

A Brief Discussion on Urban Waterfront Landscape Design under the Healthy Landscape Perspective

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Abstract:

On the one hand, while the modern urban pains like garbage siege, ecological fragmentation and waterlogging push people to the extreme isolation from nature, it makes people more longing for the green hills and blue waters in cities as well. On the other hand, the traditional Chinese culture never treats nature as human's opposing alien, but regards the two as an inseparable integrity, and only when human's behavior conforms to natural principle, can he maintain his healthy mental and social development. The waterfront space is an important composition of an ecological city, which plays positive role in upgrading urban ecological civilization and life taste, as well as promoting resident's mental ecology and emotional exchanges. This paper plans to start from the perspective of healthy consciousness to briefly discuss the planning and design of urban waterfront landscape by integrating the design practices of Wuhan Shahu Park around two dimensions of main healthy functions of waterfront landscape as well as planning factors and design strategies. It aims to upgrade a further understanding to the planning and design methods and their functional values of the modern ecological urban construction and waterfront landscape.

Keywords:

Urban Waterfront Space, Healthy Landscape Design, Design Method and Practice

1. Introduction

To live by water is human's essential needs. The waterfront space radiating charm is one of the most vibrant places in cities, attracting numerous citizens to visit each day. Its landscape environment poses significant impact on promoting the harmonious existence between city and nature, increasing people's emotional exchange occasions and fostering a lively habitat space. Therefore, in the modern urban waterfront landscape design, the past design methods at the cost of destroying natural resources must be discarded. This paper regards the important significance of waterfront environment on human healthy development is not gaining its due understanding, and its design methods should also be switched from ecological design to healthy design. This paper will elaborate in three aspects: the first part briefly discusses the healthy

significance of urban waterfront space. The second part will put forward the research focus of this paper, that is, the factor analysis and design thoughts of waterfront healthy landscape. In the third part, the author will combine part of the landscape space of Wuhan Shahu Park of Hubei Province in China to discuss the design practices of urban waterfront healthy landscape.

2. The Effect of Urban Waterfront Healthy Landscape

As to the west, the ancient Greek doctor Hippocrates is the first to notice diarrhea might be linked to the city's waters and soils. After the industrial revolution, faced with a series of urban public health crisis caused by water source pollution, the UK promulgated the first urban health act—Public Health Act in 1848. Later Howard also proposed the Garden Cities, hoping to introduce the water from rivers and lakes into cities and combine with city's Greenland to build an urban form existing for healthy living and industrial development. In the 1960's, after the survey of the relationship between city's air tank and city's health and pathology, the ecological design pioneer McHuck found the urban environment was closely related to its citizen's health, he thus thought the essential purpose of ecological design was to “create—fitting—health” [1], and the urban waterfront space should be especially protected and used to exert its healthy effect of ecological environment. The American landscape designer Simmons also thinks that we should fully use the landscape resource advantage of urban waterfront environment on the basis of water resource protection by integrating the blue lanes into city's Greenland and doing well the microcirculation of the whole water area of the city to provide citizens with a green waterfront space [2]. Around 2012, the Landscape Art and Human Health Laboratory (LHHL) of the University of Illinois directly prove with evidence that Community outdoor landscape can play a positive role in curing depression in boys and the bedroom green environment out of the window also does a lot in improving girl's discipline ability [3]. Because of this reason, the modern urban landscape in countries in Europe, America and Japan generally has strong healthy consciousness and humanistic concern color.

What is different from the west is that in Chinese culture, nature is never to be a subject to be controlled and transformed, and waters and mountains are also closely related to human's materialistic and spiritual lives. According to the traditional Confucianism, "mountain" is the symbol of political morality that all people admire, and "water" is the best symbol of benevolence, righteousness, propriety and wisdom. And the ideal life realm is “the wise is happy with water, the benevolent loves maintain; the wise men are happy, the benevolent men live a long life”. So the traditional Confucianism advocates reaching a life realm of perfect beauty and perfect kindness through the aesthetic experience in waters and mountains. The traditional Taoism also believes the “coexistence of man and nature”, “The foundation of life is Yin and Yang”, so that man and nature are actually one entity. For that reason, his ideal life realm is to hold the spirit and stick to the shape to “occupy oneself with the spirit-like operation of heaven and earth” with a clear, modest and quiet heart. These thoughts have contributed to the basic pattern of Chinese traditional human settlement environment, which is “be situated at the foot of a hill and beside a stream” and “movable and habitable”. In addition to the influence of Taoist and medical thoughts, people also attach great importance to the positive role of natural health factors in the construction of cities, settlements, gardens, houses and other activities.

