

Research on Sustainable Design of Public Facilities in Historical and Cultural Blocks

---Take the Improved Design of the Trash can on Yandai Xie Street as an Example

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Abstract

City is an important carrier for the development of human civilization, the historical and cultural blocks, as the most geographically and culturally representative areas in the city, have witnessed the historical changes of the city from ancient times to the present, reflecting the regional cultural and humanistic characteristics, the inheritance of the city's historical context, the display of local culture and characteristics of great significance. However, after a long period of baptism in the historical and cultural districts, some traditional districts once pursued commercialization, which led to the problem of environmental pollution such as old public facilities, unreasonable placement, unsightly appearance, and no reasonable garbage classification, greatly affected the overall landscape environment of the block. This article takes the Yandai Xie Street of Houhai Commercial District in Beijing as an example, combined with the concept of sustainable development, for the above problems, investigate and analyze the trash cans on the Yandai Xie Street, attempt to improve and enhance the environmental image of the block through the micro-environmental improvement design of public facilities, and promote the good development of China's historical and cultural blocks.

Keywords

Historic district; Sustainable development; Public facilities.

1. City under Traditional Development Concept

1.1. Urban Development under the Concept of Traditional Development

In the stage of industrialization promoting urban development, the urban population is growing rapidly and the urbanization process is accelerating, while making tremendous contributions to urban economic development, we often neglect the natural resources on which humans depend. People extract materials and energy on the earth with high intensity and discharge a large amount of waste into the ecological environment. Although urbanization has accelerated the expansion of urban scale, it has brought about environmental problems and people's quality of life, this has led to unhealthy conditions in the late period of industrialization, such as dirty, chaotic and poor people's living environment, insufficient value of urban space, and serious decline in land use efficiency. The rapid development of industrialization has greatly changed our cities and living spaces, while accelerating the construction of modern cities, China has gradually begun to increase the construction of urban public facilities, focusing on people's feelings in the urban environment. Public facilities are the carrier of urban civilization, an indispensable important constituent element in the city, and the detailed design of the city, they are of great significance for improving the cultural taste of the city, coordinating the relationship between people and the environment, and improving people's quality of life.

2. Sustainable Development Theory

2.1. Sustainable Concept

With the development of society, the improvement of productivity and the advancement of science and technology, humans have gradually transformed from relying on natural resources to consuming natural resources, this uncontrolled consumption of natural resources and unreasonable development and utilization have caused natural resources to become in crisis, the contradiction between human beings and resources is intensifying. The promulgation of "Future Earth-Global Sustainability Research Program" makes sustainability science a hot topic in global research[1]. In order to solve the contradiction between human survival and development and the environment, mankind abandoned the old development model and way of thinking and put forward the concept of sustainable development from the aspect of rational use of resources. The international community has also managed to translate the solutions to problems and conflicts into national strategies[2]. In terms of humanistic spirit, the concept of sustainability reflects the protection of historical and cultural heritage, promotes the continuation and inheritance of human history and culture, provides education on sustainable landscapes, and improves human awareness of land and the environment[3]. The goal of sustainable development is to achieve rapid economic development and protect all-natural resources and the environment while meeting the needs of contemporary people without compromising future generations.

2.2. Relationship between Sustainable Concept and Urban Development

The concept of sustainability is closely linked to urban development, the concept of sustainability is the premise of urban development, and the development of cities is the result of the concept of sustainability. China is a developing country, and its urban construction and management tasks are particularly arduous. In urban development, it is necessary to plan and construct cities based on scientific theories and guidance, urban development cannot only emphasize the concept of sustainability, but also care about the environmental capacity on the basis of science, on the basis of reasonable development of resources, seek methods and approaches that are suitable for China's national conditions to solve environmental problems, propose countermeasures for specific problems, so that urban development can achieve good economic and social benefits, thereby forming the integrity and coherence of the urban landscape environment [4].

