

Discussion on the Planning and Design of Waterfront Space- Take Shanghai as an Example

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Abstract. Waterfront green spaces are valuable natural resource of the city, which has the functions of purifying air, cleaning waste water, maintaining water source and improving the climate environment, and it is an important part of the urban ecological lung and ecosystem of ecological city. This paper summarizes the water + plant model and plant + plant model as typical representative of the spatial pattern of the Suzhou River waterfront. The visual space created by this model is more flexible than other modes when creating a path. It has a sense of space: and can form a richer and more diverse landscape space through the combination of landscape elements and various entertainment facilities. This research is a useful supplementary means to explore the coast of Suzhou and Shanghai and as a reference and guide for coastline design and landscape improvement.

Keywords: ecological corridor; recreation; link; water green belt.

1. Related Concepts of Urban Park Waterfront Plant Landscape

1.1 The Concept of Urban Park

Nowadays, the garden form of "urban park" was developed on the basis of the public gardens of the old city. In 1857, American landscape designer F. L. Olmsted designed and built the first truly urban park-Central Park. He gave the grass, woods, water, various natural landscapes and rich activities to this park, and made the park become green lung for improving the urban environment. Later, due to the huge influence of Central Park, the United States launched a city park movement, and it has a great impact on the world, and become a pioneer in the development of urban parks in Western countries. The early urban park inherited the style of the British natural landscape gardens, which introduced nature into the city through open space system, and it had spontaneous ecological awareness. With the aggravation of the environmental crisis, the ecologicalization of the living environment has attracted increasing attention. In 1971, UNESCO proposed the "man and ecosphere" plan, pointed out that urban construction should follow the basic principles of symbiosis between man and nature. With the implementation of the Man and Ecosphere plan and the rise of the western "green city" movement, urban parks have been given ecological connotations and are developing towards ecologicalization, and many urban eco parks have emerged. It can be seen that the definition of urban parks is not static, as a place to serve human beings; it should also continue to deduct new connotations over time.

It is clear that today's urban parks are green open spaces in high-density metropolitan areas, this activity provides residents with tourism, entertainment, and education that are coordinated with natural ecological processes and so on. The naturalized entertainment environment reflects the theme for achieving a win-win between humans and the living environment.

1.2 The Concept of Waterfront Green Space Landscape

"Waterfront green sscape landscape" refers to the natural complex of all vegetation in waterlines of given range of along specific structure. Due to its patchwork and rich organization, this type of natural complex gives green natural beauty, such as rhymes, lines and colors, enough space, and creates a pleasant landscape and lingering mood.

The waterfront green space is mainly composed of water grassland, moist green land and waterside, and green coastal land. Yu Shuxun believes that aquatic green land refers to "green soil that grows in the depths of fresh water or naturally floats in water, and sometimes appears in the green areas of the

swamp.” According to the living habits, growth characteristics and ecological environment of the water grassland, which can be divided into floating green area, floating leaf green area, green water area, sinking green area and marine green area.

The water grasslands used in this work are mainly herbaceous water grasslands and urban parks, because the blue water in the grassland shore area has high ornamental value. Generally, wet green space should be grassland that belongs to water: grassland, soil and green areas that grow in an environment with high or relatively high-water content in the atmosphere, which goes through the land environment and water environment. The intertidal greenbelt is mainly composed of medium green grasslands and ground grasses, which are what we usually call green areas, such as arbor, bush and ground. Today, parks are often use leak prevention for coastal green spaces, many green spaces are not waterproof and moisture-proof, they can proudly stand by the pool and plant green areas with water and wetlands.

2. Green Allocation in Waterfront Landscape Design

2.1 Green Allocation based on Ornamental Value

The water in urban landscapes, green spaces and water areas will be built in urban areas, form landscapes and ecological corridors, free areas of the water continent, and connect to the suburbs, form an important role in optimizing the ecological environment and landscape of modern cities. The importance of natural and aquatic plants is critical to the construction of urban green buildings. In urban green belts and urban waterfront water systems, it is important to consider the conservation and reconstruction of the water body itself and the ecological function and natural water systems that mimic the ecological and landscape continuity of water and land borders. On this basis, various aquatic plants are planted at the edge of the water body to form a natural and lush green landscape, a unique and healthy aquatic ecological river landscape is formed.

2.2 Green Allocation based on Ecological Value

The plants in the urban green belt not only have high ornamental value, but also absorb pollutants in the water, which is a natural cleansing agent for water bodies. Based on the marine habitat, this is a habitat formed by ecological coral reefs; the multi-architecture is water and coastal communities, it is a reasonable and rich and stable water belt for the cultivation and restoration of ecological landscape. People can enjoy the natural beauty of "blue waves, birds and flowers" and truly appreciate the value of the green space of water. The diversity of aquatic plants has gradually changed from land to submersion, and the layers are rich. In addition, the plant shape, leaf shape and flower shape of aquatic plants have their own characteristics. Due to the continuous increase and interactive nature of these aquatic plants, urban waters have become a vibrant ecological environment.