After rapid urbanization construction, the number of urban residents is 770 million in China. Compared with rural areas, cities have some considerable advantages, such

as cleaning water sources, fast transportation, sanitation, education, health care and other public services. Therefore, cities will be the best carrier for implementing comprehensive health management. On the other hand, in recent decades, under the efforts of Chinese government, the positive correlation between expectancy average life and urban population ratio is becoming more significant with the proportion of urban population increases (Figure 1). The life quality and cultural taste have become the main content of the modern urban construction. From the above views, the main health functions of urban waterfront landscape are followed.

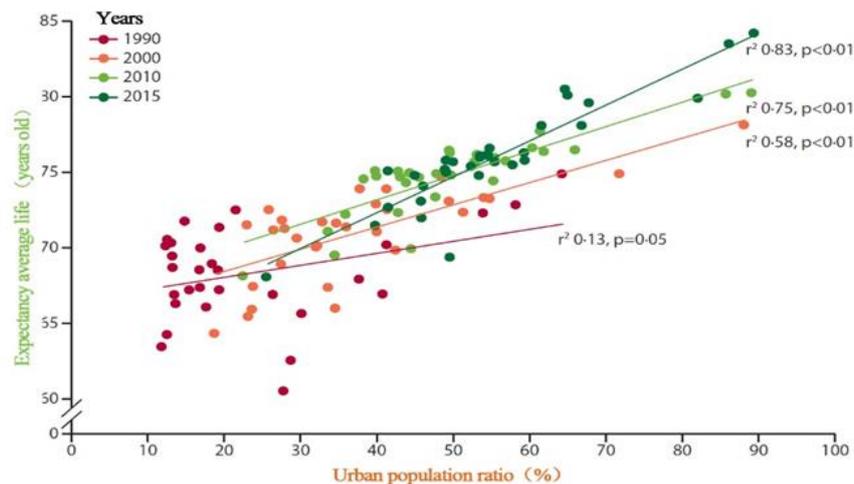


Figure 1. Expectancy average life and urban population ratio in China, 1990, 2000, 2010 and 2015. Data source: China National Statistics.

2.1. Healthy Life

The landscape environment acts on human body mainly by physiological and psychological effects. In terms of physiological part, human's metabolism and energy exchange cannot be completed without the exchange with nature, and his life activity can also be continued with the dynamic balance of nature. Huangdi's Internal Classics is to summarize the relationship between man and nature with "Man is born of the spirit of heaven and earth, and is made by the method of four seasons [4]. The traditional Chinese pharmaceutical culture thus regards human body a natural small world, which will have natural physiological reactions to external environmental changes. Therefore the traditional Chinese culture believes the way to health is to be natural. In psychological part, the ancient Chinese savants believed green hills can be "compared to morality", blue waters can "make the spirit happy", and nature is human's permanent spiritual reliance and psychological comfort, especially the supreme soft and kind water has long been regarded by the Chinese as a common symbol of life between society and nature. The classical garden, which integrates the essence of Chinese traditional culture, is a typical space for respecting nature and giving full play to natural health factors, with the high and low scattered rockery, winding waters hidden in the woods. The artificial architecture and natural interest reflect each other, the indoor and outdoor environment mutually borrowing and infiltrated. Environment with small bridges and flowing waters pays much attention to the physical and health needs of people; the introduction of large amount of natural factors makes people close to nature. Various forms of pavilions and walls are also advantageous for the ventilation and light of space and creating a good micro ecological climate. In this way, the healthy landscape meaning of relevant adaptation of human body to natural environment is interpreted so cozy and moving.