2.3. Problems in the Sustainable Development of Beijing's Old City Blocks

As a representative historical and cultural city in the world, Beijing's protection of historical and cultural blocks is even more important and difficult, and public facilities are an important part of historical and cultural blocks, but in the process of urbanization, public facilities have not developed with the development of the city. The historical and cultural block is a typical external image of an ancient city, Yandai Xie Street, as a historical and cultural block, represents the unique humanistic style of the old Beijingers, and it is also an important tourist attraction that integrates culture, tourism and commerce. However, it is precisely because of the cultural and geographical characteristics of Yandai Xie Street that attract more passengers, and its own environment is inevitably damaged, the carrying capacity of public facilities is in an extremely unbalanced state, which seriously affects the local landscape environment. At the same time, it also has a negative impact on the image of the city.

3. The Current Status of Public Facilities in Yandai Xie Street

In recent years, with the acceleration of urbanization, the protection of historical and cultural blocks has attracted more and more attention, research on historical and cultural blocks is

gradually biased towards sustainable development and people-oriented. In a specific environment, people's visual and spatial feelings are increasingly valued. After investigation, the Yandai Xie Street has a total length of 232 meters, and the types of trash cans are divided into sanitation trash cans, smoke extinguishing comprehensive trash cans, and outdoor sorting trash cans. Among them, there are 4 sanitation trash cans and outdoor sorting trash cans. As one of the representatives of Beijing's historical and cultural blocks, Yandai Xie Street has its own unique features in the creation and production of public facilities. However, with the gradual rise of some shops, especially the increase in the number of gourmet shops, environmental problems have become more serious, and garbage such as bamboo sticks and paper skins can be seen everywhere on the street. The existing trash cans on the ramp of the cigarette bag are not only old and small in number, but also have problems such as an incomplete trash classification system and a lack of basic maintenance, its functionality and shape do not meet the needs and aesthetic standards of today's mainstream people, it is difficult to reflect its own regional culture, and it is not conducive to the sustainable development of the landscape, there is an urgent need to improve infrastructures such as cigarette slanting street trash cans and landscapes to improve the tourist experience of tourists, thereby improving the external image of the city.

The survey conducted a sample survey and quantitative analysis of the questionnaire, hoping to fully understand the views and feelings of the general public on the public facilities of the Yandai Xie Street. The surveyed population is very wide, including a total of fifty local residents, tour guides, tourists, volunteers, etc., and on the basis of this preliminary analysis of the questionnaire results.

Table 1: Questionnaire survey on the environmental protection and improvement of the landscape of Yandai Xie Street in historical and cultural blocks

Convenience of throwing garbage in cultural blocks	Excellent <input type="checkbox"/>	Good <input type="checkbox"/>	Bad <input type="checkbox"/>
The phenomenon of littering by tourists in cultural blocks	Excellent <input type="checkbox"/>	Good <input type="checkbox"/>	Bad <input type="checkbox"/>
Hygienic environment and propaganda in cultural blocks	Excellent <input type="checkbox"/>	Good <input type="checkbox"/>	Bad <input type="checkbox"/>
Your own awareness of the importance of environmental construction	Excellent <input type="checkbox"/>	Good <input type="checkbox"/>	Bad <input type="checkbox"/>

Questionnaire statistical data of landscape environmental protection and improvement of Yandai Xie Street