2.3 Significance of Urban Waterfront Green Space Allocation

At the ecological level, the natural factors of the water city green space create a harmonious and balanced development between people and environment; at the economic level, the green space of urban waters has high-quality entertainment and tourism potential, at the social level, the green space improves the livability of the city, and provides a stage for various social activities. In urban form, urban green space is critical to the overall perception of the city. Therefore, the urban grassland landscape of water must consider the combination of ecological effects, aesthetic effects, social effects and artistic status, and strive to achieve harmony of man and nature, city and nature.

3. Combination Mode of Waterway Interface Element of Suzhou River Waterfront Space

Suzhou River's old name is "Song River", also known as "Wu-Song River "; it comes from the Taihu and has about 125 kilometers. It is a tributary of the Huangpu River and flows through Shanghai

Qingpu, Jiading, Putuo, Changning, Jing'an, Zhabei, Hongkou, Huangpu, and plays a role in transportation, water protection and health facility. It has an irreplaceable effect: the length of the portion of the Suzhou stream is 53.1 kilometers, the river is about 24 kilometers away from the center of the city, and the width of the flux portion is generally 50 to 70 microns. The research scope of this paper extends from the Waibaidu Bridge to the outer ring segment.

The total length of the north-south coastline is about 40 kilometers. The Suzhou River is channel of the natural waterway is Shanghai, which organizes a series of urban waters, make citizens peace and can swim, other landscape corridors perform important tasks in flood control due to land use, the nature of development strength and the limitations of the floor, the water path in each section is clearly different from the water path, according to the urban-green-space classification criteria [18], and the field studies of existing flows along the Suzhou stream. Waterways are divided into four types: 1 water path, it either passes through city streets or directly adjacent urban road waterways, 2 waterways, which can be connected to each other as parking: part of the road network is adjacent to the green space in the water park, 3 water pathway: as part of the road network as a residential community in adjacent waters; 4 riverside paths: as part of way network of roads and institutions, such as creative parks, schools, warehouses, etc., and border waters.

Field surveys of various types of water trails and the distribution of various types of paths along the Suzhou River (Fig.1).

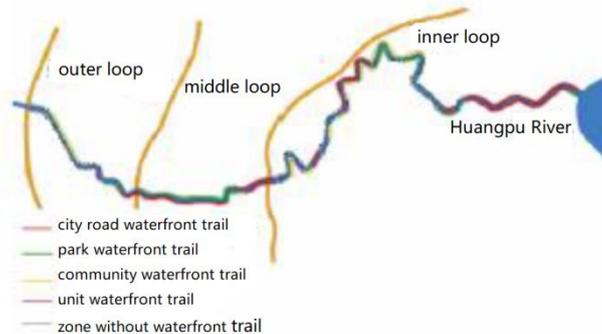


Fig.1 Distribution map of Suzhou River waterfront trail

On both sides of the waterfront, various interface combinations can be realized, which can generally include 2 categories, 9 sub-categories and 15 sub-categories. Different interface combinations can create different spatial patterns and spatial feelings, thus producing various activities.

3.1 Combination Mode of Interface Element of Waterfront Walkway

3.1.1 "Water + Plant" Interface Mode

It consists mainly of the water side (water surface) + the back-water side (plant). Due to the different plant combinations, this model can be subdivided into two sub-categories: the water side of the water surface is a broad water surface and the rear water surface is an infiltrated plant community for the closed plant community (Fig.2) or the backwater side of the riverside path (Fig.3), create a visual experience for the open water surface and support the water on one side or the other.

3.1.2 "Plant + Plant" Interface Mode

It consists mainly of the water side (plant) + the back-water side (plant). If the shore path is planted on both sides, then we can divide the space types generated by different combinations of different types. Open, infiltrated type, as shown in Table 5. The open mode means that at least one plant community type is a combination of shrubs and herbaceous plant communities, and the sight line can pass completely through the community and reach another region.

The infiltration mode means that the community combination pattern on both sides of the tree is arbor + vegetation, and the sight line can pass through the central community space to create an emerging visual effect (Fig.7-10).

3.1.3 "Water + Building" Interface Mode

It consists mainly of the water side (water surface) + the rear water side (building) (Fig.4). If the water side is open, then when the other side is under construction and the visual perception of the room changes due to the D/H ratio of the building. Section 2.4 introduces the space experience in detail.

3.1.4 "Water + Road" Interface Mode

It is mainly composed of water surface (water surface) + rear water surface (road). If one side of the waterfront is adjacent to the water and the other side is connected to the road, then there are two types, and the waterfront is flat with the city street. The board is taller than the city street, and the two forms of space feel very different: if the board is flat with the city street, the board is a transition between the city and the water, and their work with urban traffic has a certain meaning and function, and it is not safe when walking on the streets of the city, and the walking speed is relatively high, which is not suitable for landscape design (Fig.5). When the shore path is higher than the street in the city, the two floors form a distinct difference in the plane: the corresponding increased floor area of the waterway allows people to walk on it. There is a worrying mentality, which is worse in privacy and is not suitable for staying (Fig.6).