2.2. *Healthy Living*

Health is not only a way of life, but even an artistic mind. Under the circumstance of rapidly increasing of city population and ever differentiating social strata, human's material needs are constantly satisfied, but their mental world is experiencing subtle transformation. The relation between man and nature, ego, others and society has been increasingly remote and plain. "Man himself cultivates himself into fragments" [5], because the perception and rationality are constantly estranged makes them difficult to feel happy. Then what is the method to mend the gap? In fact the most simple and feasible method is to re-pick "natural aesthetics". After all, man comes from nature, and nature gives people not only production and life materials, but more relies human life emotion, only if man reflects his personal feeling into nature, nature would then be "feelings are like gifts and pleasures are like rewards" [6], making people have affirmative value experience. The waterfront space of floating sky and supporting earth is a medium and platform for the interaction between man and nature, man and society. The rhythmic beauty, the rhyme beauty, the heterogeneity of plant communities, beautiful colors, the interpenetrating flowing beauty and glossy beauty of waters and Greenland is just like a "folk prescription" without toxic or side effect for human's physical and mental cracks. Here is the integration of man and scenery, waters and mountains are the externalization of self, the plums and bamboos are the healthy internalization. Having been together for a long time, it's natural to cherish things and me.

2.3. *Healthy Ecology*

The waterfront space is a common border between the urban land system and water system, and it is a buffer zone between natural ecosystems and man-made environment. It provides necessary space and place for the mutual conversion of material and energy among urban ecological system, having important ecological healthy function and significance. Not merely providing habitats for animals and plants, the urban waterfront space also combines multiple values in flood storage and drought prevention, regulation of microclimate, prevention of soil and water loss, conservation of water resources, purification of water quality and maintenance of ecological balance. It can be said the role that it plays in maintaining urban ecological health is similar to the "lung" and "kidney" of the human body.

3. Factor Analysis and Design Thought

3.1. *"Mountain" "Water" Reflecting Each Other*

The mountains and waters element or mountains and waters image is the main body and basic element of the urban waterfront landscape. Affected by the traditional Chinese longevity thought, long time ago, the Chinese classical gardens have attached great importance on the mountains and waters element. No matter it is the grand layout of the "one pond and three mountains" of the Jianzhang Palace in the Emperor Wu of Han, or the landscape interest of "the big house always goes to the village" of the Jiangnan gardens in Ming and Qing Dynasties, both are the life landscape with mountains and waters as the basis.

The scenic poem, landscape painting and mountain and water garden in the hands of the Chinese literary men is not only the condensation and summarization of the objects in nature, but also includes the author's deep life understanding and lofty moral pursuit. What they created is the natural innovation of the imagery of the place

of life. For example, Guo Xi of the Northern Song Dynasty believes that it's just because of the movable and habitable natural mountains are hard to get, so the main task of the landscape painter is to "imaginably create mountains and waters in movable and habitable places", making more people experience the healthy effect and aesthetic value of them without leaving their houses. The specific method is: "Mountains, big things, their shape desires to be tall and straight", "Water, living thing, its shape desires to be deep and quiet", "Mountain takes water as blood, and water takes mountain as its face". He further proposes that only through this creation method, people viewing the scenery can be "carefree", "cultivating a broad mind", arise spontaneously an "amiable, upright, gentle and faithful feeling" [7], thus reaching a healthy state of "neutralization" between the body and the mind. This creation concept and aesthetic experience of "the mountains and rivers are pleasant to live" is also having enlightening meaning to modern urban waterfront landscape planning and design.

In design, the layout can be reasonably laid according to the status-quo of places. When you have mountains as well as waters, you should try as much to use the natural landscape resource by creating a landscaping environment of the path winds through high peaks and feelings of frequent gaze. When you have waters without mountains, you might as well take tall buildings as the background, water as the midview, flowers and trees as the foreground by building landscape based on existing site conditions. Or you can borrow the landscape imagery from what Wen Zhenheng (Ming Dynasty) was written "stone makes man ancient, water makes man in distance" by adeptly laying the combination of "stones" and "water" to create a microscopic landscape form of "a stone can see the rigidity and precipitousness of Huashan Mountain, a spoon of clear water can show the surging majesty of the ten thousand li rivers" [8]; As to places with neither mountains nor water, you might flexibly plan to build the landscape imagery of the traditional theory of geography "an inch higher is mountain, an inch lower is water", you can also get good landscape result.

3.2. "Road" "Bridge" Interaction

Road and bridge are the framework and vessel, which can support and connect the whole scenic spot. As to garden road design, the literary man of the Qing Dynasty Li Liweng believed that "Convenience is the most important for a path, but the subtlety of it lies in its winding" [9], which adeptly indicates the points for the landscape design of waterfront roads: the main road should be straight, and the auxiliary road should be winding. The straightness for main road is for its rapid passing; the winding of auxiliary roads is for its sightseeing. If starting from health care, then auxiliary road (footpath) design becomes the key for garden road design of waterfront landscape.

