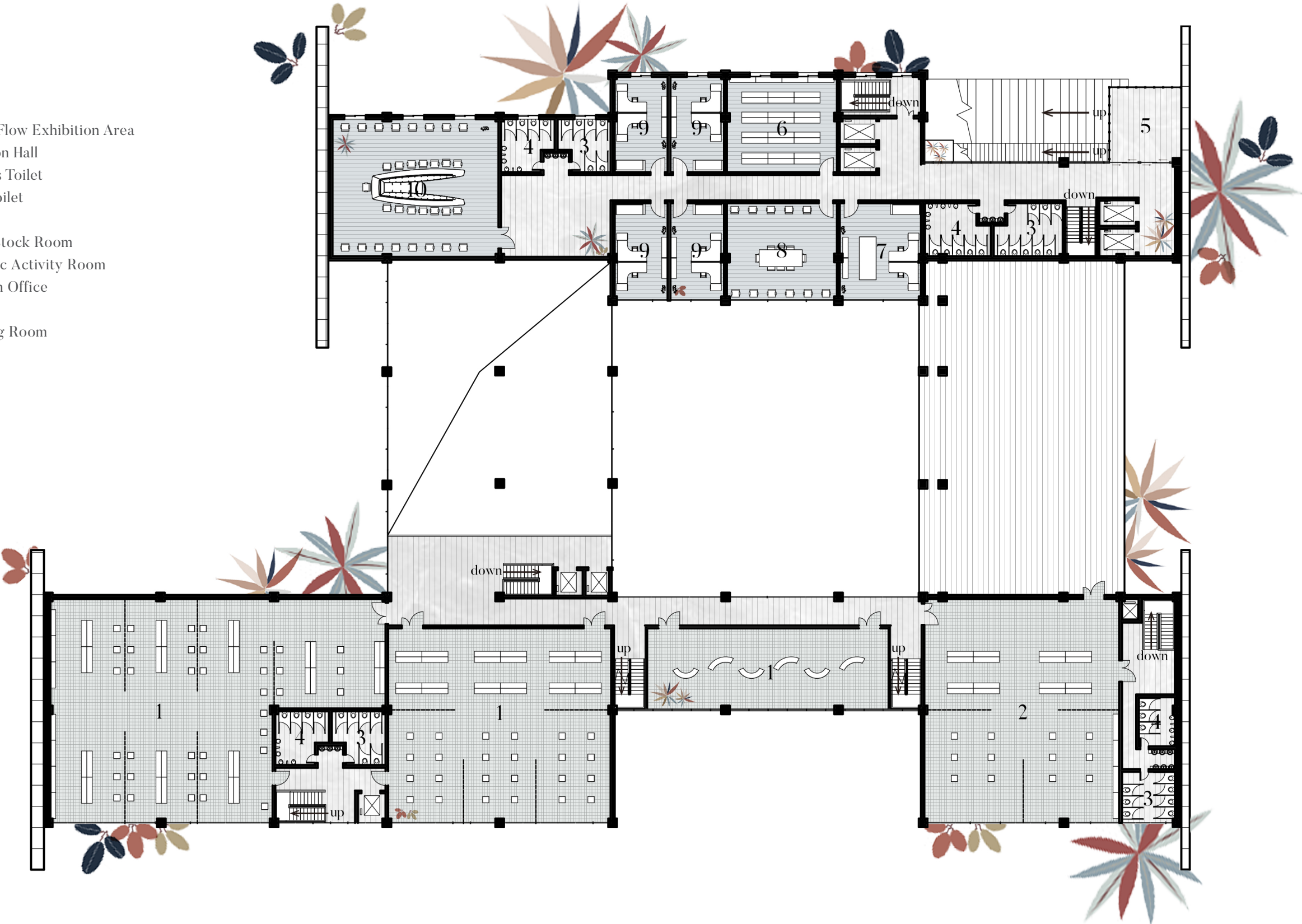
6.7.4 1F Plan 1:300

- 1 Projection Hall
- 2 Exhibition Hall
- 3 Balcony
- 4 Women's Toilet
- 5 Men's Toilet
- 6 Collection Studio
- 7 Office
- 8 Meeting Room
- 9 Equipment Room
- 10 Control Room
- 11 Restroom
- 12 Storage Room



6.7.4 2F Plan 1:300

- 1 Process Flow Exhibition Area
- 2 Exhibition Hall
- 3 Women's Toilet
- 4 Men's Toilet
- 5 Balcony
- 6 Closed Stock Room
- 7 Academic Activity Room
- 8 Research Office
- 9 Office
- 10 Meeting Room

