

Privatization, Marginalization and Reuse of Waterfront Space in New Town——Taking Zhangjiang Science City Zhongshi Unit as an Example

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Abstract: In the past ten years, China has ushered in a new era of urban development. The urban renewal project has gradually changed the original urban pattern. In the suburbs, the construction of new cities has replaced the old towns and formed two types—an industry-led new towns and life-oriented new towns. The Zhangjiang area is one of the earliest industrial zones in Shanghai. It is currently in an important period of transition from industrial zones to the urban area. The comprehensive improvement of scientific research capabilities, living environment and urban vitality is its development goal. The long-term industrial development has led to the relatively closed industrial parks in the Zhangjiang area. The high-end communities have been built everywhere but the supporting facilities are insufficient. This has led to the emergence of city-industry separation, and separation of jobs and residential in the Zhangjiang area. These problems are particularly prominent in the Zhongshi units. In the process of building a fast new town, Zhangjiang Old Town, which was originally water-based, gradually declined, and was replaced by a new town with roads as the development axes. Planners used modern and mature design methods to design high-end residential communities and spacious car roads, but also brought public space with no vitality. Taking the Zhongshi unit of Zhangjiang Science City as an example, this paper first analyzes the existing characteristics of public space, and takes the waterfront space as the research focus. It is found that the waterfront space is characterized by privatization and marginalization. After that, some urban design method was used to redesign the form of waterfront space, function, and relationship with the surrounding area in order to realize the reuse of the public space.

Keywords: waterfront public space; urban renewal; privatization and marginalization;
Zhangjiang Old Street

1 New town development model and existing problems

1.1 Two models of the development of China's new town

With the continuous development of China's economy, the urbanization process is also accelerating. In 2018, China's urbanization rate is close to 60%, and the city is undergoing rapid changes and transforms. In the core area of the city, the urban renewal project with the main contents of comprehensive renovation, functional change and demolition and reconstruction of existing buildings, infrastructure, public facilities, streets and environment is changing the original urban pattern (Chen, 2019). Tianzifang, Xintiandi in Shanghai and other urban traditional street reconstruction projects have become a model for urban renewal in the country. Due to the expansion of the city's scale and the need for development, there is no land and space for urban development in the city center or the old city. As a result, various new town and new district planning and construction projects have been carried out across the country to meet the needs of industrial development or urban population expansion.

New town or new district is a relatively independent unit planned for political, economic, social, ecological and cultural needs(Feng, 2015). After more than 30 years of construction, China's new town and new district has formed a huge and complex system. There are many types and development models of new urban new districts. Many new town developed from industrial parks have become important economic growth poles besides the core areas of the city. Due to the rapid development of the new town, it is also facing problems such as city-industry separation and lack of vitality. The development model of the new town needs to be transformed. The relationship between industry and urban space has always been an important issue in the development of new towns in China. The problem of city-industry separation has seriously restricted the healthy development of cities. Scholars have conducted in-depth research on the phenomenon , the classification and causes, and the path of city-industry integration. At present, China's new town and new district can be divided into four categories: residential new district, industrial park, high-speed rail new town and science and technology new town(Yang and Lin, 2017). Its development model can be classified into the following two situations.

The first is new town formed by industrial agglomeration, represented by industrial development zone. Most of the industrial development zones are located in the suburbs, relying on the construction of industrial parks to form industrial clusters, and promote the economic development of the new town. In terms of space, large-scale closed spaces such as factories and parks have gradually replaced the more densely populated old towns and farmland. People live

in places with good housing conditions and supporting facilities in the city center, and only work in the new town during the day. Second, new town relying on opportunities such as high-speed rail with the residential area is the main function. In order to share the population pressure in the city center, large residential areas are built on the edge of the city or in the suburbs. Lower prices and larger space meets the housing needs of people working in the city center. However, there are certain problems in the current two development models. The new town with industry as its main function cannot provide supporting service facilities. The new town with residential function as the main function lacks industrial support. It will be less attractive to talents, so the ability to absorb the population is limited. The space differentiation between jobs and residences causes the industrial park to become a "ghost town" at night, and the strange phase of the residential area becomes "empty town" during the day. It leads to the lack of vitality in the city and the low sense of identity of the crowd.

