

Low Carbon Design of Urban Public Space under the Concept of Symbiosis

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Abstract:

With the dramatic increase in population and over-exploitation of resources, the area of urban public space has been greatly reduced and the space for activities is limited. In the process of rapid urbanization, the trend of expanding public space will be more rampant. The problems of single static functional use and lack of vitality in urban public space, the fragmentation of community's environment and natural environment, and the waste of resources need to be solved by integrated design means. In this paper, we explain the essence of symbiosis concept, urban public space and low-carbon design; clarify the mutual demands and correlation between the three; on the basis of symbiosis concept, sort out the basic characteristics and attributes of urban public space, further summarize the strategies of low-carbon design of urban space, and discuss how to build a low-carbon and harmonious symbiosis community.

Keywords:

Symbiosis Concept, Urban Public Space, Low Carbonized Design

1. Introduction

Current industrialization has brought great material abundance, but at the same time the global population has grown dramatically and community environmental problems have become increasingly serious. The rapid development of cities brings community space squeeze and waste of resources. Compared with residential buildings, urban spaces are more concerned with providing material support in communication, leisure, transportation and service support, and have distinctive attribute characteristics (public, openness, sharing and diversity). In today's urban life where social interactions are increasingly frequent, public urban space has become the main space in the city open to the public and carrying out various social interactions, which is of great significance to the city and the people living in it. Background and overview of the development of symbiosis concept. [16]

2. Background and Overview of the Development of Symbiosis Concept

2.1. Definition and connotation of the concept of symbiosis

Symbiosis as an idea has already appeared in ancient China, and the “symbiosis concept” coincides with the concept of “unity of heaven and man” in traditional thought. In today’s modern science, the term “symbiosis”, or symbiosis, was first applied in the context of biology. Symbiosis is a state of equilibrium between two or more organisms that are physiologically dependent and interdependent on each other, a fate of harmony between human and human, human and nature. “Symbiosis” in the field of biology is actually a methodological approach to describe the relationship between “biology-biology” and “biology-environment” from a systematic latitude. The methodological approach to describe the “biology-biology” relationship and “biology-environment” relationship from a systematic latitude. With more and more in-depth exploration, the concept of symbiosis has been slowly extended from biology to various fields such as sociology, economics, philosophy, psychology, literature, architecture, design, etc. The interdisciplinary extension and collision have broadened the single meaning of the concept of symbiosis originally in biology and brought diversified thinking and innovation. For example, the zero-sum game in political science has been transformed into a community of destiny; for example, in architecture, the symbiosis of all things and the use of space in the form of resource sharing have been emphasized.

2.2. The development and application of symbiosis concept

As a concept developed from biology, the “symbiosis concept” has been slowly integrated into various fields, providing a new vision and design ideas for urban space and low carbon design. However, the emergence and development of the symbiosis concept is not accidental, but is accompanied by the social Darwinism of the nineteenth century biologist Darwin's proposal of the elimination of the fittest and the strongest, and is proposed in the context of global competition and the shift to the symbiosis era under the plummeting resources. In the process of putting forward the idea of symbiosis there are mainly the following representative figures: nineteenth century such as the Russian anarchist Kropotkin against the Darwinian law of evolution, the 1960s members of the Club of Rome, etc. In the 21st century, Japanese architect Kisho Kurokawa continued to develop the symbiosis concept on the basis of his predecessors, and predicted a new world order in the 21st century, which he called the “symbiotic order” or “symbiotic era”. [8] Such an era is characterized by, first, a move toward a post-industrial society that values individuality, territoriality and creativity. Second, a shift from a linear to a non-linear economy. Third, a shift from the age of power to the age of authority.

The Age of Life will shift from dichotomy to symbiosis. The Age of Life rejects monomodalism, the fundamental point of reductionism or analyticism - dualism and dichotomy. There will be a shift from dualism to symbiosis. The idea of symbiosis is fundamentally different from coordination, compromise, coexistence, mixture, and compromise.

3. Community Public Space Under the Concept of Symbiosis

3.1. Properties of community public space

Urban public space is one of the material carriers of urban spiritual life, which has been fully reflected in the ancient Greek and Roman times in the West. It can be said that urban public space is the carrier of Western civilization. In urban space, there are three elements of uninterrupted integration: the state needs to expand political public

space; citizens need to constantly expand their personal space; and various organizations, especially informal organizations, need some kind of public space for social and interaction in a group sense.

First, urban space is public in nature. Fundamentally, urban public space is designed to meet the diverse lifestyles of urban people, and it is open to all urban people and is completely public.