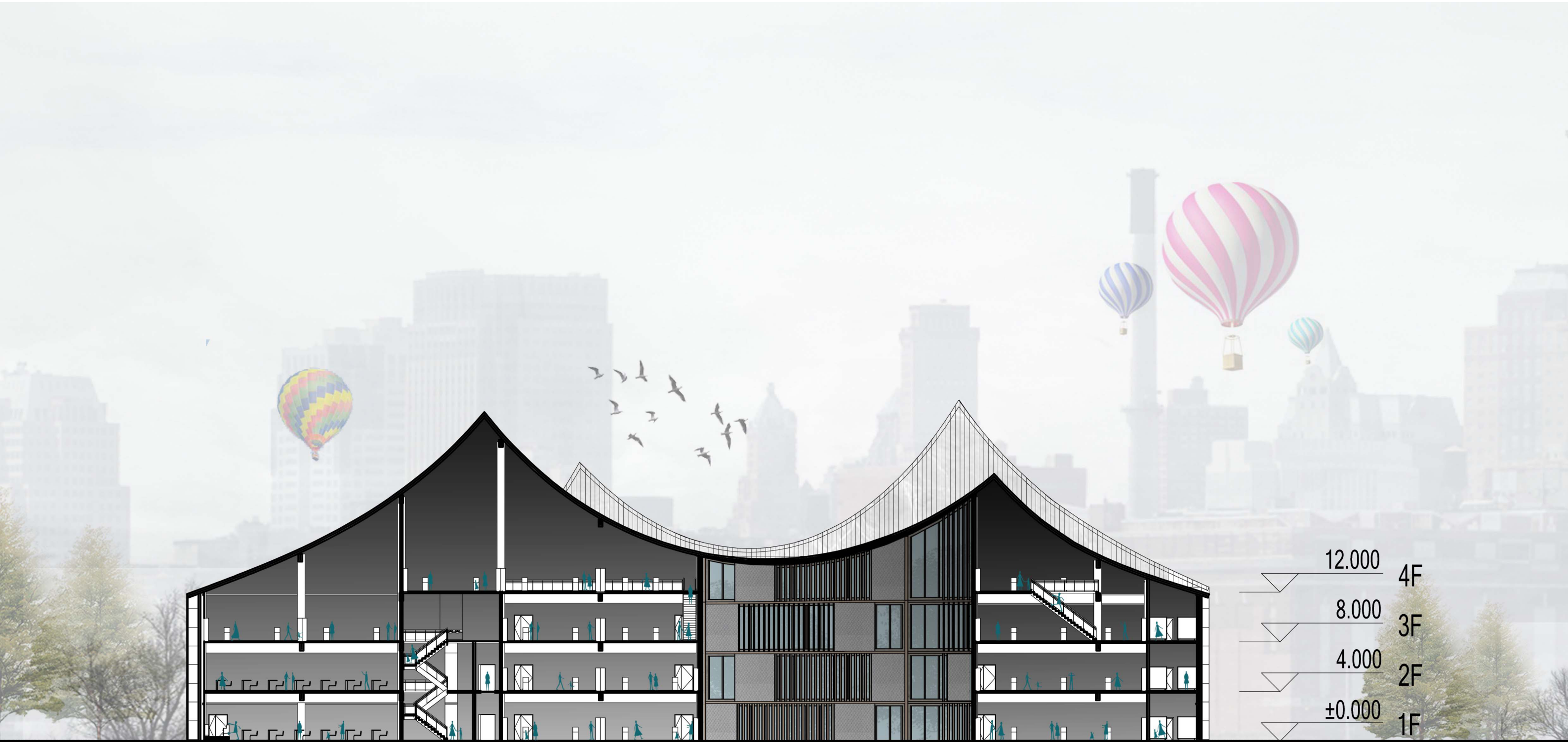


6.7.5 3F Plan 1:300

- 1 Reception
- 2 Interactive Area
- 3 Women's Toilet
- 4 Men's Toilet
- 5 Market
- 6 Bridge