1.2 Development and transformation background of Zhangjiang area

Zhangjiang High-tech Zone is located in the center of Shanghai Pudong New Area, adjacent to Lujiazui Financial Center and Shanghai Disneyland (Figure 1). Since the establishment of the Zhangjiang Hi-Tech Park in 1992, it has experienced the development phase of the exploration period (1990-1999), the incubation period (2000-2005), and the development period (2006-2011), and entered a new era of transformation (Wang and Huang, 2013). After the implementation of the "Zhangjiang" policy in 1999, a large number of high-tech industries gathered in Zhangjiang. The area of the park continued to expand, and the industrial functions were further strengthened and improved. It became the vitality point of the economic development in Pudong, and its influence continued to expand. In 2011, Shanghai was approved to establish China's third national independent innovation demonstration zone, and named after Zhang Jiang. The word Zhang Jiang has become synonymous with Shanghai's high-tech development, and Zhangjiang region has entered a new era of transformation and development.

In 2017, the "Zhangjiang Science City Construction Plan" was approved (Figure 2). The plan is based on the original Zhangjiang High-tech Industrial Development Zone. The area is increased to 94 square kilometers, and a science city integrating production and urban space is to be established. With the concept of open agglomeration, integration of diversity and green communication as the planning concept, the transformation and development of Zhangjiang Science City will become the creation place of new knowledge and new technology in China and the world, the breeding place of new industry, modern new livable city and municipal public center. And built into a world-class science city.



Figure 1 Zhangjiang Science City Bitmap



Figure 2 Land Use Planning of Zhangjiang Science City Construction Planning

1.2 Main problems in the construction of new towns

Zhangjiang Science City began construction in the 1990s. Planners use advanced planning concepts and design techniques to design clean, modern and urban areas. However, in the past 30 years of, some contradictions and problems have been exposed. The livability and vitality of the new town have not met the vision of the government and planners. The Zhongshi unit is located in the north of Zhangjiang Science City. It is the earliest developed unit in Zhangjiang area. The northwest corner of the unit is an industrial park, the east is a large-scale residential area with mature and mature construction, and the southwest corner is a newly-planned software park. It presents a pattern of intertwined collages between residential areas and

industrial areas. From the perspective of the Zhongshi unit, the main problems reflected in the new town include the following aspects.

First, the industrial park area and the residential area are relatively independent and the supporting facilities are insufficient. The density of public service facilities in residential areas is enough but unevenly distributed, lacking comprehensive hospitals and cultural and sports venues. Second, the road is wide but not suitable for walking, which makes it empty. Each urban cluster has a fence, which is closed to the public. People mainly work in residential areas or work inside industrial parks. The street only bears the traffic function. Although there are walking and running lanes, there is no corresponding supporting function on both sides, and the road is too wide, the radius of the turn at the intersection is large, causing people to lack the desire to travel. Third, the ecological base is rich, but the accessibility and continuity are poor. The landscape function of the green space is greater than the public activity function, and it is not systematic. There is a fault zone in the waterfront activity space. Fourth, ignore the inheritance of historical context. The old town of Zhangjiang are damaged, the intangible cultural heritage lacks the space carrier, and the emerging culture lacks the output platform and space.

2. Introduction to the water environment of Zhangjiang Old Street

2.1 Impact of urban development on river systems

The Yangtze River Delta is a typical plain river network area. The water system of the Pudong New Area is vertical and horizontal, with a typical Jiangnan water town style. The water system and the town are interdependent. As an important part of the urban public space, the waterfront space can not only improve the urban micro-environment, but also improve the environmental quality. It is also a public place for residents' activities. In the planning of the new town, the planning of the waterfront area is a key design area to display the image of the city. The dynamic waterfront space design can drive the economic development of the surrounding area and become a symbol of the region. However, the construction of the new town is often accompanied by the destruction of the original river network. In the construction and development of the Zhangjiang High-tech Zone, in addition to the rivers or main streams in the center of the city are preserved and redesigned, many tributary water systems are landfilled into roads or the construction of the park. The original farmland was requisitioned, and the water environment of some water systems was also invaded by industrial pollution, causing the river network to shrink and the water surface rate to drop. Bai Yiqin (2010) compared the land use and water system remote sensing data and water environment quality in Pudong New Area over the years, and found that with the acceleration of urbanization process, the length, area and

quantity of river network decreased. Small and medium-sized rivers and village-level rivers disappear faster. In the central urban area, the network is relatively systematic, while the river network in the urban fringe area maintains the original natural form. (Figure 3).