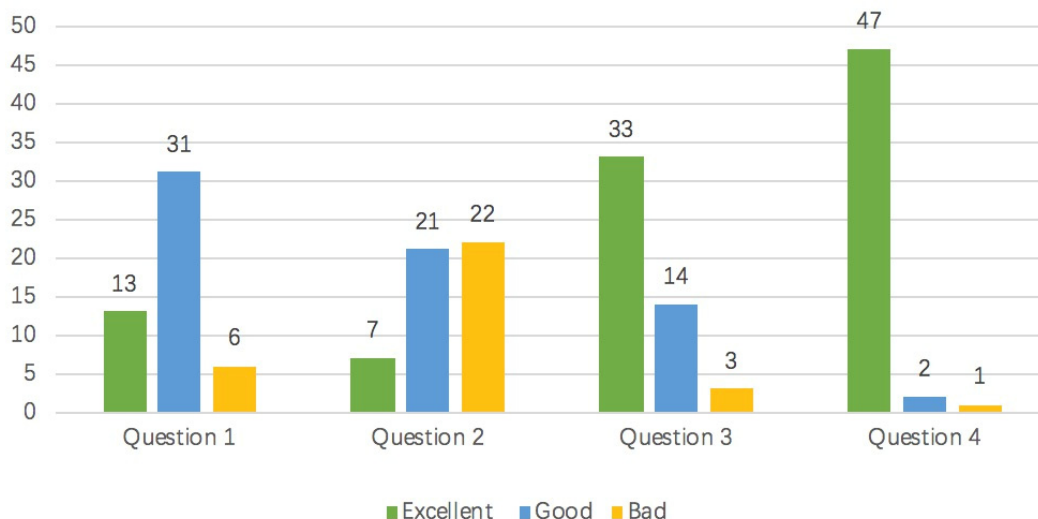


Fig 1: Questionnaire statistical data of landscape environmental protection and improvement of Yandai Xie street

As can be seen from the chart, the hygienic environment and publicity of the Yandai Xie Street are better, and most people can realize the importance of environmental construction, but it also reflects that tourists throw litter more frequently and the convenience is less. It can be seen that the small number of trash bins in the Yandai Xie Street in the historical and cultural blocks, the incomplete garbage classification, and the poor functionality have become important factors in the environmental issues of the cigarette slant street in the historical and cultural blocks.

3.1. Lack of Cultural Identity

The historical and cultural blocks are the "ribbons" of historical and cultural cities. Whether authenticity protection can be achieved in the process of urbanization directly affects the cultural character of the city. The cultural characteristics of historical and cultural blocks are composed of material elements and non-material elements, material elements refer to the space environment enclosed by existing buildings, non-material elements refer to the historical and cultural information in the historical and cultural blocks and the customs and habits of local residents, etc. Material elements exist as non-material elements to a certain extent, and non-material elements need to be embodied by material elements, the two are closely related. The construction and management of historical and cultural blocks are weak, and the new and old buildings are intersected, which destroys the original historical and cultural features and spatial texture, so that people's psychological emotions of "linger on and forget to return" are swallowed. In recent years, with the acceleration of urbanization, international modernism has continued to spread, historical and cultural blocks have neglected historical and traditional culture and regional culture in the renewal and protection, and most of the landscapes are the same, failing to fully highlight the local regional and cultural characteristics of historical and cultural blocks, and destroy the original social structure of historical and cultural blocks, thereby reducing the tourist quality of tourists, destroying the authenticity of the lives of residents around the blocks, and cutting off its historical context.

At present, the trash cans on the Yandai Xie Street are not closely integrated with the local regional culture, which reduces the landscape style of Yandai Xie Street, lacks the cultural flavor and connotation of the block itself, and reduces the living standards of local residents, not only is it not conducive to the spread of traditional culture, it is also not conducive to the development of tourism economy. Shape, color, material, function and other elements combine to form a suitable public infrastructure and landscape sketch, it is necessary to explore the regional culture of historical and cultural blocks in all aspects and angles in order to make the public facilities such as trash cans fan out from point to area, and better show the unique cultural characteristics and spiritual civilization connotation. Moreover, only by improving the living standard of the residents can the local residents be retained, it is only possible to retain the residents to maintain the vitality and charm of the Yandai Xie Street in the historical and cultural blocks.

3.2. Lack of Human-machine Features

With the accelerated pace of life in society, people's pursuit of spiritual life is getting higher and higher, and they pay more attention to the feelings of "comfort, convenience, safety" and other aspects. Therefore, in the design of basic public facilities, more thinking should be invested in ergonomics to achieve a more humane, safer design that meets the requirements of environmental factors.

