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Research on three-dimensional art greening design

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Abstract: With the continuous development of society, the living environment of human beings has been greatly changed, and the concept and meaning of "greening" has become more and more concerned by the public. This paper uses the method of data collection and case study, based on the discussion of the concept of "three-dimensional greening", analyzes the significance of developing "three-dimensional greening" to the modern human living environment, and the application of "three-dimensional greening" in various fields. The application of "three-dimensional greening" in various fields is analyses, and the artistic and aesthetic value of "three-dimensional greening" is comprehensively studied. Stereoscopic greening plays an important role in building and managing cities, improving the ecological environment and promoting social development. Ecological greening not only promotes economic development, but is also an important part of the construction of social and spiritual civilization.

Keywords: Three-dimensional greening; Urban architecture; Landscape environment.

1. Introduction

In terms of the development of "three-dimensional greening" in China, the level of three-dimensional greening in key cities such as Beijing, Shanghai, Guangzhou and Shenzhen, where economic and cultural development is more mature, has increased rapidly. Shanghai's urban greening has achieved high quality development and has shown a stable development trend. Regional special planning has been completed in Hongkou, Jiading and Baoshan, and a number of high-quality projects have emerged, including rooftop greening and vertical greening [1]. The public's awareness and mastery of three-dimensional greening is increasing, and the interest and participation of all sectors of society in three-dimensional greening is growing.

In terms of the development of "three-dimensional greening" abroad, most developed countries in the West have experienced half a century of development and precipitation in the design of three-dimensional greening, with increasing technological progress, the superiority of three-dimensional greening in improving the urban environment is gradually reflected. So far, in many western developed countries such as Singapore, the United States, Germany and Japan, three-dimensional urban greening has achieved significant results.

In particular, Singapore, a country recognized worldwide as a model 'garden city', has implemented a number of effective measures to achieve and improve this goal. Firstly, the government established the National Parks Board of Singapore, a special department to manage urban greening. Not only is the management level clearly laid out, the government also encourages the establishment of industry associations and organizes academic forums. In addition to policy implementation, the Government regularly organizes the Garden City Awards each year, inviting industry experts, companies and students to participate in the competition to promote innovation and public participation in urban green space planning.

Through comparative research we found that domestic three-dimensional greening construction is very single, only in the ordinary roof greening, and the development of a late start. Foreign three-dimensional greening practice started early, three-dimensional greening industry development is relatively mature. In particular, Singapore is the first, its scale, institutionalization, industrialization of the development process can be used as a model for the development of three-dimensional greening in China [2]. It is true that there is less academic discussion and research on three-dimensional greening design in China, but with the attention and planning of policies, the concerns and needs of the people, and the continuous improvement and implementation of theories and policies, three-dimensional greening design is bound to gradually become a hot topic in society.

2. Organization of the Text

2.1. Overview of "three-dimensional greening"

2.1.1. The concept of "three-dimensional greening"

Stereoscopic greening refers to the greening method of harmoniously and uniformly decorating the building body with greenery that is reasonably selected to suit the environment according to the different topography and terrain. Stereoscopic greening is commonly used on the walls of buildings, roof balconies of houses, bridge decks of bridges and green corridor railings.

The three-dimensional greening talked about in this profession mainly refers to the selection of suitable plants to be used in the artificial environment, so that the plant landscape fills the gray space of the building, making the flat plants more three-dimensional, and also making the originally hard building more vivid.

2.1.2. Basic types of "three-dimensional greening"

Stereoscopic greening refers to all but flat greening the most used forms of greening in practical design are: wall greening Green roofs the most used forms of greening in practical design are: wall greening, side slope greening, elevated greening, etc.

(1) Wall greening

Wall greening refers to the use of greenery on the facade of a building, see Figure 1. It is important to make full and reasonable use of planned land, and if there is not enough flat space it may be worthwhile to find another way to do more on the facade of the building, and wall greening is thus birthed. Wall greening has developed rapidly with the advancement of science and technology in society and the attention of people, resulting in a variety of forms. The ecological value of wall greening is huge: beautifying the environment, feeling natural,

saving energy, improving the local climate, creating a vibrant living environment, reducing the urban heat island effect, reducing dust absorption and noise reduction, etc.

Figure 1. Greening of the wall

(2) Green roofs

In contrast to wall greening, roof greening is the planting of greenery on the roof of a house,see Figure 2. The difference is that green roofs do not just have a literal meaning; they include all parts of the building that do not border the ground, including balconies and terraces, overpasses and the top of basements. It is a form of green landscape that people build on top of buildings and all special spaces by choosing suitable plant materials according to the structural characteristics of the building roof and the ecological environment conditions on the roof.

Rooftop gardens are just one of the typical forms of green roofs, but nowadays, green roofs are not simply "gardens on the roof", but are used as an urban planning tool as important as greening on the ground.