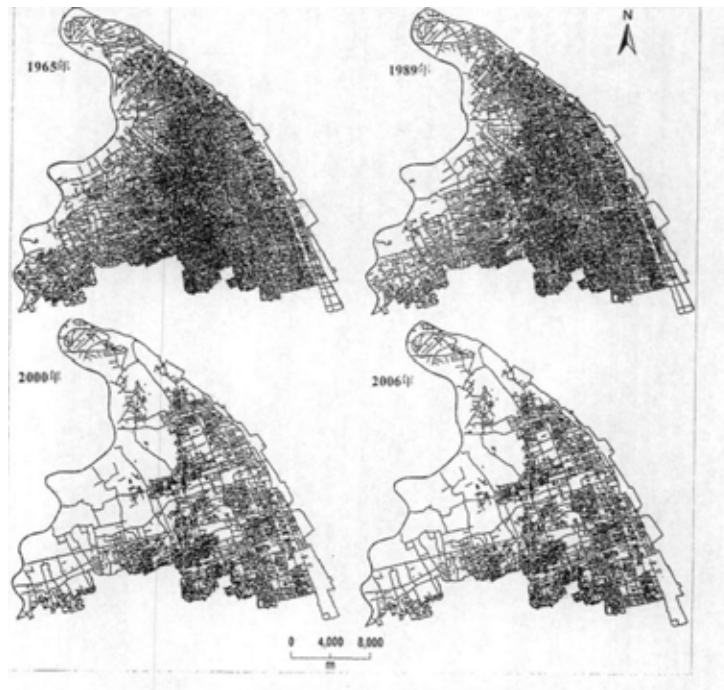


Figure 3 River network changes in Pudong New Area from 1965 to 2006(Bai, 2010)

2.2 Water resources around Zhangjiang Old Street

There are many rivers in the Zhongshi unit. The main two rivers, Majiabang River and Lvjiabang River cross in the middle of the unit (Figure 4). The river from west to east is the main traffic in the hinterland of Pudong. Transporting waterways, nowadays, has lost its transport function and has become a landscape river. The north-south Majiabang River was dilapidated and digging through the original Libang channel. In addition, there is a river called Taohe passing through the east of the unit. The river sets the Majiabang River and Lvjiabang River together in the interior of the block to form a ring structure.



Figure 4 Existing river in Zhongshi unit

The intersection of the two rivers of Majiabang River and Lvjiabang River is the location of Zhangjiang Old Street. Zhangjiang Old Street is a spontaneously formed market town formed during the Ming Dynasty (1567-1572). It retains the longest historical memory in the Zhangjiang area and the original spatial pattern of the Jiangnan water town. The old street extends along the east and west sides of Lvjiabang River, and the enclosed courtyard space is arranged in layers to form a deep spatial feature of the courtyard. A main street is set up in parallel with the water system to form a house-street-river spatial pattern. A number of lanes are perpendicular to the water system and extend to the bridgehead, the water system intersection, and the intersection to form an open space (Figure 5).



Figure 5 Zhangjiang Old Street courtyard and water street space pattern

3. The role of waterfront space in the change of Zhangjiang Old Street

Up to now, the surrounding area of Zhangjiang Old Street has been replaced by modern industrial parks and residential buildings, and the construction of new town is still in progress. Zhangjiang Old Street is also facing demolition, and some indigenous people have left their long-term residence. In the process, Lvjiabang River transformed from the original main

transportation channel into a landscape river channel, and the waterfront space was transformed from a lively and energetic public space to a place where no one cares. From a historical point of view, the change of Zhangjiang Old Street witnessed the entire process of industrial park development changing the old market town space.