The standards of ergonomics are roughly divided into: (1) Whether the infrastructure easy to use; (2) Whether the infrastructure is safe, including dangers caused by improper operation by users; (3) Whether the infrastructure and human body size and shape are in harmony; (4) Whether the infrastructure can clearly demonstrate its functionality; (5) Whether the infrastructure is easy to move, clean and maintain. The Yandai Xie Street sanitation garbage bins are not properly classified, and household garbage, kitchen waste, etc. are put together, which is very likely to make garbage difficult to throw into the garbage bin. (See figure 2); And it's very inconvenient to recycle garbage in the trash can, which eventually makes the trash can itself dirty, people want to stay away from it. Due to the insufficient number of trash cans, regular trash cans are not placed in some locations, and other devices are used instead, which seriously affects environmental sanitation and is seriously incompatible with regional culture. (See figure 3~4); The role of the trash can is to hold garbage, not part of it, if the trash can itself feels dirty, it will not beautify the environment, but will become the culprit of polluting the environment.



Fig 2: Sanitation trash can



Fig 3: Other devices replace the trash can



Fig 4: Other devices replace the trash can

3.3. Lack of Regional Element Characteristics

Regional culture refers to people who live for a long time within a certain range. They have certain local characteristics in life and production, including the living habits and traditional concepts of people living in the local area. The speed of development of modern cities is accelerating, and people are increasingly pursuing both material and spiritual needs. Beijing has a special regional culture, and its unique cultural charm and attraction are also extremely strong. However, the environmental chaos caused by trash cans at Yandai Xie Street has a negative impact on the historical and cultural districts and even the entire city. Therefore, the performance of regional elements is essential in basic public facilities such as trash cans. The role of regional elements is reflected in two aspects: On the one hand, for those living in it, the proportion of landscape sketches should be unified in space, and full use of regional elements can increase people's recognition of historical and cultural blocks and enhance people's sense of belonging to the city. On the other hand, for tourists, each area will form different landscapes due to the influence of climate and terrain, and naturally have different regional characteristics, the regional elements can better enhance the attractiveness of historical and cultural blocks, thereby promoting economic development. The historical and cultural blocks have a specific historical and cultural background and are the link between the city's external image and internal geographical elements. The more durable and stable the development of regional elements in a city, the more prominent its regional characteristics.

3.4. Investigation and Analysis

In order to gain a deeper understanding of people's views on the design of trash cans in the Yandai Xie Street of historical and cultural blocks, this article takes a sample survey, mainly in the form of questionnaire survey. And analyzed and summarized the survey results with graphs.

Table 2: Views on the design of trash cans in the Yandai Xie Street

Protect	Like	Dislike
Number	4	35
Percentage	10%	90%

From the data in the table, we can see that most people do not like the design of the trash can in the Yandai Xie Street, and this can be improved.

Table 3: Whether the garbage in the trash cans in the Yandai Xie Street is cleaned in time

Protect	Timely	Untimely
Number	13	26
Percentage	33%	67%

Table 3 shows that the timely cleaning of trash cans needs to be improved, the timely cleaning of trash is an important guarantee for the function of trash cans.

Table 4: Whether you will consciously sort garbage

Protect	Most of the time	Sometimes	Very little time	Never
Number	11	18	7	3
Percentage	28%	46%	18%	8%

It can be seen from the information in the table that people's awareness of garbage classification still needs to be strengthened, and good personal habits are also one of the important factors for the function of the trash can.

4. Case Analysis of Foreign Trash Cans

The trash can of a shopping mall in Poland (See figure 5) is a new type of trash sorting trash can, fully demonstrates the concept of sustainable design, and innovates in appearance. With graphical image prompts in the trash throwing place, it simplifies the process of distinguishing between recyclable and non-recyclable when throwing, making garbage collection and classification more convenient. The garbage shape classification of garbage bins in a shopping mall in Poland not only makes garbage bins out of the simple classification, which is convenient for people to throw, but also makes great progress in the comprehensive management of garbage bin development.