Traditional Chinese pharmaceutical culture has it that "Both spleen and stomach belong to the earth; the earth needs mobility, because in this way the earth can be generated, if not mobile, it will not be generated... From this, we know that spleen and stomach must have mobility to keep in good health." ([Ming Dynasty] Wang Kui Yihai Collection•Human Body Classification) The health preserver expert Cao Tingdong of the Qing Dynasty also said "Walking is for muscles and bones, if we walk, then our muscles and bones are stretched, then our four limbs are healthy" [10]. The winding footpath means longer walking and exercise route, longer sightseeing time and more visitor capacity. In terms of landscape significance, the beauty of mountains cannot be reached without paths and cannot be obtained without travelling. The ancient literary men climbed mountains, entered deep woods, exhausted in

streams, with cloud veil and Tao cloth, bamboo sticks and went to the farthest places; outskirts outing, lakeside drinking, they were immersed in “walking” because they regarded walking as vehicles. The winding footpath can bring people richer landscape change, more diversified landscape feeling and experience. Bridge is the extension of roads, which is the link connecting water and land space. The unique bridge itself is a scene. Combining with garden road design can often get unexpected landscape effect.

When designing, the road width and detour coefficient should be considered. The width of main footpath can be about 2.25m and the detour coefficient should be controlled within 1.5 times to satisfy pedestrian’s rapid passing needs. The secondary footpath should be won with windings and undulations, the width can be controlled about 1.5m, and the detour coefficient can be expanded about 3 times to extend the sightseeing route and increase the landscape vertical change. Besides considering walking starting point and destination as well as controlling detour coefficient, road landscape should also provide the safe and convenient passing environment, diversified sightseeing and social experiences. Special attention should be paid to use the architecture corridor, tree shade and green isolation to provide weather, safety, noise and pollution protection measures.

3.3. “Fishing” “Woods” Grow Together

Animals and plants are the dynamic factors in waterfront landscape. Many animals and plants are pinned on the good hope of Chinese people's pursuit of a happy and healthy life. Diversified floras are interdependent and interacted, which can exert multiple functions in improving city’s small climate, purifying air, reducing noise and nourishing water and soils. When designing, attention should be paid to the utilization of the associated relationship of animals and plants and the landscape creation of local plants, which can effectively improve the ecological efficiency of the landscape and reduce the cost of construction and maintenance. In the aspect of landscape nodes, vertical arrangement of plants can be used in combination with landscape architecture and themes to light up, so as to activate the spirit of the place, and to obtain the landscape effect of “warm the whole body with Qihai Point”. In terms of linear landscape, tall trees like weeping willow, camphor, purple bamboo can be planted along the lake or road and many aquatic plants to outline large space lines such as road lines, water lines, and skylines. The plane space can be combined with the design of small exercise square and open forest lawn to actively guide people for sightseeing and exercise to communicate and interact, so as to create a lively occasion of frogs everywhere in lawns and ponds and the intimate interaction between people and nature.

4. Creating Exploration and Design Practice

The site selected for this project is a near lake area in one university at the northwest side of Wuhan Shahu Park, which is an urban central area with the total planning area of 45,000 m². The purpose is to give full play to the radiation effect of ecological civilization and health culture of Shahu Lake, the only lake in the inner ring line of Wuhan City. It can be seen from the analysis of Figure 2 that tall buildings are everywhere around this area, and the internal closed waters are polluted seriously, with piles of construction garbage. The conflict is very prominent between people’s “Hard to see the lake although near it” and high expectation of outdoor water-loving activity. The site selection here can take the green basin effect of the place as an aid to actively attract the surrounding college teachers and students and five community

residents to the garden area, so as to realize multiple values and significance of urban landscape and improving urban ecology and integration of urban life.