3.1 Late Ming dynasty to the Republic of China: prosperous period

The history of Zhangjiang Old Street can be traced back to the Ming Dynasty. It is said that there are two phoenix trees on both sides of Lvjiabang River. Therefore, the old name is Gutongli. During the Longqing period of the Ming Dynasty, there was a man named Zhang Jiang who opened a ceremony here. He built a fence as the boundary between the east and the west, so it was named "Zhangjiangzha". At this time, the river channel is the main means of transportation. Both the cargo ship and the passenger ship to and from the sea and Shanghai have to transport each other through the rivers. As one of the main transportation waterways in the hinterland of Pudong, the Lvjiabang River has frequent commercial trade on the river. Zhangjiang Gate has also developed as a major market town along the Lvjiabang River. By the time of Qing Emperor Qianlong, Zhangjiangzha had formed a commercial market town with more than 200 shops. The number of households exceeded 1,000, and it formed a 100-meter-long east-west street and a north-south street and sugar shop across the Lvjiabang River. Street (Figure 6). By the time of the Republic of China, Zhangjiangzha was already a major town in the northern part of Nanhui County, and a water and land transportation hub, known as the "North Gate Key." Until the 1950s, Zhangjiangzha has always been a commercial and trade center in the district. The waterfront space is mainly commercial activities. The merchant ships that come and go are docked at butou for loading and unloading goods. There are many shops, tea houses and pubs on both sides. The commercial atmosphere is strong (Figure 7). It can be said that Zhangjiangzha has developed and expanded by relying on the transportation of the Lvjiabang River. The waterfront space is the most popular public space in Zhangjiangzha, and it is also the place where people interact and trade.



Figure 6 The whole territory of Nanhui County, Qianlong, Qing Dynasty



Figure 7 Zhangjiang Old Street Historical Image (1948)

3.2 After liberation: privatization of space brought about by the transformation of functions

After the founding of New China, with the start of the economy, a large number of urban construction activities occurred frequently. Chinese cities entered a stage of rapid development. Due to the change of transportation mode, land transportation has gradually replaced water transportation and has become the main mode of transportation. A large number of roads were built, and influenced by the traffic location, commercial and other public functions began to gather on the road. In Zhangjiang, the new town center was established on the west side, and the shops concentrated on the roads, forming a pattern along the ZhenXixin Street, Chuanbei Road, and Zhangjiang Road (Figure 8). The original commercial functions of Zhangjiang Old Street were gradually replaced into living spaces. Old Street lost its status as a core city and became a town dominated by residential functions. This process is spontaneous and not government intervention. Since 2000, Guanglan Road

has been constructed, and Zhangjiang Old Street has been divided into two parts (Figure 9). The old street of Zhangjiangzha has entered a decline period. The functional changes on both sides of the river and the decline of water transport have also made the riverside space The original commercial vitality space has been transformed into a living space for residents.

With the improvement of people's quality of life requirements, the living conditions of Zhangjiang Old Town are becoming more and more crowded, and the waterfront space is showing a trend of privatization. In the period of our investigation, the aborigines have not yet fully moved out, and we can see the imprint of life that has been preserved on both sides of the river bank. Some illegally built sheds extended from the residential houses to the river banks. The fences blocked the waterfront roads. The riverside stood many poles for drying clothes, and it became the home of the residents on both sides of the river.



Figure 8 Zhangjiang Old Street Historical Image (1948)



Figure 9 Zhangjiang Old Street Historical Image (1948)

3.3 The construction period of the new town: the marginal space in the development of the new town

Since the 21st century, urban construction in Zhangjiang has entered a stage of rapid development. As mentioned above, the changes in the river system of Pudong New Area have also been staged around Zhangjiang Old Street. Now the water system around Zhangjiang Old Street faces the following problems, affecting the vitality of waterfront space.

First, the tributary water system lacks management and the waterfront space is poorly accessible. On the south of Zhangjiang Old Street, there is a river that runs through Pudong New Area and is 28 kilometers long and about 70 meters wide. It is also one of the main main streams in Pudong New Area. The city-level public service center will be built on both sides of the Chuanyang River. The implantation of science and technology and public service functions will greatly stimulate the vitality of the riverside space on both sides of the Chuanyang River. The Zhongshi unit where Zhangjiang Old Street located is in the northern part of Science City. Its status and role are much lower than those on the banks of the Chuanyang River. The tributary water system such as Majiabang River is neglected, the river channel is narrow, and some riverside landscapes are poor and lack of management. In addition, due to the complex property rights on both sides of the Lujiayu River and the Majiabu River, the public shoreline has not been integrated into unified management and planning. Most of the shorelines are in a closed management mode and are not open to the public (Figure 10). Besides, the collapse of many river-crossing bridges has not been repaired (Fig. 11). The river banks are filled with domestic garbage and building materials, so the connectivity and accessibility of the riverside space is poor (Figure 12). This is also one of the main reasons for the openness and vitality of the riverside space.