Fig 5: Trash can in a shopping mall in Poland
Image source: "Sichuan Building Materials", Issue 11, 2019

Street sorting trash can in a business district in Tokyo, Japan (See figure 6). There are also obvious text and graphic marks at the place where the trash is thrown, which is convenient for people to distinguish in which trash can the trash should be thrown at a glance, thereby reducing the time for the cleaning staff to reclassify the trash. And the color of the trash can is integrated with the surrounding environment, even if it is placed in a more prominent position in the commercial area, there is still no abrupt feeling.



Fig 6: Trash cans in a business district in Tokyo, Japan

5. The Improved Design of Yandai Xie Street Trash Can

5.1. Function

As one of the most important public sanitation facilities in the historical and cultural blocks, the trash can is responsible for many functions such as garbage storage and the display of regional culture. It can be said that the trash can is a container for "smudge and dirt" in people's lives, and it is also a reflection of social culture. Practicality is the fundamental principle in the design of trash cans, but in historical and cultural blocks, humanized design and the display of regional culture are factors that must be considered in improved design.

Due to the large flow of people and the small number of trash bins in the Yandai Xie Street, the phenomenon of littering is often visible, leading to increasingly serious sanitation. This not only

destroys the appearance of the city, but also increases the workload of the street cleaners. According to the survey, the interval between garbage bins in commercial blocks can be in the range of 25 meters to 50 meters. However, if this problem is solved only by increasing the number of garbage bins, other problems will arise. For example, the increased density of trash cans will occupy the road space of historical and cultural blocks. Therefore, in the design thinking of the trash can, people in the past should be easy to see the trash can, but also to save space as much as possible.

As early as October 2003, China has issued "the classification mark of municipal solid waste". According to the unified logo formulated by the state, domestic waste is divided into three categories, namely recyclables, hazardous waste, and other waste, so the classified trash cans have been promoted and used in all cities. After several years of transformation, intelligent trash cans have gradually emerged in the market, compared with the functions of traditional trash cans, it has the advantages of reliable performance and long service life. There is an automatic scanning device on the top of the intelligent trash can, which can detect the type of trash thrown by the user on the top, so as to carry out scientific garbage classification and save manpower and resources. In the historical and cultural districts, there is a large number of people traveling in and out of the Yandai Xie Street, and the air circulation is slow. Cleaners must dispose of domestic garbage as soon as possible to prevent hygiene infections caused by environmental hygiene problems. The intelligent environmentally friendly disinfection and deodorization garbage bin can dispose of garbage through low temperature and can be sterilized and disinfected without adding any chemicals, avoiding the problem of secondary sanitation pollution.

5.2. Shape

The historical and cultural block is a densely populated public place, a tourist place, and a place where people show themselves. Many people often spend a lot of time dressing up to come here, so most people have a show-off mentality when playing in the historical and cultural blocks. Under such circumstances, when people use the trash can, there will be a psychological sense of distance, most people will not rely on it too close, and will not touch the trash can with their hands. Therefore, when designing, you should reduce the use of hands as much as possible, but use the opening and closing of the foot, or a intelligent trash can that can be automatically sensed. In this way, people can throw garbage without touching any part of the trash can, reduce the spread of bacteria, reduce the distance between people and the trash can, and improve the utilization rate of the trash can.

The shape of the trash can in the historical and cultural block of Yandai Xie Street is different from the historical building, it must not only be practical, but also highlight the consistency with the surrounding environment. From the perspective of sustainable development, Beijing's characteristic elements should be extracted into the shape of the Yandai Xie Street trash can and combined with the surrounding environment, making it extremely valuable for research and appreciation. The application and development of Beijing characteristic elements in the trash cans on the Yandai Xie Street can be reflected in the fine-tuning of the shape of the original trash cans, for example, we should improve the structure and decoration of the trash can, with the design of Beijing elements, but it cannot change the historical style of the trash can and the historical and cultural blocks, and destroy the historical culture.