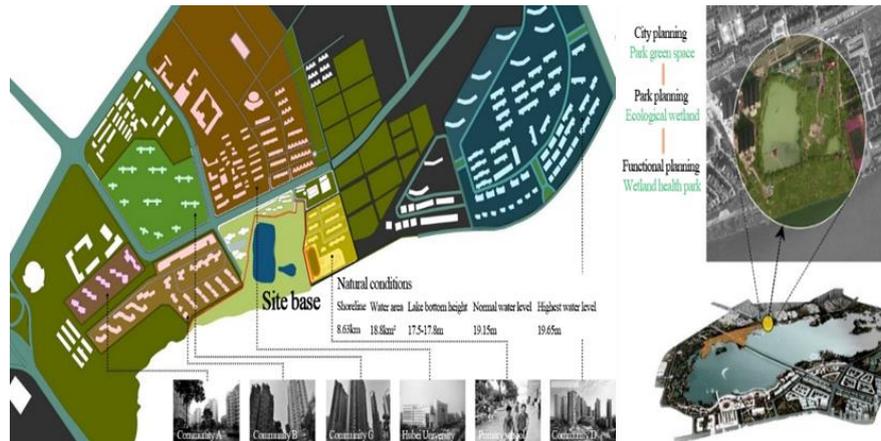


Figure 2. Planning base status-quo and upper planning research, Drawn by Li Jialiang.

4.1. “One Axis and Three Districts” Linkage Community

An important characteristic of urban waterfront landscape is to create public space, so it has important ecological and social functions. The analysis of Figure 3 shows that the available green space in the site is mostly patch distributed, so it is difficult to form the main scenic spot by using it as a whole. For that, this plan takes the design strategy of one axis linking three districts by building a main landscape axis to connect the spotted Greenland scattering around the lakeside and community, which improves the continuity and wholeness of the place landscape. The garden area entrance and waterfront experience dock are as both ends to act as the arc landscape main axis to series connect three scenic spots, namely garden experience district, healthy and leisure district and wetland walking sightseeing district from top to bottom to form an encircling space for people to enter the scenic spot. The time for nearby residents to reach the park on foot is generally not more than 10 minutes, Wuhan citizens can also make use of urban public transport to quickly achieve. In addition, surrounded by tall buildings and less parking space, this also advocates a green way of travel.

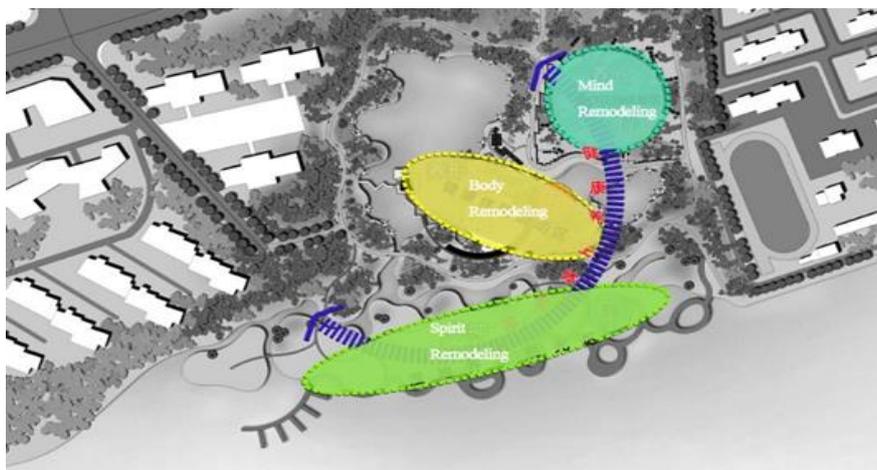


Figure 3. One axis three districts space layout. Drawn by Li Jialiang.

For the treatment of the three scenic spots, this plan also strengthens the function and value of the urban landscape as far as possible from the healthy consciousness

point of view of. For example, the garden experience district mainly uses herbal flowers with the effect of improving collateral circulation and Qi running to dissipate blood stasis, like canna, carnation, paulownia, China rose and chrysanthemum build the flower mirror, flower pond and flower belt to reach the effect of a healthy body of “fragrant flowers treat hundreds of illnesses” by human’s sense of smell experience to relax. As the major activity space, the healthy and leisure district is composed of pebble pavement, sports equipment and health themes, to make it convenient for people to massage feet bottom, chatting and exercise, talking and interacting here. The wetland sightseeing district mainly consists of wooden trestle bridge lying on the lake. The linear space of the winding loop allows one to breathe fresh air from the lake while enjoying the water view. The larger detour coefficient can also provide walking space with both landscape effect and exercise function. Through this design, not only the surrounding universities and communities are connected into one, but also the quality of life and cultural taste in the urban area are improved.