Second, urban space is shared. Every city resident has the obligation to enjoy the use of urban space. This means that people have certain obligations to maintain urban space, and these obligations are based on rights, which is of course because people have the right to use urban space.

Third, the low-carbon use of urban public space in the process of use. Since 2010, research results on green space for public health are rapidly increasing at home and abroad. The current research results are mainly in exploring the correlation between public health and green space, the mechanism of green space affecting public health, green space as public health policy, green space planning and design application, and other aspects. The low-carbon concept should also be pursued in the use of public space, and not too much pollution should be created in the urban public space.

3.2. Urban public space under the low-carbon concept

On September 22, 2020, President Xi Jinping proposed at the 75th General Debate of the United Nations General Assembly that "China will increase its independent national contribution, adopt more vigorous policies and measures, strive to peak CO₂ emissions by 2030, and strive to achieve carbon neutrality by 2060. With the development of the global economy and the acceleration of urban industrialization, the quality of our lives has changed significantly, which has prompted people to put forward higher requirements for the quality of their living environment, thus promoting the rapid development of urban public space design. Low carbon design as a new design idea and method has attracted the general recognition and attention of all human beings, which is to reduce carbon dioxide emissions, improve the use of renewable energy and slow down ecological deterioration. Therefore, in a sense, design under the "symbiosis concept" is a deeper level of design thinking.

Nowadays, the concept of low carbon has become an indispensable part of our life, and as a progressive lifestyle and attitude, low carbon always affects our life and natural environment. As designers, we have the responsibility to lead low-carbon consciousness in design, create low-carbon life, try to develop in the direction of low consumption in the design of urban public space, reduce the emission of greenhouse gases, mitigate the pollution of the atmosphere and protect the natural ecological environment.

3.3. Status of the design of urban public space

The urban public space is squeezed by high-density residential areas, various buildings of different scales and architectural styles are put together, disorganized and crowded streets, functional areas are fragmented and handed over to large-scale investment and construction, making the organization of urban public space fall into a chaotic scene and the order of spatial structure is destroyed. This spatial disorder problem leads to the inability to effectively use the light and heat of nature, but instead intensifies the energy consumption of resources; the improper organization of public space and artificial environment with ecological environment, for the large area

of hard, non-permeable tarred horse pavement and artificial environment built with heat-conducting and heat-storing materials, forms a dense and rough urban surface, which not only deprives the original urban ecology of its ability to heal itself, but also blocks the diffusion of airflow and pollutants. It also blocks the diffusion of airflow and the disposal of pollutants. At the same time, the aggregation of various high-density supertall buildings and unsystematic open spaces lead to high energy consumption and emissions, affecting the original air circulation and creating a more serious heat island effect.

4. Low-Carbon Design Strategies for Symbiotic Communities and Spaces

4.1. Low carbon design principle of ecological sustainable development

Ecological sustainable development emphasizes “harmony between human and nature”, the basis of sustainable development of human society is recyclable resources and sustainable ecosystem, sustainable development requires not only creating an adaptable and sustainable lifestyle, but also setting sustainable emission standards within the tolerable range of the environmental system. . In the process of creating a symbiotic community, the systematic spatial construction area achieves the design principles of resource conservation and regeneration and resource reuse for sustainable development. In the new construction concept, we have to take the initiative to solve the current environmental problems of congestion and disorder, reduce the high pollution and high consumption of energy in cities and communities, break through the traditional concept, and strive to use new energy sources, such as: one design or research recycling related technology equipment to improve energy utilization and thus reduce energy consumption; two look for new clean energy sources that are more environmentally friendly; three is to establish a low-carbon and environmentally friendly energy-saving policy. Top-down change of the whole system operation.

4.2. Human-centered low-carbon design principles

The construction of urban public space requires human participation. The human-centered principle is to respect the human way of life as the starting point, to coordinate various relationships in the space from the human perspective, and to create a healthy environment for the use of public space. The main function of urban public space is to provide places for leisure activities such as rest and entertainment, which reflects the concept of harmonious coexistence between people and nature. To design low-carbon urban public spaces, we should not only consider the surrounding environment, but also consider the context of human use to create a human-oriented low-carbon design. Nowadays, for many public spaces, the construction of public stations is too consumable, and various materials are piled up, which leads to the reduction of greenery in urban public spaces and also increases the cost of expensive maintenance in the later stage, which is contrary to the harmony between human-centered and nature. People as users, linking the natural environment and public space buildings in tandem, will definitely become the top priority in the design of low-carbon urban public space.