Figure 10 Waterfront space with closed management measures



Figure 11 Bridge collapse

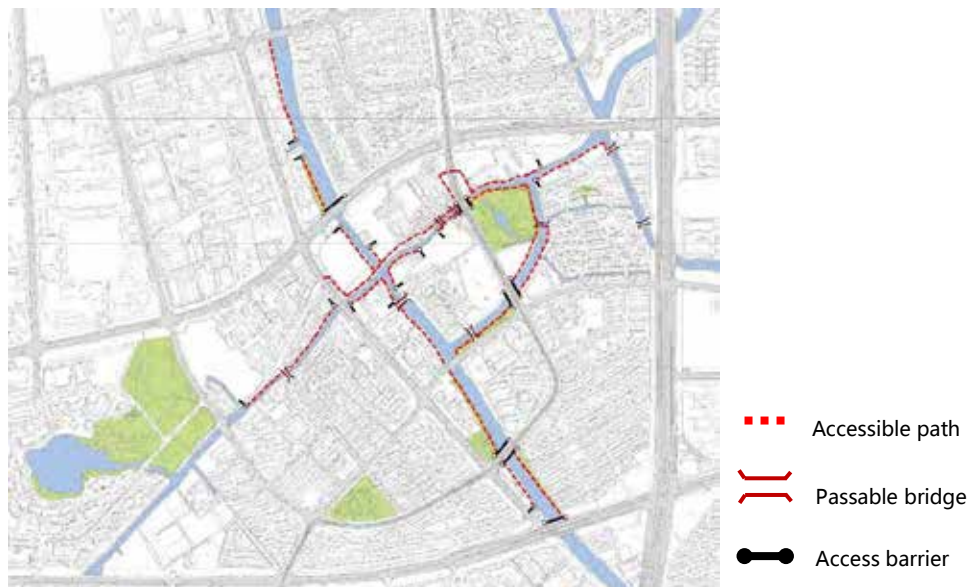


Figure 12 Analysis of the Traffic Situation between Ma Jiazhen and Lu Jiayu

Second, the river bank line is simple and lacks design, and the waterfront space is difficult to get close. Take the Majiabang River River passing through Zhangjiang Old Street as an example. The south side of the eastern section of the river is Guanglan Park. Combined with the streamline design of the park, the walkway and the hydrophilic square are set up in the waterfront space, and the space is relatively open. On the other side of the Guanglan Park, the embankment is relatively simple, with fences as the mainstay. Although the passage space of the old street waterfront was preserved, it was undesignated and the vegetation was overgrown, which made it impossible to get close. In the important urban core area, the waterfront area is a place where vitality gathers. But in the non-core area such as Zhangjiang Old Street, the waterfront space exists only as the “back of the street”, and the waterfront space is neglected and becomes the edge of the city. (Figure13, Figure 14).



Figure 13 The difference between the two sides of the Majiabang River River is obvious



Figure 14 Straight shoreline with vegetation

4. Design strategies of waterfront space: reuse and vitality

In order to preserve the spatial pattern of the water town of Zhangjiang Old Street and enhance the vitality of the waterfront space, we designed the area around the cross-shaped river formed by the Lujiayu River and the Majiabang River River, covering an area of about 33 hectares. A design response strategy is proposed for the waterfront space. The land includes Zhangjiang Old Street and some Zhangjiang Townships built after the 1990s. Existing buildings are dominated by industrial, residential and businesses. It is hoped that through the planning of space design techniques and theme functions, the waterfront space of Zhangjiang Old Street will be activated, thus driving the regeneration and development of the entire area.