5.3. Material

The development trend of Yandai Xie Street is gradually commercialized. There are many small commercial shops and food shops, and a large number of residents. Therefore, the use of garbage bins should consider various issues such as high temperature resistance and corrosion resistance. Most of the trash cans currently used in the Yandai Xie Street are made of plastic, although the processing is simple and easy to clean, it is not suitable for use here. The wooden

trash can is composed of wooden strips and steel plates. The wooden strips can use pure wood, steel wood, solid wood, anti-corrosion wood, etc. The wooden trash can have a good texture and easy coordination with the surrounding environment. Metal trash can, high durability, can be recycled after being damaged. Steel trash cans, steel wood trash cans, and antique copper trash cans can be easily cleaned and moved while adapting to the concept of sustainable development. But the disadvantage of steel is that it is easy to rust. Generally, it can be degreased and derusted first, and then painted. Thereby enhancing the rust resistance of steel products used outdoors.

The material of the product is closely related to the emotion of the person. The natural material embodies a natural instinct. It is derived from the natural environment, taps its "natural" quality, and serves the sustainable concept. Humans' emotional attachment to natural materials is much higher than that of man-made materials, which proves why the affinity of traditional materials for humans is compared with the affinity of emerging materials, people's emotions are more inclined to traditional materials. People's psychological emotions often change with different materials [5].

5.4. Color

The buildings have colors, and the cities have colors. The unique color mark is one of the important elements of the city's image. Under the concept of sustainable development, consider the relationship between environment and color, the historical style background and solemn historical atmosphere of historical and cultural blocks, compatible with white, gray, and yellow and red trash cans with lower brightness and saturation, showing excellent visual comfort, and the five theme image colors of the historical and cultural blocks of Beijing's old city are "green, red, yellow, white, and gray". The color of the trash can should be suitable for the color standard of historical and cultural blocks, and the color of the style of the historical and cultural blocks should be consistent. The color requirements of the trash can not only meet the color standards in historical and cultural blocks, but also meet the requirements of traditional style of historical and cultural blocks.

As an important infrastructure of historical and cultural blocks, trash cans are an important element to show the overall image of the block. The optimized design of the trash cans makes the historical and cultural blocks have higher requirements for the landscape design. For example, in the process of landscape design of historical and cultural blocks, full consideration should be given to the protection of the environment and resource consumption. The optimized design of trash cans should not only be convenient for humans, but also conform to nature.

In addition, in the sustainable improvement design of the trash can, on the one hand, it can achieve "energy saving and consumption reduction" through effective methods such as appearance modification, equipment update, and garbage classification; on the other hand, it can increase the publicity of environmental protection in historical and cultural blocks, establish a good city image for historical and cultural blocks, promote citizens and tourists to support the dissemination of historical culture and tourism, improve the market efficiency of historical and cultural blocks.

6. Conclusion

Through research on the problems and causes of the landscape environment and public facilities in historical and cultural blocks, combined with relevant cases at home and abroad, it puts forward quantitative and qualitative analysis of historical and cultural blocks, as well as plans and assumptions for the improvement of the public facilities of the Yandai Xie Street. The historical and cultural block is a public accommodation space and a link between people and the interaction between people and space, it is related to the image of a city and represents the

basic qualities and living standards of people in this city. As an indispensable public facility in historical and cultural blocks, trash cans play a vital role in providing people with a harmonious and beautiful environment. The optimized design of the function, shape, material, color, etc. of the Yandai Xie Street trash can not only improve the urban block landscape environment, but also enrich the urban public space. Unreasonable design can make the trash can become part of the trash, and good design can not only make the trash can beautify the environment, but also make people feel happy.

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