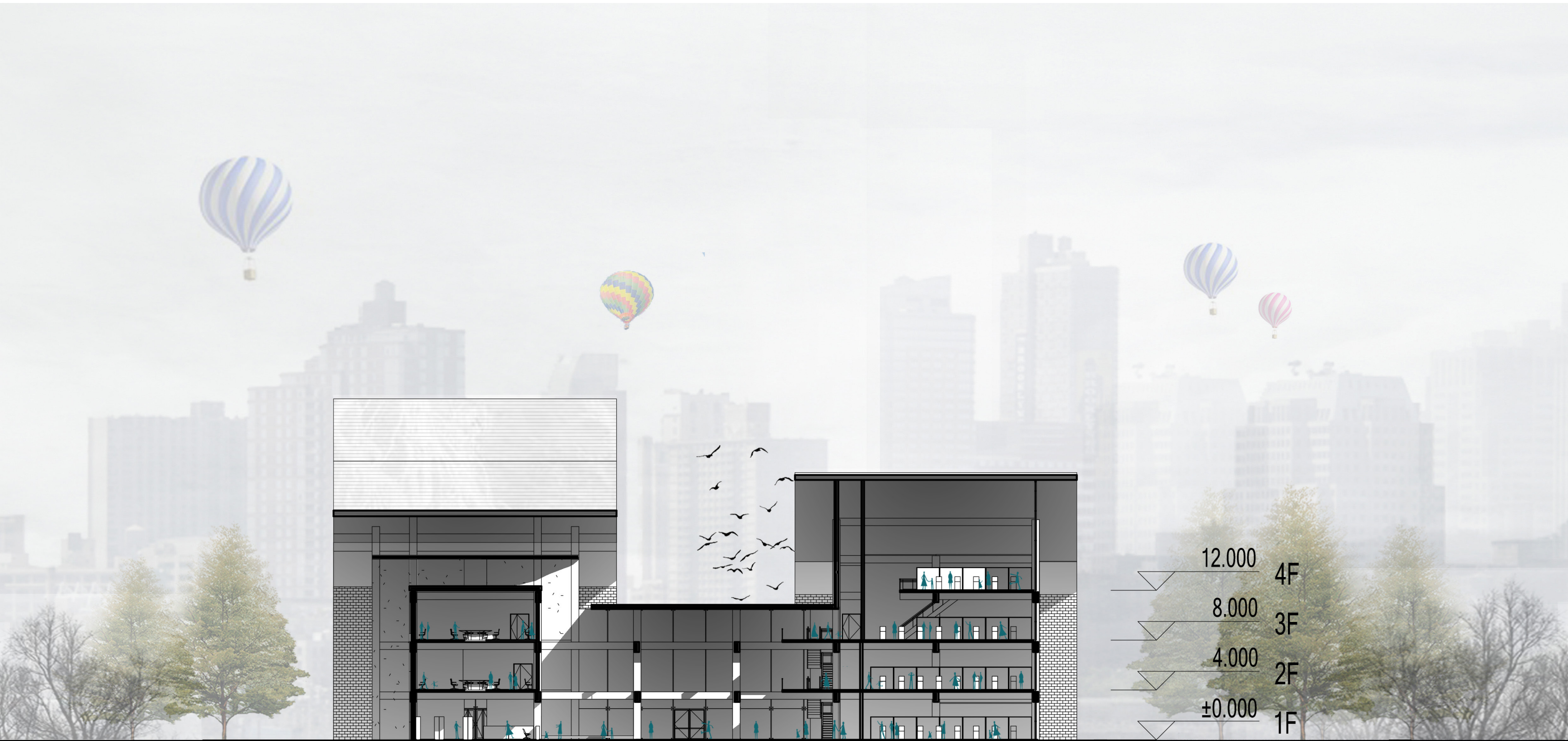
6.7.6 1-1' Section 1:300



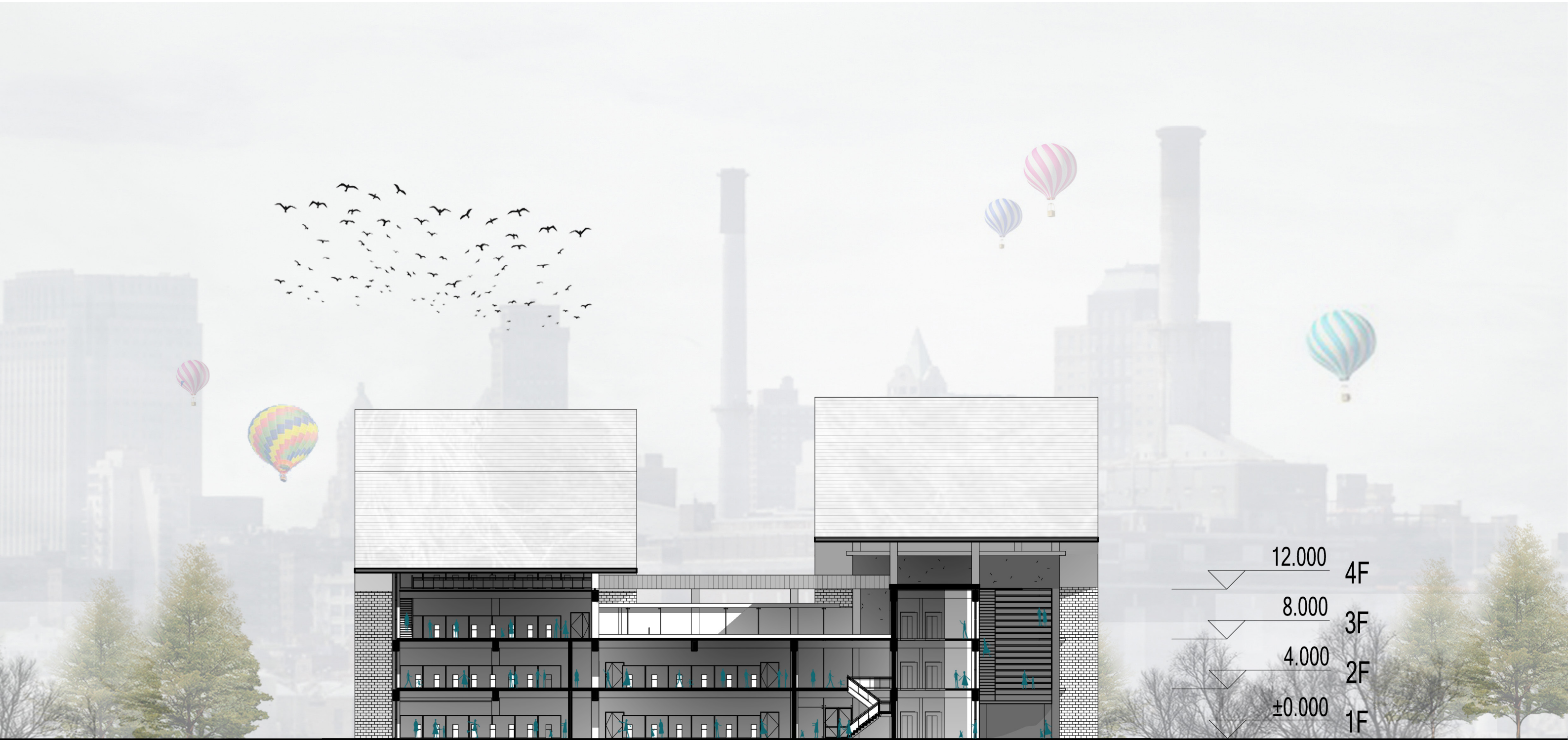
6.7.7 2-2' Section 1:300



6.7.8 3-3' Section 1:300



6.7.9 4-4' Section 1:300



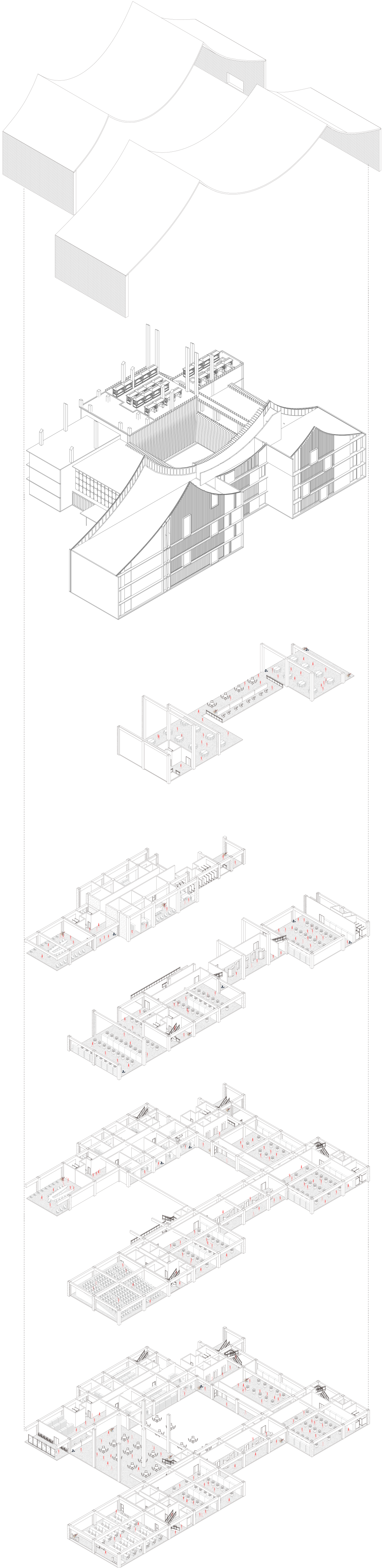
6.7.10 South Elevation 1:300



6.7.11 North Elevation 1:300



6.8 Explored View



Conclusion

This thesis uses quantitative and qualitative analytical research, case study research and hypothesis validation research.