4.1 Public function is concentrated in the river

Science and technology is the eternal theme of the development of Zhangjiang area. In the vicinity of the design scope, there are software parks based on R&D and innovation, as well as industrial parks that focus on parts processing and manufacturing and have future transformation and upgrading needs. However, there is a lack of places around the base for R&D personnel to rest and exercise. In addition, the surrounding cultural atmosphere is relatively strong. Zhangjiang Drama Valley, Zhangjiang 368 Cultural Industrial Park and

Changtai International Cultural Center are located in the Zhongshi unit, but these cultural industries lack a platform for export and publicity, resulting in insufficient influence. Therefore, we consider implanting technological innovation and cultural creativity related functions in the base to gather public functions to the river. The waterfront space serves as a space carrier for the external display and activities of the creative experience function, and promotes the regeneration of the riverside space with diversified functions.

Create a common core of science and technology at the intersection of rivers. The Chuangzhi Square, the Game Interactive Hall, the Comprehensive Experience Hall, and the Binhe Park are arranged around the river intersection to form a public activity center. The Chuangzhi Square on the west side is the main place for undertaking various kinds of performances. It is also a place for residents and researchers to exchange and gather. In combination with the outdoor space of the Exhibition Center, various technology product launches, creative markets and roadshows can be held. It is also a great place for watching the waterfront landscape. The north and south sides are equipped with small-scale buildings, which is a continuation of the old street texture. They allow small and micro enterprises to interact and experience offline and attract people. On the east side, a riverside park was designed as the most concentrated public space in the entire area, allowing busy people to relax and enjoy the natural beauty after work.

On the east side of the science and technology public core is the reserved Zhangjiang Old Street area, along the river to form a waterfront business district based on casual dining, and join the retail, experience, old street memory hall and other functions. Further to the east is the commercial service and leisure area formed by the Guanglan Road subway station. While continuing the function of the old street, it also adds functions such as parent-child activities, shopping and entertainment, and provides corresponding supporting facilities for the surrounding communities. On the west side of the science and technology public core, the current building quality is good. The main problem is that many closed blocks are formed due to the barrier of the wall, and there are more negative spaces. Therefore, the micro-update method is adopted to sort out the stock space, and the waterfront landscape is infiltrated into the area, and sports activities facilities and leisure plazas are arranged in places with large space as places for residents' activities.

Three theme routes are planned, which are the Old Street Discovery Tour, the Kechuang Experience Tour, and the Leisure and Recreation Tour. The public nodes besides River are connected in series to create a communication place (Figure 15).



Figure 15 Theme tours and public events

4.2 Reconstructed River Street Space

Due to the acceleration of the construction of the new town, the original river street space of Zhangjiang Old Street has been destroyed, and the modern waterfront space is obviously not suitable for this historic land. By combing the existing architecture and space texture, we summarize the past river-street relationship of Zhangjiang Old Town based on historical images, hoping to rebuild the river street space and continue the traditional space pattern of the old street. According to the existing building quality, the buildings that need to be demolished and can be reconstructed are selected, and new buildings are implanted to bury the damaged space. The original space texture of the old street is restored and continued. Some of the waterfront space design direct waterfront commercial interface, enhance the accessibility of the waterfront space, and form a continuous pedestrian street on both sides of the river bank. Thus, a building-street-river-street-building spatial relationship is rebuilt(Figure 16). The bridgehead is designed with a relatively small open square to form a small public node in the neighborhood. The riverside combines commercial buildings to form a good leisure and commercial space. The outdoor teahouse and viewing platform are set up to reshape the traditional watertown atmosphere.



Figure 16 Spatial relationship of river and street in Zhangjiang Old Street

4.3 Shoreline design for different people and functions

The waterfront space adopts a differentiated design approach to the functions of both sides of the river to create a variety of waterfront space forms and meet the needs of different groups of people. The shoreline can be divided into four sections according to its functions: the living section on the west side, the river intersection section, the Zhangjiang Old Street section, and the Guanglan Park section.

The living section on the west side: the riverside is dominated by talent apartments, commercial and residential areas, and the living atmosphere is strong. The riverside creates a community atmosphere and increases the space for residents to do some activities. The original single straight shoreline is partially widened to form a multi-layer retreat, and a continuous two-story water walkway is provided in combination with the two sides to provide a venue for fitness, leisure, and community activities (Figure 17, Figure 19).