4.3. Low-carbon design case study

In fact, many cities around the world are actively experimenting with the practice of “low-carbon cities”, and relevant Asia-Pacific countries and regions have left behind many experiences and approaches in the process of building low-carbon urban public spaces, such as the concept and model of low-carbon cities and towns, energy strategies, low-carbon technologies, policy initiatives, and low-carbon planning.

In Japan, there is a systematic process for building low-carbon city demonstration projects. The first step is to collect basic data before the city is developed, set quantified overall “carbon reduction” targets and sub-targets for the city based on the basic conditions and overall expectations of the city, and give direct and indirect targets to achieve the targets using a top-down approach. Japan’s low-carbon cities emphasize “cost-cutting” in the context of sparsely populated urban areas, and establish intensive energy-saving and low-carbon cities at different levels in the fields of buildings and transportation, and meet other control conditions such as convenient and efficient urban functions, disaster prevention and safety, and environmental comfort on this basis.

In terms of specific implementation of low-carbon technologies, Japan pays more attention to modern technologies such as intelligent control, realizes community intelligence and household intelligence through hierarchical management model, mainly facilitates regional structural energy management, building energy conservation management, transportation electric vehicle service system, etc., and realizes networked and digitalized urban multi-level structural services through smart grid, Internet of Things, cloud computing and other technologies.

4.4. Low carbon design of symbiotic space

First of all, in the selection of raw materials, materials that are less susceptible to corrosion and easy to clean and maintain should be used, so as to extend the service life of public facilities, reduce the cost of later maintenance and reduce the waste of natural resources. On the other hand, renewable and degradable green materials should be chosen as much as possible to reduce the damage to the environment. Among all materials, wood becomes the preferred low-carbon environmental protection material. As long as wood is reasonably cut and replanted in time, wood can be sustainable and become a renewable resource. Many natural materials such as bamboo, rattan, hemp, watercress, corn husk, straw, etc. can be applied to urban public space design through certain artistic and technical treatments, and such materials can greatly reduce the pollution of the environment and the harm to our human bodies. In addition, the wood-plastic composites called environmental protection wood to PE, PP, PVC resin or recycled waste plastics and sawdust, straw, rice hulls and other natural biological fibers after a special process composite, because its biggest advantage is to turn waste into treasure, and can be 100% recycled and reproduced, can be decomposed, will not cause “white pollution”, to form a low-carbon design. It forms a low carbon design.

Secondly, the disassembly of the structure meets the sustainable principle of recycling. Design for Disassembly (DFD) is a method of achieving good design performance in the design phase of a product. Only disassembly can achieve complete recycling of materials and reuse of some parts, and only by taking into account disassembly at the end-of-life in the conceptual design stage of public facility design can we achieve efficient recycling of facilities in the end. By designing facilities in this way, most of the parts can be reused or recycled, reducing the pollution of the

environment from waste facilities, which is one of the basic ideas of low-carbon design. In addition, detachable design facilitates the reorganization of public facility items and their service and maintenance during their life cycle, thus achieving the goal of both saving natural resources and protecting the environment.

In the process of creating symbiotic spaces, new energy-saving technologies and new energy sources are reasonably applied. Energy-saving technologies and new energy sources have long been widely used in many design fields, and renewable energy generation such as wind, solar and biomass are the mainstream of new energy generation today. For example, solar energy is inexhaustible and a clean green resource, which can meet the sustainability of using energy without harming the environment, and this design method is very suitable for the low-carbon lighting design of public facilities. Solar energy is converted into electricity during the day and stored to supply night lighting, which can be illuminated even in special situations such as power outages. Solar energy has a wide range of applications and can be used in a large number of street lights, lawn lights, landscape lights, traffic signals, advertising light boxes and other facilities in public spaces. It not only saves electricity, but also eliminates the cost of digging trenches, laying pipes, and laying cables for ordinary night lighting facilities, and also avoids damage to vegetation, resulting in low-carbon design from the source.

5. Conclusions

At present, people still keep exploring the research of low-carbon design. The design of urban public space advocates harmonious coexistence, and the low-carbon design idea makes the design achieve the best matching effect of shape, color, light, material and sound, reduces energy consumption, and creates environmental public space suitable for human use, which has more important significance for us in developing countries. In the low-carbon design of urban public space, public facilities under the low-carbon concept will certainly provide people with a safer, healthier, more comfortable and efficient life, and play an increasingly important role in the urban environment, making the urban landscape more artistic and more vital.

Conflicts of Interest

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

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