The project site is in Luoyang, Henan Province, China. First of all, a detailed analysis of the city in which the site is located was carried out in terms of culture, urban structure and building form. These analyses gave us a rational understanding of the overall context of the whole block, which will guide us in the design of the following specific projects.

Secondly, three case studies with similar characteristics have been selected and analyzed based on the history, culture and other circumstances of the chosen block. The analysis of the cases provides a reference for the urban design guidelines and the selection of functions for the individual building design.

Thirdly, we develop urban design guidelines for the block based on some preliminary analyses of the block and the case studies. The design of the block is defined in terms of urban planning, roads, open spaces, architectural design and function. We wanted to preserve the block while gradually transforming it from an old building style into a contemporary one. In addition to this, we have also taken into account the improvement of the quality of life for the inhabitants and have therefore focused on the design of open space.

Fourthly, we have carried out urban design according to the urban design guidelines. We came up with the concept of Neurobionic City. Based on the preliminary analysis, we

demolished some of the lower quality buildings and built new curved pitched roof buildings. In parallel, a lot of public space has been designed and used to direct the flow of people into single building sites we have chosen. The urban design improves the quality of living for the residents and also enhances the city's appearance.

Fifthly, we have chosen the site of a single building in the test zone of the urban design and the intangible cultural heritage experience center as a function of the single building design. We hope that this form will evoke the memories of the residents and, attract visitors to the site and stimulate the vitality of the city. In terms of architectural design, the form is unique, the functional flow is well designed and the façade is iconic. The urban design guidelines and the requirements of urban design are met. Through qualitative and quantitative analyses and case studies, we developed urban design guidelines for the block. Subsequently, the urban design and the design of the individual buildings were adjusted and validated. This process verified the rationality of urban design guidelines and urban design. We believe that this design approach has a certain degree of practicality.

Whether or not the desired results will be achieved after the actual construction of the building is a legacy of the design. In the theory of urban design, there are many examples of buildings that often do not work as expected after many years of construction and use. We hope that in the future there will be an opportunity to build them, to fully test their feasibility and to promote their use.

Acknowledgements

Time flies, two and a half years of study life is coming to an end. We look back over the past two and a half years. Then we find that we have many unforgettable life experiences and memories.

After we got our bachelor's degrees, we came to Politecnico di Torino for the master's degrees. For the first time to go abroad, we are far away from our motherland, families, and friends, so we were very uneasy. We didn't know if we can live and study in a strange country. After a period of adaptation, our life and study are gradually on the right track. We have learned a lot of professional knowledge, made a lot of friends, and also saw different scenery and buildings. This greatly enriched our life experiences. However, the outbreak of coronavirus in 2019 has changed our lives. We have been forced to change the way we used to live, and the university has also been forced to change the way of teaching, which has caused inconvenience to our life and study. But at the same time, because of COVID-2019, we have had a different experience. During this period, we also gained a lot of care.

Now the final project is about to be completed immediately, we would like to express our sincere thanks and best wishes to all people who care and help us.

First of all, we would like to thank Politecnico di Torino. It also provided an opportunity for us to travel from China to Italy for master's study, so that we can feel different cultures. Our university has a nice learning atmosphere and provides great learning conditions for us to study at ease. Besides, in our daily life, our university also gives us some help.

This final project is completed under the careful guidance of Professor Michele Bonino and Ph.D. candidate Camilla Forina. Their help is inseparable from the topic selection of the project, the collection of data, the determination of research methods, and the design of the project. In the process of research, whenever we have any questions, we can get their patient answers and help. We are very moved that they can also consider our final project guidance in their busy scientific research work. What's more, we benefit from their rigorous and realistic academic attitude and innovative research style. We would like to express our sincere thanks to Professor Michele Bonino and Ph.D. candidate Camilla Forina!

Then we are supposed to thank our parents. They supported our life in Italy. They are also very concerned about us during our final project. They help us a lot in our daily life.

We also need to thank our classmates. Because of them, we can get close to different cultures and share the joys and sorrows of our lives. In the usual study discussion, their remarks also gave us a lot of inspiration. In the past two and a half years, we studied together with classmates and made progress together. We thank them for all their care and help.

Campus life may be coming to an end. Stepping into society is the beginning of the real challenge in our life. In the future, we would encounter all kinds of difficulties and setbacks, but no matter where we are, in the future work, we will continue to work hard to repay all those people who have supported and helped us!

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