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Construction and Innovation of Guilin Urban Green Rainwater Landscape System from the Perspective of Sustainable Development

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Abstract: With the acceleration of China's urbanization process, there have been many rain and flood problems such as the increase of urban stagnation and serious water pollution. People began to reflect on the relationship between urban green infrastructure construction and ecological nature. As an important part of the urban rainwater system, the green rainwater infrastructure plays an important role in managing urban rainwater, building a benign water cycle in the city, and protecting the ecological environment. The article proposes to build a Guilin urban green rainwater landscape system based on the green rainwater infrastructure and propose innovative suggestions.

1. Introduction

In recent years, with the rapid and large-scale urbanization in China, the ecological environment load of local areas has been aggravated, urban land use and cover change have been severe, and the functions of hydrological ecosystems have been significantly weakened, resulting in rainstorms throughout the country. The frequency and intensity of occurrence are increasing [1-2]. To the end, China has proposed the goal of building a sponge city, which provides a good condition for systematically solving urban stormwater problems. Green rainwater infrastructure is an effective measure for surface stormwater runoff control and an important carrier for sponge city construction [3].

The urbanization process has made the original large-area permeable floor covered by impervious materials such as buildings and asphalt, blocking the passage of rainwater into the underground. The runoff of urban rainfall has increased from 10% before development to 55% after development [4]. In addition, due to rainfall scouring the urban surface, carrying pollutants from surface sediments, pollutants pollute the water around the city. The drawbacks of the traditional stormwater management concept, which relies solely on the gray infrastructure, have been highlighted. In the advanced foreign stormwater management concept, the emphasis is on adopting the "soft drainage" model of ecological and near-natural rainwater ecological management, giving full play to the urban natural ecosystem. The value of storing rainwater, conserving water sources, improving water quality, and utilizing rainwater resources [5]. At the same time, as part of the urban green infrastructure, in the design of green rainwater facilities, more attention should be paid to the natural characteristics and beauty of rainwater, and more attention should be paid to the green rainwater landscape system to create a unique rainwater landscape facility that will bring beauty to people. A pleasant, pleasant and profound experience creates a beautiful and pleasant urban environment.

2.Green rainwater landscape system construction and development

Green Rainwater Landscape Systems is the development and upgrading of green rainwater infrastructure, and the Green Storm Infrastructure (GSI) evolved from the concept of Green Infrastructure (GI). In 1999, the Green Infrastructure Working Group, jointly established by The Conservation Fund and the Agriculture and Forestry Administration (USDA), defined green infrastructure as the nation's natural life support system. Waterways, wetlands, forests, wildlife habitats and other natural areas, greenways, parks and other protected areas, farms, pastures and forests, wilderness and other species that sustain native species, natural ecological processes, protect air and water resources, and improve the United States An interconnected network of communities and people's quality of life in the wilderness and open space [6]. GI emphasizes the importance of the natural environment in urban land use. Based on the important role of GI in stormwater management and utilization and a large number of practical engineering applications, the Seattle Public Utilities Board proposed a more professional term for GSI, which refers to various green ecological measures used in stormwater management. [7]. At present, there is no unified definition of "GSI" domestically and internationally, but from a variety of academic concepts, there is a common starting point, that is, GSI is a reflection and summary of the shortcomings in the development of human society. The concept of sustainable development is applied to the construction of rainwater infrastructure. The green rainwater infrastructure is divided into different levels such as site, land use functional unit, and region (or watershed) according to the application [8], which correspond to the micro, meso and macro scales of the green rainwater infrastructure, namely the rain garden and the green roof , green streets, wetlands, urban areas, watersheds [5].