Figure 17 Waterfront perspective of the living section on the west side

The river intersection section: At the intersection of the two main rivers-Majiabang River and Lvjiabang River, it is the most crowded place for crowds. Therefore, it is necessary to design a shoreline with a high degree of publicity to provide outdoor activities and make full use of the waterfront. The landscape creates a vibrant and open atmosphere. Design a shoreline form that is open to the surface of the water, and maximize the provision of a hydrophilic space by adding sunken plazas, waterfront terraces, and stepped slopes. Part of the waterfront building has a roof garden that provides a rich view space in the vertical direction (Figure 18, Figure 20).



Figure 18 Waterfront perspective of the river intersection section

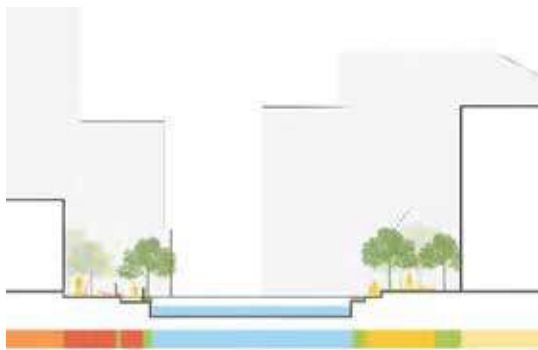


Figure 19 River section of the living section on the west side



Figure 20 River section of the river intersection section

Zhangjiang Old Street section: There are many commercial buildings on both sides of the old street, and the shoreline has been redesigned. When the street is indirectly facing the river, it is completely open space. When the building is directly facing the water, the street is a semi-open space on the inside and becomes the backyard of the waterfront shop. The two ancient bridges, Zhong'an Bridge and Taiping Bridge, are restored, and the landscape and the directly hydrophilic steamed buns are intertwined to form an ecological and artificial mixed coastline. The traditional waterfront forms such as Shantou, plank road and wooden bridge are used to

link the waterfront street with the Lvjiabang River. The riverside space occupied by the residents is designed to open to the public, forming multiple riverside parking spaces and reshaping the atmosphere of Zhangjiang Old Street. (Figure 21).

Guanglan Park section: The south bank of the Majiabang River on the east is Guanglan Park. The landscape resources are good and the flow of people is dense. It is in stark contrast with the landscape on the north bank. The waterfront space between the two sides lacks contact. Design a waterfront revetment that is partially open to the river and form a contrast with Guanglan Park. The tour line in Guanglan Park is also close to the river. The hydrophilic platform is added to the narrow river. People can directly enter Guanglan Park from the north side, which also enhances the accessibility of Guanglan Park and the radiation capacity to the surrounding area. (Figure 22).



Figure 21 River section of Zhangjiang Old Street Section



Figure 22 River section of Guanglan Park section

4.4 Pay attention to walking space

The entire area requires people-oriented, paying attention to the walking experience and weakening traffic. The internal roads are dominated by narrow urban roads, and landscape and lifestyle roads are preferred. The two main rivers are the main open space streamlines, extending the public corridors, connecting the Guanglan Park and the Zhangjiang Theme Park on both sides, and infiltrating into the surrounding areas to increase access to the waterfront space to form a public space network(Figure 23).



Figure 23 Walking space system

5 Conclusion

Zhangjiang Science City is an outstanding representative of the construction of Shanghai new town, but there is still a phenomenon of low vitality in the north, and there are problems such as insufficient supporting facilities, lack of street life, unused waterfront space, and destruction of cultural memory. This reflects the lack of humanistic care and quality in the planning and construction of the new town. Zhangjiang Old Street bears a long history of Zhangjiang area, and the change of its waterfront space reflects the change of urban construction to the spatial pattern of old towns. Through field research, we found that the waterfront space in the Zhangjiang Old Street area currently has problems such as poor accessibility and simple bank line, which leads to the lack of waterfront space vitality. In view of the above problems, we proposes a redesign of the waterfront space with four strategies as follows: public functions to be concentrated in the river, shoreline design for different people and functions, and pay attention to walking space. We hope it can activate the entire Zhangjiang Old Street and even the Zhongshi unit.

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