Figure 2. Green roofs

(3) Slope greening

Slope greening is an emerging form of ecological slope protection, see Figure 3, that can effectively protect exposed slopes. In the course of vigorous economic development and construction, many infrastructures have created a large number of exposed slopes. In order to reduce the safety risks associated with these exposed slopes and to beautify the surrounding environment at the same time, a large number of slopes have been landscaped. Greening of slopes has a major role in protecting the environment, as it beautifies the environment, nourishes water, prevents soil erosion and landslides and purifies the air.

Figure 3. Greening of slopes

2.2. The significance of the development of "three-dimensional greening" for the modern human living environment

2.2.1. Status and development of the human habitat

(1) The current situation of our habitat

Our country's unique national and historical situation has led to the fact that we will be in and remain in the primary stage of socialism for a long time in this century, which means a late start in terms of economic strength and social and cultural construction compared to other developed countries, and a flat development trend [3]. The pattern of economic development has a direct impact on people's livelihoods, such as the current state of our housing.

At the beginning of the century, China entered a period of high tide in real estate development. In the pursuit of economic benefits, many developers sought only quantity rather than quality, resulting in the development of many residential buildings that did not truly meet the needs of people's lives. However, in the past few years, as real estate development has entered a period of calm, people are not only pursuing "housing for all", but also wanting to have a housing environment that meets their living aspirations, so the design of China's residential environment is gradually reflecting ecology and sustainability.

(2) Trends in the human habitat

The development of society and human living space must weigh up the harmonious development of multiple layers of economic, scientific, technological, natural and social aspects, and must be developed and built in such a way as to meet its own needs as far as possible without harming the resources of future generations of mankind. [4]

Open living is in fact the most primitive and simple mode of human existence, unlike today's human beings who live in their own small spaces of various kinds, but live and study and work together, humanity has truly become a community of destiny. People strive to live in harmony by sharing information and resources, all for the sake of others as well as for themselves, exploiting resources in a rational and restrained manner in order to achieve the goal of sustainable development.

The community model is the most common and widespread model of group living, in which the community is like a small society, in which everyone has a clear division of labour and each has his or her own role to play, and in which human beings are concerned not only with the individuals themselves, but with the development of the community as a whole, with the idea of living in harmony and stability. [5]

2.2.2. The significance of three-dimensional greenery for the modern human habitat

(1) Increase the green area of the living environment

Compared to ground greening, three-dimensional greening has the advantages of "less land, wider coverage, lower cost and better effect". Three-dimensional greening is carried out on roofs, balconies, terraces, and other three-dimensional spaces to magnify the effect of environmental beautification in the smallest space[6].In terms of aesthetic value, three-dimensional greening can make up for the shortcomings of flat land greening, making the greening effect rich in layers; in terms of ecological benefits, three-dimensional greening can promote ecological balance, transform the bad environment and make the human living environment more harmonious.

(2) Beautifying the living environment

The natural beauty of three-dimensional greenery itself is the most intuitive visual beauty to people. In addition to the material functionality that brings social value, three-dimensional greenery also has a strong spiritual role, and three-dimensional greenery also has its own sense of beauty, which comes from people's appreciation for healthy nature.

Because of its unique malleability and plasticity, greenery is able to extend and change freely in architecture. Three-dimensional greenery can integrate static buildings with dynamic plants, thus adding movement to the building and giving the plants a terrain to cling to so that they do not appear too unkempt. The plants can take different shapes and various forms, and the green appearance can also cover less aesthetically pleasing buildings, which can liven up the building monolith.

(3) Improving the air quality of the living environment

Plants rely on chemical reactions such as transpiration by photosynthesis to purify and filter the harmful components of urban air and can be considered natural filtering instruments [7]. In addition, the branches and leaves of plants are also natural sieves, as they can absorb large particles in the air, thus improving the surrounding environment. The use of three-dimensional greening extends the greenery around the building and brings fresh air to the people living in the building.

2.3. Analysis of the application areas of "three-dimensional greening

2.3.1. The role of three-dimensional greening in improving the urban environment

(1) Expanding the green area of the city and enriching the green levels of the city. Namba Park is an integrated commercial complex in the heart of Osaka, Japan, whose functions include shopping, offices, recreation and entertainment. The main building of Namba Park is a gently sloping building that rises eight layer from the flat ground, and a large amount of three-dimensional greenery is used inside and on top of the building, making the whole park like a mountain range lying quietly in the middle of the city. The park is a reflection of the ancient Chinese sage's pursuit of "a hut in the realm of the people without the noise of horses and cars",see Figure 4.