Foreign countries are far ahead of the domestic construction and development of green rainwater infrastructure. In the construction of green rainwater infrastructure, emphasis is placed on the integration of landscape elements or the landscape of green rainwater infrastructure, not only to reflect its ecologically sustainable functions, but also to satisfy humanity, the beauty of the landscape is need [5]. In the traditional rainwater management mode, the rainwater landscape project is introduced to form a rainwater management system that simulates the natural ecosystem. When the rainwater resources are effectively and comprehensively utilized, the rainwater landscape can be innovated to create a beautiful urban space and landscape environment[9]. Many countries in the world have formed a pattern with national cultural characteristics in the construction of green rainwater infrastructure due to differences in ecological or landscape needs. For example, Germany has long been committed to the development of rainwater utilization technologies and is currently the most successful country in Europe for rainwater utilization technologies. From conception, planning, design to utilization, the combination of green rainwater infrastructure and urban landscape design, and the formulation of relevant supporting laws and regulations, formed a relatively complete system of rainwater utilization technology. In the large-scale commercial development zones, residential quarters, single-family homes and roads, Germany uses rainwater technology to integrate it with urban landscape and environmental improvement, making the green rainwater infrastructure more dynamic and more aesthetic. Japan has been affected by geographical conditions and has been in a high incidence area of flood disasters. In order to control the flood disaster, the Japanese government has adopted a series of measures to form a relatively perfect rainwater management system, which has become the most typical country in Asia that attaches importance to urban stormwater management. Japan pays more attention to the combination of rainwater recycling and green rainwater infrastructure, and advocates rainwater multi-functional storage, and also pays more attention to rainwater landscape and ecological environment construction.

3. Conditions and advantages of Guilin's construction of green rainwater landscape system

3.1 Guilin Natural Geography Overview

Guilin City is located in the northeastern part of Guangxi, at the southwestern end of the Nanling Mountains. The administrative area spans the east longitude of 109°36'50″—111°29'30″, and the north

latitude is 24°15'23″—26°23'30″. Guilin is 236 kilometers long from north to south and 189 kilometers wide from east to west. Guilin belongs to the mid-subtropical monsoon climate, with mild climate, sufficient sunshine, long frost-free period and superior hydrothermal conditions. The annual average temperature is 18.9 °C, and the annual average precipitation is 1949.5 mm. The topography of Guilin is generally high in the north, low in the south, and high in the north, east and west. The terrain in the central and southern parts is relatively low, with an average elevation of 150 m. Guilin is a typical karst karst landform and is located in the karst extending from the northwest to the southeast. In the basin. The landforms are karst mountains, hills, terraces, karst (karst) landforms, and the landscape is peculiar.

3.2 Characteristics and laws of precipitation in Guilin
Guilin has abundant quantity and abundant water, but the distribution of rainfall during the year is extremely uneven. The rainfall in the abundance and dry season is very different. The rainfall in Guilin changed significantly during the year. From March to August, Guilin was a period of abundant rainfall. The rainfall accounted for about 80% of the whole year. From September to February, Guilin was dry season, and rainfall accounted for 20% of the whole year. Left and right [10]. The law of precipitation in Guilin is relatively obvious. The annual rainfall in Guilin is increasing, with an average increase of 19.9 mm every 10 years. The rainfall during the wet season also shows an increasing trend, with an average increase of 24.8 mm every 10 years. The rainfall during the dry season is decreasing, with an average of 10 years. The rainfall is reduced by 4. 9mm. The annual rainfall and the rainfall period can be roughly divided into 20~25, 12~14, 6~7 and 2~4 years. The rainfall in the dry season is 32~35, 8~12. And the regularity of the cycle of 2~4 years [11].

3.3 Guilin's advantages in constructing a green rainwater landscape system
Due to the scarcity of water resources, rainwater is considered the second largest source of water in the city. At this stage, major cities combine rainwater treatment with landscape design to use rainwater to landscape design through multiple channels, while maximizing the value of vision and recreation during construction, and establishing a corresponding green rainwater landscape system. Since ancient times, Guilin has enjoyed the reputation of "Guilin's landscape is the best in the world" with its mountains, waters, caves and stone. Compared with other cities, Guilin has obvious advantages in constructing a green rainwater landscape system. Due to its unique natural geographical location, abundant rainfall and hot climate, Guilin is very favorable for the growth of plants and the formation of karst landforms. Special geographical location, good climatic conditions, typical geological features, beautiful natural environment, etc, in the design of green rainwater landscape, Guilin is more conducive to combining with rainwater landscape facilities, reducing rainwater flooding on site and reducing the maintenance cost of green space. Achieving a virtuous cycle of water bodies is more conducive to the implementation of green rainwater landscape system projects such as "rainwater gardens" and "green streets", which will naturally introduce nature into urban life.