4.2. “Mountain Water Reflecting Each Other” to Restore Ecology

As mentioned earlier, the original enclosed waters inside the place have green algae everywhere; the construction garbage is piling up like hills on the sides in order to avoid secondary environment pollution and save building cost, this plan adopts a design strategy of the in-place ecology restoration. Regarding the construction garbage inside the place, because they have no toxic or harming effect, and will not generate pollutants like leachate and biogas as the domestic garbage does. Because of this reason, the design group takes a method of in-place piling up hills for landscaping. That is, the landscape construction is conducted after covering a layer of about 40-50cm thick clean soil on the original construction garbage, thus forming a continuous hilling landscape and saving a large sum of garbage treatment cost. The north side of the place is the highly dense street buildings; on the contrary, this can block the northwest cold wind in winter. In rainy, snowy or foggy climate, it can unexpectedly harvest the “mountain outside of mountain” landscape image, whereas the southern wide lake can make the scenic spot better receive winter’s warm sunshine and breeze in spring and summer.

Based on this environmental advantage, when we treating the internal closed waters, we don’t adopt the conventional practice to fill it to finish it, instead, we rather cherish the existing site mechanism to make it as the rainwater garden to be restored and used and to purify the original waters with the aid of multiple effects of soils, plants and microorganisms. Meanwhile, this plan also takes the design concept of the sponge garden area to respond to the current urban waterlogging to systematically build the ecological water system landscape by way of using permeable surfacing, rainwater garden water retention, and wetland plant water purification. As the mobility of water cycle is improved, the water quality is purified as well as a rich waterscape form is fostered.

To avoid the sudden switch from water surface landscape to land landscape, this plan sets five independent ecological floating islands between the two as the obstructive scenery transition and ecological linking space. In this way, the water purification of aquatic plants can be strengthened to provide habitable place for wild small animals, and the landscape space with more pleasant size can be formed. Regarding water depth, the shallow water is controlled within 40cm as the major water-loving area, whereas the deep water is pre-embedded with Taihu stone to be isolated from the shallow water area. The wooden footpaths are all equipped with

high and low double guardrails and handrails, lighting and weather protection facilities to facilitate the safety and water-loving of people.

4.3. “Road Bridge Interlinking” to Activate Life

As users in waterfront landscape mostly take walking as the exercise mode, so the tone for their road landscape should mainly be light and comfortable. The road landscape design of this plan is to try as much the original landform to wiring along the lake shore by adopting a serial road structure in whole to stress a kind of open vision linear flowing aesthetic experience. In order for the passing of the elderly, wheelchairs and baby carts, the wooden trestle bride of the water loving district is also this “integrated chain” gentle design, with the purpose of reducing the man-made sabotage to the lakeside wetland ecological system to increase the length of touring line and comfort of walking experience (Figure 4). The laying materials mainly use the natural materials like gravel, sand, pebbles, and embalmed wood, because they have a warm texture and strong touching effect, and walking on them can have very strong massaging effect.



Figure 4. Integrated chain road bridge space. Drawn by Li Jialiang.

In addition to stressing humanistic design, the urban waterfront space should also actively advocate urban healthy and happy way of life. We can see from combining the design of Figure 5 that in order to highlight the health theme and innovative color of that urban waterfront space, this plan also planned and designed a variety of easy “exercise equipment” at both sides of streets by road guardrails, landscape seats, Chinese traditional health culture propaganda and warning board actively for the convenience of the college teachers and students as well as community residents coming here to stretch their waists and shoulders, press their legs or hit their backs at any time to easily carry out various simple exercises to ease the stressful work and study pressure. On top of that, the landscape laying patterns inside the garden area also combines traditional Chinese health culture to be designed. While this activates the pavement, it also increases the healthy cultural atmosphere of the road landscape. Through the design like this, it not only effectively expands the social public and educational functions of the urban waterfront landscape, but also opens a healthy road connecting the ancient, present and future for the city in a minute way, thus making people create strong cultural identity and deep spiritual attachment to this space and the city where they are in.