3.1.5 "Plant + Wall" Interface Mode

It consists mainly of the water side (open/infiltration unit) and the return water side (wall). If the water side is a plant and the other side is a wall, the space created by it has a certain amount of space, which causes the sight line to face the plant community and result in a more open water surface (Fig.11).

3.2 Combination Mode of Interface Element of Waterfront Walkway Without Water

3.2.1 "Wall + Road" Mode

It consists mainly of a side facing water (wall) + backwater water side (road), which has strong sight line; sight can lead to one side of the city street (Fig.12) residential district, a narrow green area of factory or a south road bridge-Tibet Middle Road (South Bank).

3.2.2 "Plant + Road" Mode

It mainly includes the water side (closed plant community) + the backwater side (urban street)
Realize traffic on supported city streets (Fig.13).

3.2.3 "Plant + Plant" Mode

It consists mainly of the water side (closed plant community) + the countercurrent side (plant), where the backstop is the combination form of plant communities.

The difference is that different spatial effects will occur: if the plant community on the backwater side is relatively closed, it forms a long and narrow cross path when the plant community is relatively infiltrated and open in the backwater (see Fig.14).

A one-sided guide cylinder type is formed (Fig.15).

3.3 Analysis of Water Visibility of Suzhou Riverside Water Trail

The visibility of water can be measured by the water level (see water): water is the ratio of the length of the water path to the total length of the path. According to paragraph 3.2, re-integration of water analysis and survey data for various types of hikers is available. The water level on the south bank is 91.7%, and the water level on the north bank is 84.49%.

"plant + wall" mode

It consists mainly of the side facing water (closed plant community) + the return side (wall). This type of path is relatively narrow and there is no landscape suitable for fast walking (Fig.16).

The main factors affecting the visibility of the water corridor on the north and south are as follows: the sight line cannot cross the obstacle, for example: if the fence is too high, the combination pattern

of the plant is too narrow, other buildings and other structures obstruct the view; if the green belt on the beach is too wide, the bank path is mixed with space and the sight line cannot reach the surface.



Fig. 2 Type 1



Fig. 3 Type 2



Fig. 4 Type 3

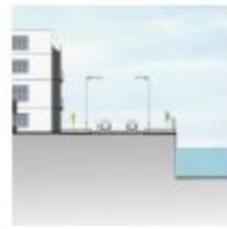


Fig. 5 Type 4

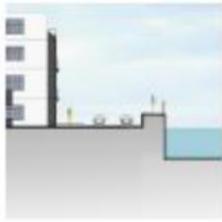


Fig. 6 Type 5



Fig. 7 Type 6



Fig. 8 Type 7



Fig. 9 Type 8



Fig. 10 Type 9



Fig. 11 Type 10

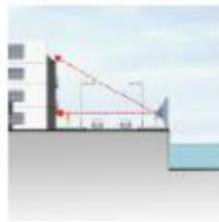


Fig. 12 Type 11



Fig. 13 Type 12



Fig. 14 Type 13



Fig. 15 Type 14



Fig. 16 Type 15

A scale diagram of each type of trail is obtained (Fig.17).

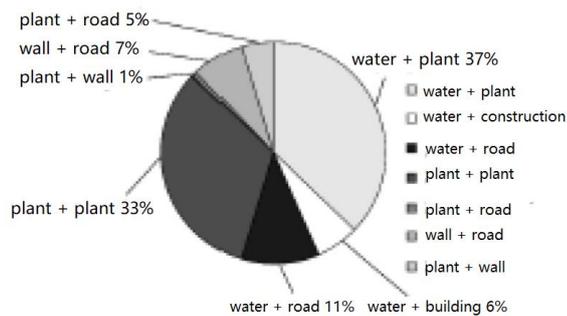


Fig.17 A scale diagram of each type of trail is obtained

It can be seen from the figure that the water + plant model and the water plant + plant model is 37% and 33%, respectively, which represent the main application types of water path design of the Suzhou River. The plant + plant model creates a more flexible visual space, unlike the other modes when creating a path. The sight line is easier to pass through, but has a sense of space, and can be used and promoted in the design.

4. Conclusion

The water grasslands used in this paper mainly refers to the herbaceous water grassland with high ornamental value in the bank area of urban park, which are mainly distributed in green water, floating leaves and floating grassland. This paper investigates the value of the green water landscape in the city's waterfront and draws the following conclusions:

(1) Urban waterscapes should follow certain principles, including scientific design, integrity and regional principles and artistic design principles.

(2) The green area around the urban waters has high entertainment value: the green areas on the water are artificial and natural, and the landscape allows the overlapping effect of the landscape to perceive the combination of human landscapes.

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