4. Guilin Green Rainwater Landscape System Innovative Design Strategy

4.1 Visualization and Experience
The traditional green rainwater landscape facilities are very industrial in color, and the design is relatively simple, which is incompatible with the surrounding environment. The core of rainwater landscape is to turn the rainwater facility into a landscape element, which is combined with the surrounding environment for visual processing. In the landscape design of rainwater, it is necessary to make full use of rainwater resources, and to create landscapes with water, such as designing rainwater waterfalls: in the landscape design, the kinetic energy of free fall of rainwater can be fully utilized to form a rainwater waterfall landscape, which can be artificially Falling water and waterfalls fall into the water. Through design, not only make full use of resources, but also make the rain change from static to dynamic, enhance and enrich the appreciation of the landscape, and make full use of the kinetic

energy of the natural world to create the landscape, thus reflecting the green, low-carbon and energy-saving design of the green rainwater landscape. In the design of green rainwater landscape design, the design form must not only be visual but also experiential. The colors of ordinary rainwater facilities are mostly gray, which makes people feel a sense of distance and is not easy for people to get close to. Adding color to the rainwater facility without changing the function of the rainwater facility can also add vitality and experience to the landscape of the residential area. For example, if you want to lay a permeable brick, you can't change its form, but if you add warm colors that people like, brick will create an active and lively atmosphere. The experiential rainwater facilities pay more attention to the humanized natural experience and interactive participation, pursue natural education and ecological education, and respect culture and regionality.

4.2 Personalization and artistic
Most of the gullies and rainwater manhole covers in China have more considerations for their use functions, and less consideration is given to the decorative aesthetics. In daily life, the rainwater pipes are mostly white and vertically attached to the wall, which is simple and monotonous and boring. The artistic and personalized rainwater facilities can make people's eyes shine, gain a deep experience, and increase people's interest and attention to the rain landscape. Therefore, it is necessary to take into account the sensory and auditory senses of the rainwater landscape, based on the unique shape and characteristics of the rainwater, and comprehensively consider the shape, color, pattern, material and other formal elements of the rainwater installation, from the placement position, the placement angle, detailed design of the design elements such as landscaping materials and layouts enables the green rainwater facility to manage both rainwater and beauty. From the details, the green rainwater facility fully demonstrates individuality and artistry.

4.3 Thematic and specialization
In the rainwater landscape design of the green rainwater infrastructure, it is necessary to create a rainwater landscape with site characteristics. Each place has its own unique spatial layout and theme. When designing the rainwater landscape, it is necessary to first define the theme of the area, then refine the elements of the rainwater landscape, and finally deepen the design. For example, if the theme of the residential area is "livable", it is necessary to create a feeling of "home". Then, when designing the waterscape, you cannot make some empty water surface, but you should create a small space with a semi-enclosed feeling. Gives a sense of security. To create green rainwater infrastructure with different themes in different regions, with characteristics and features.

5. Conclusion
Rainwater is essentially a valuable sustainable resource. According to the natural conditions and environmental factors of the site, a suitable green rainwater infrastructure is built at the source of rainwater runoff, and the management of rainwater is achieved by simulating the natural hydrological cycle process. At the same time, through the artistic method, the Guilin urban green rainwater landscape system is constructed to improve the comprehensive value of rainwater management. Guilin's urban green rainwater landscape system not only plays an important ecological function, but also provides people with aesthetic, entertainment and educational experiences. To build a sustainable and beautiful rainwater infrastructure, build a green rainwater landscape system to improve rainwater management. Comprehensive value.

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