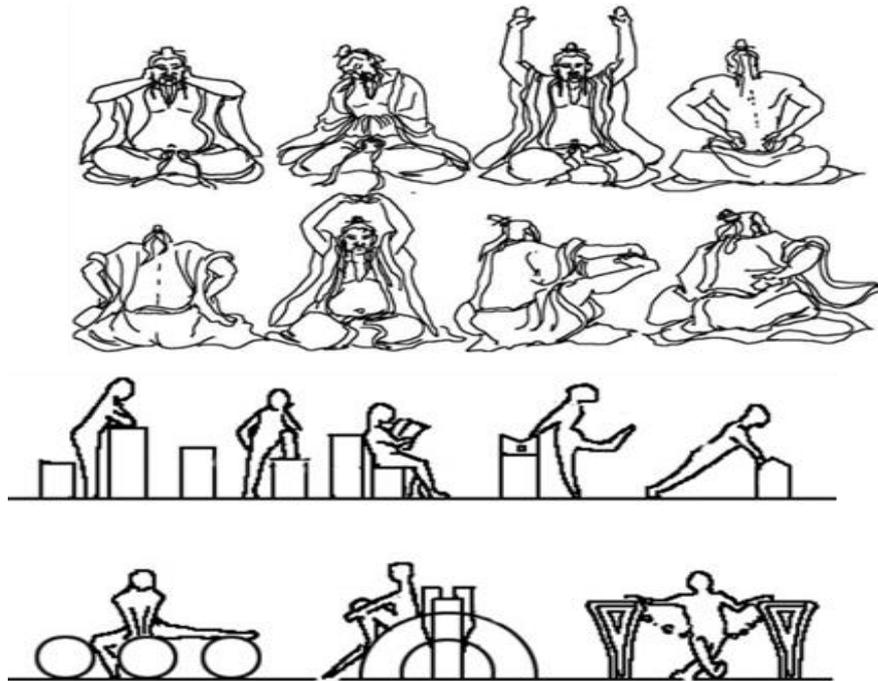


Figure 5. Traditional exercises “eight-section brocade” and simple exercise equipment by using isolation belts. Drawn by Pan Feng

4.4. “Fishery and Forestry Interdependence” Highlighting the Theme

In order to resume the lakeside wetland ecological function, this plan establishes three layers of plant purification barriers (emergent aquatic, floating and submerged) in the waterfront area. For example, emergent aquatic plants like acorus calamus, typha and reed can secondarily purify the water quality. Black algae, goldfish algae and so on can adapt to the environment of running water and play an important role in absorbing sewage and purifying water. Appropriately throwing in aquatic animals like crucians, carps and frogs can reduce the breeding of mosquitos and provide nutrition for plants, as well as attract little animals like birds to come here to rest. In order to strengthen the health theme of the place, we also try to combine the element image of traditional Chinese Medicine Theory of Tibetan Images by combining red (heart fire), yellow (spleen pertaining to earth), green (liver), white (lung) and black (renal water) to set up many health-themed plant areas, landscape sculpture and sketches in the garden area to light up the place spirit of this space. Cinnamon orchards, lemon orchards, clove gardens, pine woods, and a large number of native plants inside the place can also play a positive role in ecological health. For instance, they can kill the endemic bacteria in the air; reduce dust and pollutant content like volatile organic compound (VOCs), NO₂ and SO₂. Compared to other types of urban landscape, waterfront plants are also more likely to release more negative oxygen ions under the action of water molecules. Experiments show that this ion has curative effect on diseases like most anxiety, depression, asthma, respiration, skin and neurosis. The application of a large number of native plants can also play a subtle role in conserving soil and water, regulating urban microclimate, purifying air and so on.

5. Conclusions

As a result of our experiments we concluded that:

I. Faced with a series of city problems like haze pollution, ecological fragmentation, garbage siege and waterlogging, as an organic composition of ecological city construction and an important occasion of healthy and happy life, the planning and design of landscape should actively respond to the above problems and people's actual living needs.

II. Waterfront landscape has multiple functions. We must help people to be close to nature to resume an active mental and physical state harmoniously. It is a beneficial attempt to explore how to strengthen the interaction and integration between the urban waterfront landscape and the surrounding communities from the perspective of healthy consciousness, especial to restore and improve the original ecology, inherit the culture and to serve the construction of the urban spiritual ecology.

III. The traditional health culture, which included in the excellent traditional Chinese culture, is not a load for modern city or social development. On the contrary, they are exactly the source drive and stabilizer of China's ecological city construction and social economic development. The planning and design of the modern urban landscape should reasonably interpret and use it.

In summary, on the basis of fully exerting the natural landscape and humanistic landscape effects of the urban waterfront space, we should integrate the healthy humanistic concern into the finely created originality of ecological environment, contact space, no barrier facility, road landscape and facilities. Only in this way can we provide people in the "cement forest" with a warm and sensible affectionate space.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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