Figure 4. Namba Park in real life

(2) Beautifying the city's view and creating an urban calling card. What makes Namba Park a model for the industry is also its amount of three-dimensional greenery, with greenery planted on the roofs of almost every storey and a typical rooftop garden on the highest part of the building, giving a sense of climbing alone in the middle of a downtown city. The building's shape recreates the cascading peaks of the mountains, and the pedestrian walkway in the middle is like a winding valley, which is fascinating. The eye-catching expanse of green in Namba Park,see Figure 5,contrasts sharply with the monotony of the linear architecture of the surrounding city, like a green emerald in a gray concrete forest. The unique commercial space created in Namba Park is a model for us to follow. A successful commercial space should not only be judged by the economic benefits it brings, but also by the social value it brings, and a green space in the city can bring a sense of breathable feeling to a high-density complex, allowing city dwellers to find an "oasis" outside their busy lives. Successful urban greening is the calling card of a city's external publicity. [8]

Figure 5. A realistic view of Namba Park

(3) Purify the city air and alleviate the urban heat island effect. Beijing China Central Place is a landmark one million square metre mega city complex on East Chang'an Street. The project covers an area of over 15 hectares, with a development and construction scale of about 1 million square meters, integrating offices, hotels and shopping malls inside,see Figure 6. The roof garden of China Central Place is one of the largest and most technologically advanced rooftop gardens in the city, and is a model for the greening of urban shopping centers in China. It is planted with Forsythia, a plant that is extremely cold resistant, and is lush and green even in the northern winter months, adding a touch of interest to the gray Beijing sky.

Figure 6. The roof garden of the China Central Place

In the roof garden of the China World Trade Centre, technicians used moisturizing materials to build the roof, which makes the roof a water-bearing layer that automatically sprays when plants need water, thus eliminating the cost of artificial irrigation, and is a model of intelligent three-dimensional greening. Rooftop greening has an important role to play in improving the ecological function of the city. Experiments have shown that green roofs can reduce the roof temperature by 20-40 degrees Celsius in summer, and indoor temperature by 4-6 degrees Celsius, reducing the urban heat island effect and saving 50% of the electricity used for air conditioning; in winter, they can effectively insulate [9].

2.3.2. The role of three-dimensional greening in improving the environment of the township

(1) Increase the green area of the township and improve the

ecological environment. The Poly Taohuayuan villa area is located in the suburbs of Guangzhou, and is a typical stacked villa type residential building. Due to the unique sloping terrain, the designer uses the form of stacking to add an extra part of space on the side of each household's house as green space[10] . The slope of the terrain cannot be changed, but the shape of the building can be, and the designers have used this method to create a green space for each resident in order to achieve the maximum amount of green space in the minimum space,see Figure 7.

Figure 7. Poly Taohuayuan Cascade Villa

(2) Create a characteristic green ecological town and drive tourism development Located in Changde City, northern Hunan Province, the Sun Mountain National Forest Town has unique geographical advantages and resources, with Changsha to the south, Yueyang to the east and the Three Gorges Scenic Area to the north. The site retains the original five forest areas in the Changde State Forest and Sun Mountain mountain areas, with rich landscape resources, such as religious sacred sites like the Sun Well, humanistic landscapes like the PanGu Square and natural mountain rock landscapes like the Eagle's Beak Rock, with significant advantages in terms of location and natural resources. The project takes the forest healing tourism industry as the main line, specifically planning out six industrial sectors: ecological retirement, health healing, meditation, leisure, sports and fitness, and farming experience.

(3) Regulates humidity and improves the local climate. The Waterfront Lodge in Mumbai, India, is located on a hill in the Ghats in south-central India. The building blends in with its surroundings due to the dense planting inside and on top of the entire building, making it almost impossible to see the boundary between the building and the surrounding landscape from the east side [11]. The natural surroundings of the building are a unique natural resource, with views of the mountains to the north and the sunset over the river to the west. The planted roof will also be used as an outdoor space. Seen from above, the roof is an extension of the natural landscape, allowing the building to blend perfectly into nature. The high thermal insulation of the green roof plants helps to keep the interior spaces cool even during the dry season.

3. Conclusion

In environmental art design in three-dimensional green landscape plant colour is an important expression of people melting emotions into the landscape, three-dimensional greening and flat greening as well, is the different kinds of plants together, where the constant is that green is the main colour of the whole field. As the green plants grow and mature, the plants themselves will show colourful visual changes, expressing the unpredictable rhythm of colour and presenting a unique colour beauty corresponding to the season. The colour of the green plant's flowers is also spectacular, beautiful and atmospheric when in full bloom.

The simple and diverse formal beauty of plants in landscape design emphasizes balance and a reasonably proportional design of plant configurations in the form that we are required to carry out in different situations. Most three-dimensional landscaping designs can follow the principles of simplicity, emphasis, scale, balance and wholeness.

The aesthetic value of three-dimensional greening can make up for the shortcomings of flat greening, making the greening effect rich in layers; in the ecological benefits of three-dimensional greening can promote ecological balance, transformation of the bad environment, so that the human living environment is more harmonious.

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